THE EFFECTS OF SCHOOL-RELATED GENDER-BASED VIOLENCE ON ACADEMIC PERFORMANCE

EVIDENCE FROM BOTSWANA, GHANA & SOUTH AFRICA

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ACRONYMS

AFR/SD/ED	Bureau for Africa, Office of Sustainable Development, Education Division
ATE	Average Treatment Effect
ATT	Average Effect of Treatment on the Treated
ConDev	Center on Conflict and Development at Texas A&M University
DAG	Directed Acyclic Graph
HESN	Higher Education Solutions Network
IEA	International Association for the Evaluation of Educational Achievement
OASIS	Opportunities for Achievement and Safety in Schools
OLS	Ordinary Least Squares
PIRLS	Progress in International Reading Literacy Study
PSM	Propensity Score Matching
RDCS	Regional Development Cooperation Strategy
SRGBV	School-Related Gender-Based Violence
TIMSS	Trends in Mathematics and Science Study
USAID	United States Agency for International Development
USG	United States Government

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FOREWORD

The Bureau for Africa, Office of Sustainable Development, Education Division (AFR/SD/ED) of the United States Agency for International Development (USAID) commissioned the Strategic Analytics Lab of the Center on Conflict and Development (ConDev) at Texas A&M University under the Opportunities for Achievement and Safety in Schools (OASIS) program to empirically assess the effect of bullying on student academic achievement. ConDev is a multidisciplinary center sponsored by USAID's Higher Education Solutions Network (HESN).

In support of the USAID Education Strategy, the Bureau for Africa Office of Sustainable Development's Regional Development Cooperation Strategy (RDCS), and the United States Strategy to Prevent and Respond to Gender-based Violence Globally, the OASIS program aims to increase access and quality in education for students and out-of-school youth by focusing on school-related gender-based Violence (SRGBV). OASIS is designed to help reduce SRGBV by enabling USAID and its partners to effectively address SRGBV through better understanding of SRGBV by (a) generating evidence, (b) fostering better capability to generate such evidence, (c) improving coordination, and (d) increasing awareness.

Specifically, under OASIS, AFR/SD/ED commits to:

- **Generate data that contributes to understanding causes, incidence, and effects of SRGBV:** Few studies, specifically in developing countries, have directly investigated the impact of school violence on academic performance or explored differences in experiences by different populations. OASIS will (a) support large-scale, gender-sensitive comparative research in developing countries by working with existing national surveys to include more refined questions on school violence, (b) analyze data from existing large-scale surveys to better understand the causes and effects of SRGBV, and (c) support rigorous evaluations of SRGBV intervention programs in a few select USAID countries to test their impact on educational achievement.

- **Strengthen USAID and other stakeholder capacity to address and monitor SRGBV:** The lack of commonly accepted definitions and conceptualizations of SRGBV and its sub-types is one major challenge to generating reliable, comparable data. OASIS aims to fill this gap by supporting the development of a standardized measurement framework in partnership with other USG and non-

USG stakeholders, which can be used and built on for program impact evaluations and other research around SRGBV.

- **Improve stakeholder coordination:** OASIS aims to facilitate the coordination of efforts across USAID and partner with national and international education stakeholders.

- **Increase awareness of SRGBV among USAID and non-USAID stakeholders:** OASIS aims to disseminate research findings strategically, develop talking points and fact sheets and partner with national and international education stakeholders on including this issue in the agenda of key meetings and conferences.

The present study is a contribution to the first objective of OASIS: "Generating Data." It is expected to contribute to the evidence base in order to help the international development community understand how SRGBV affects academic achievement.

Collectively, OASIS activities will inform and promote programs for a safe learning environment free of violence and abuse—an "oasis" for working, teaching, and learning without fear.

EXECUTIVE SUMMARY

Violence in and around educational settings is a global phenomenon. Sexual harassment and abuse may be the most well-known forms of school-related gender-based violence (SRGBV), but it can take many other forms. SRGBV includes violence or abuse that is based on gendered stereotypes or that targets students on the basis of their sex, sexuality, or gender identities. The underlying intent of this violence is to reinforce gender roles and perpetuate gender inequalities. It includes rape, unwanted sexual touching, unwanted sexual comments, corporal punishment, bullying, and verbal harassment. Unequal power relations between adults and children and between males and females contribute to this violence, which can take place in the school, on school grounds, on the way to and from school, or in school dormitories, and might be perpetrated by teachers, students, or community members. Both girls and boys can be victims as well as perpetrators. School-related gender-based violence results in sexual, physical, and/or psychological harm to girls and boys.

School-Related Gender-Based Violence (SRGBV)

Violence or abuse that is based on gendered stereotypes or that target students on the basis of their sex, sexuality, or gender identities

All of these forms of violence, including bullying, should be conceptualized as gendered, as they are affected by gender-related stereotypes that persist in society. For example, males and females are bullied at similar rates (Carrera-Fernandez et al., 2013; Due et al., 2005; Hussein, 2010), but boys are more often perpetrators than girls (Hussein, 2010) and the type of bullying that females and males experience is different: girls more often experience psychological bullying (Carrera-Fernandez et al., 2013), while boys more often experience physical bullying (Roman & Murillo, 2011). Conformity with heterosexual gender norms also affects who gets bullied (Drury et al., 2013; Gruber & Fineran, 2008; Navarro et al., 2011; Toomey et al., 2010).

Global data on SRGBV are fragmented. While there is some evidence on the harmful effects of SRGBV, its impact on academic achievement in particular has not been studied extensively. The International Association for the Evaluation of Educational Achievement (IEA)'s Progress in International Reading Literacy Study (PIRLS) and

Trends in Mathematics and Science Study (TIMSS) are examples of large-scale research that provides internationally comparable data on bullying as one form of SRGBV.

The present study aims to identify and quantify the effects of bullying on academic performance using the datasets collected from the PIRLS and TIMSS surveys conducted in 2011 in Botswana, Ghana, and South Africa.[1] We adopt an analytical approach that enables differentiation between the influence of bullying and demographic and economic factors on academic performance in an effort to inform educational policy.

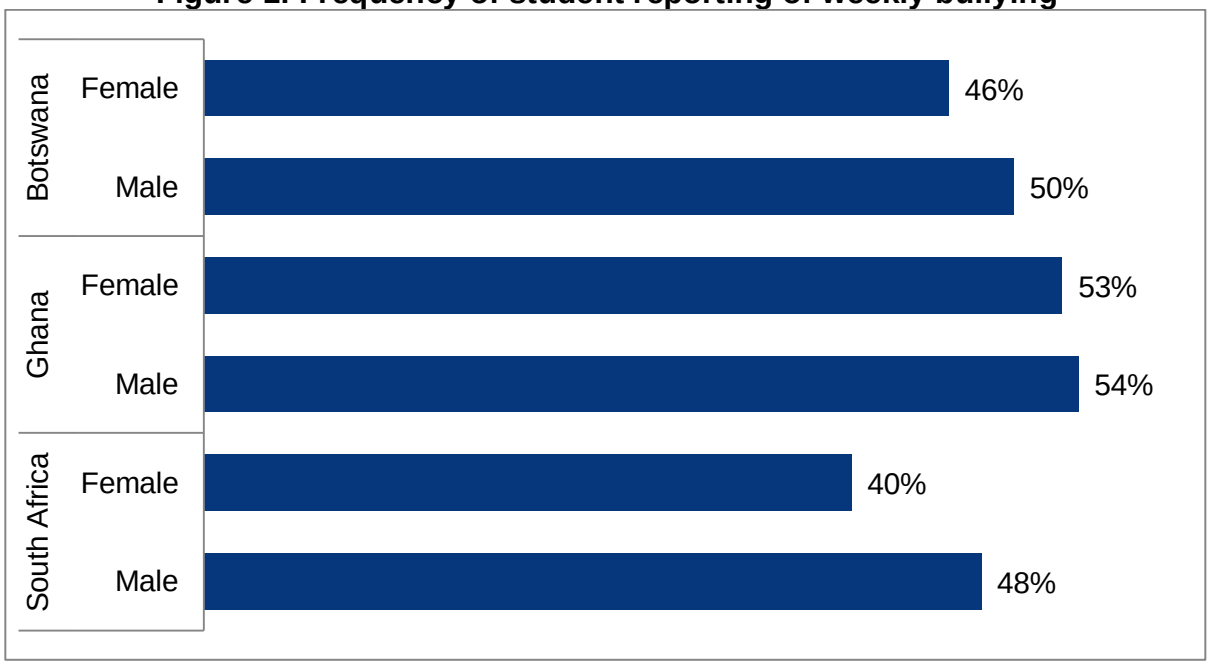
The datasets are internationally comparative, and enriched by comprehensive background information related to students and their households, teachers, and schools. The exams are administered in the fourth and eighth grades, enabling comparisons between cohorts of students. Over 36,000 students participated in the exams in 2011.

Bullying

Bullying can take many forms, including physical, psychological, and relational bullying. In the TIMSS and PIRLS, bullying is defined on the basis of the following behaviors: making fun of others; excluding others from games; lying about others; stealing from others; hurting others; and forcing others to do things. Self-reported incidents of bullying are used.

The TIMSS and PIRLS reveal that bullying is pervasive in the three countries included in this study. Approximately 80% of students report being bullied monthly, and 50% report weekly instances. Figure 1 depicts the percentage of students who experience weekly bullying instances depending on students' sex and country. Male and female students experience different levels of weekly bullying in Botswana and South Africa, but not in Ghana. In Botswana and South Africa, male students experience bullying more frequently than female students. Bullying is most prevalent in Ghana, with over 50% of students being targets of weekly bullying.[2]

Figure 1: Frequency of student reporting of weekly bullying



Note: Data provided by IEA'S PIRLS and TIMSS 2011. In total, 36,602 students are in the bar graph. By country, Botswana includes 13,795, Ghana 7,323, and South Africa 15,484 students.

Research Methods

We utilize several statistical techniques to evaluate the relationship between bullying and academic performance. Each technique is adopted to overcome limitations resulting from academic performance and bullying data having been collected at a single point in time.[3] The analysis utilizes ordinary least square (OLS), propensity score matching (PSM), and directed acyclic graph (DAG) techniques.

Matching techniques are employed to match each bullied student with a student who is not bullied but very similar in all other observed variables. We are able to identify the influence of bullying by comparing the average difference in academic performance between the two groups of students. Finally, it is possible that poor academic performance is a driver of bullying as opposed to bullying being the driver of poor performance. To account for this possibility, DAG analysis is employed to differentiate between those two interpretations. Student achievement in reading, math, and science is reported on a scale of 0 to 1000.

Summary of Results

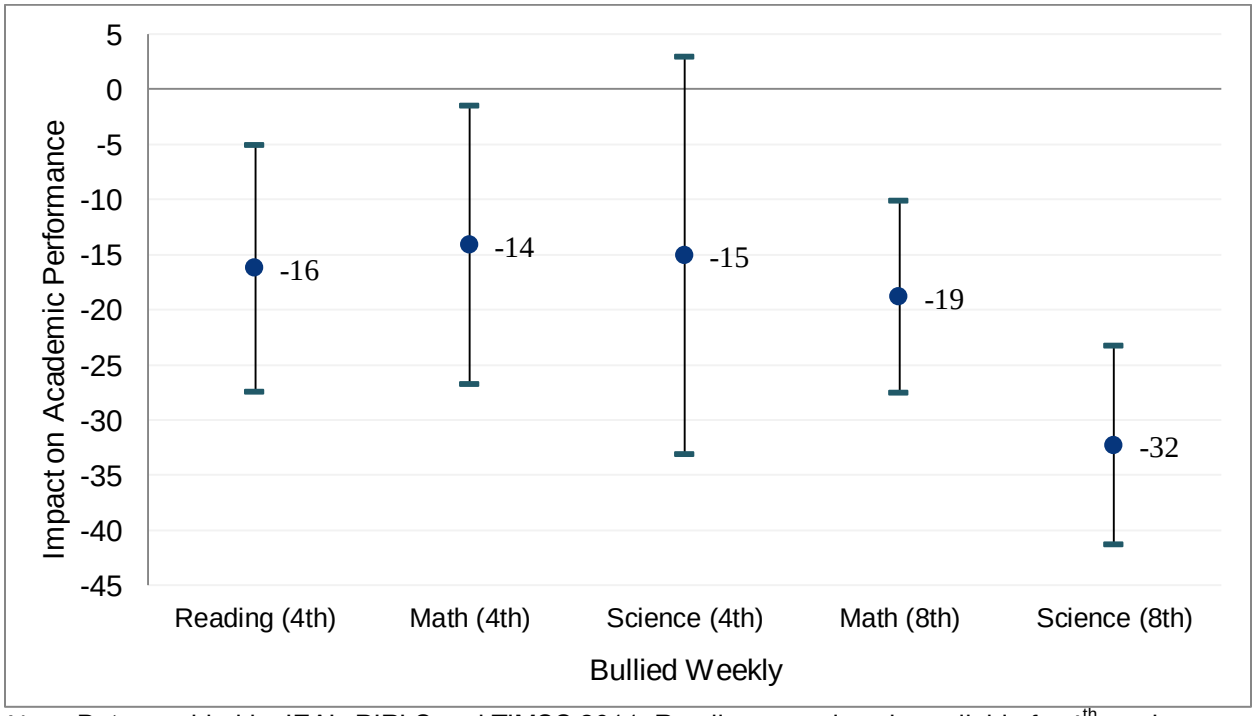
Bullying negatively impacts academic performance in each country. For Botswana and Ghana, science scores are most susceptible to the negative effects of bullying. The negative effects of bullying are more pronounced in eighth graders than fourth graders in Botswana—the only country that collected data for both grade cohorts in math and science. In addition to bullying, other factors affect academic performance, such as teachers' experience, parents' education, geographical location, as well as teachers'

sex and students' sex and age. The interdependencies between these factors and bullying are complex and vary from country to country. However, in all countries the effect of bullying is more influential than the effect of these other variables.

Botswana

Figure 2 depicts the negative effect of being bullied weekly on student performance in reading, science, and math.[4] Students who experience bullying score lower than those who are not bullied by between 14 and 32 points, with the largest effect seen in eighth-grade science. As Figure 2 shows, the effects of bullying are stronger on eighth-grade students in math and science than on fourth graders.[5] These effects are meaningful: at an average score of 400 points, the score differences correspond to a 3% to 8% decrease in performance.

Figure 2: Effects of weekly bullying in Botswana on academic performance, PSM estimate

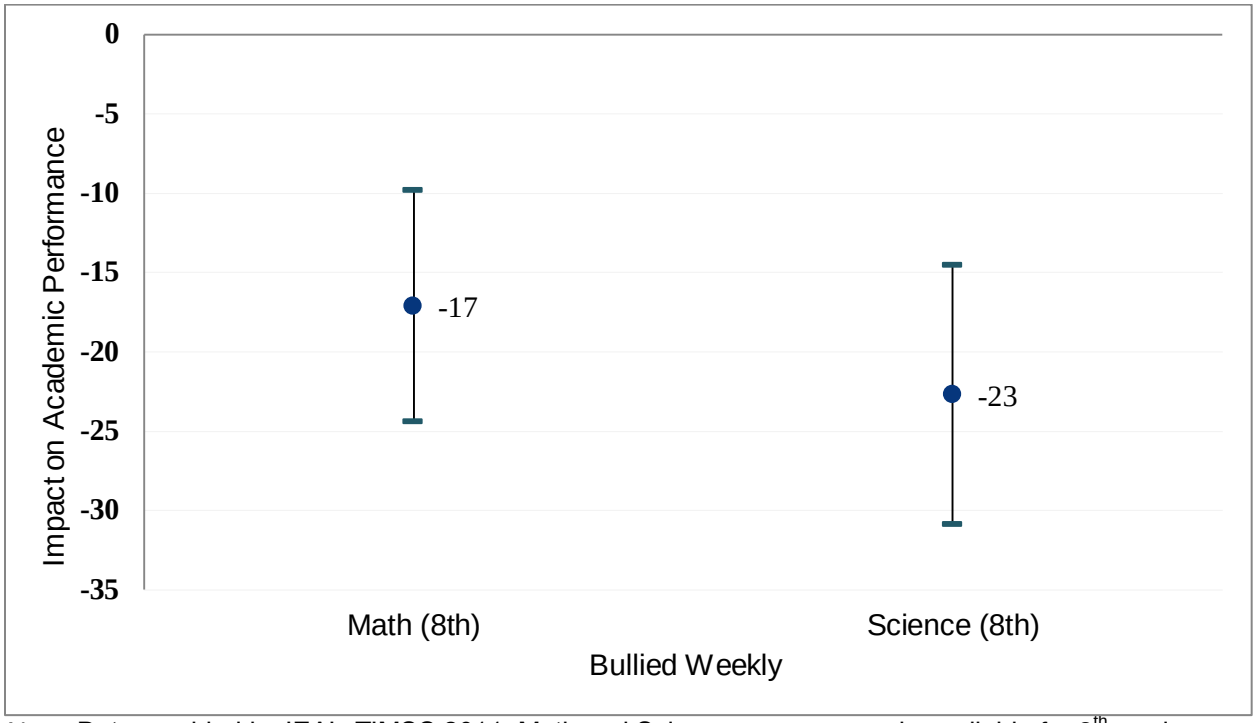


Note: Data provided by IEA's PIRLS and TIMSS 2011. Reading score is only available for 4th graders. However, the other subjects contain both 4th and 8th graders.

Ghana

Also in Ghana, students who experience bullying perform worse academically than non-bullied students. As evident in Figure 3, student performance in math and science decreases between approximately 17 and 23 points on the TIMSS exam compared to non-bullied students. At an average score of approximately 321 points, bullying decreases math scores by approximately 5% and science scores by about 7%.

Figure 3: Effects of weekly bullying in Ghana on academic performance, PSM estimate

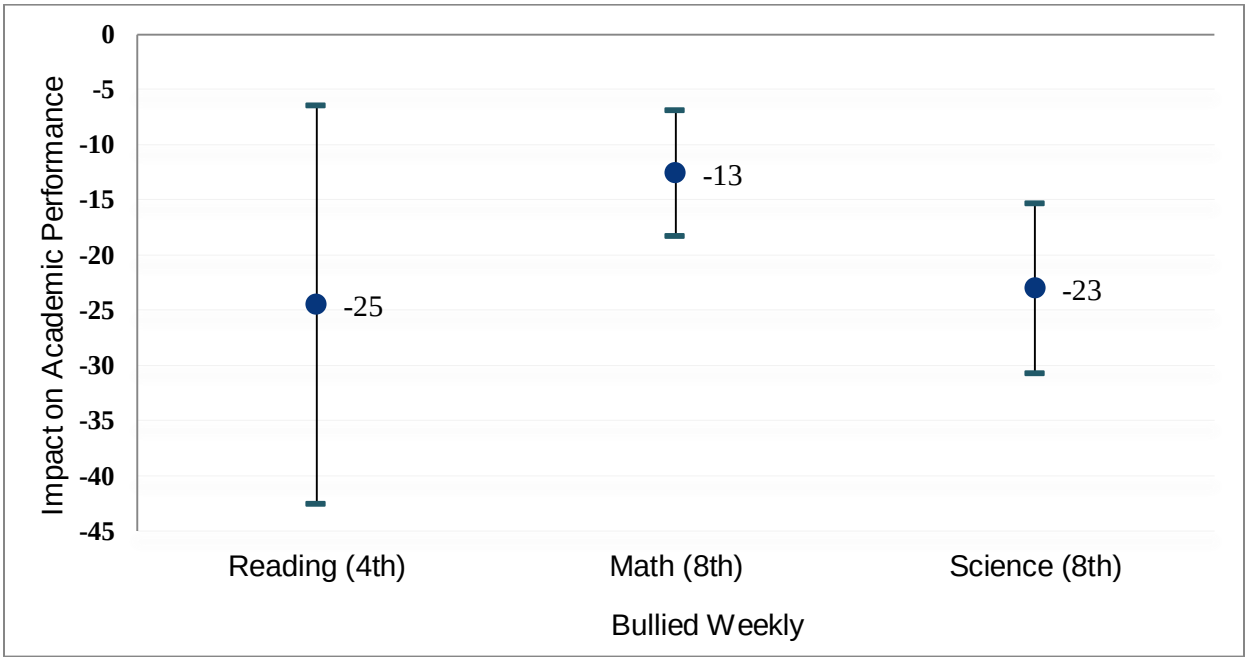


Note: Data provided by IEA's TIMSS 2011. Math and Science scores are only available for 8th graders.

South Africa

Figure 4 displays the effects of bullying on academic achievement in South Africa. Students who are bullied score between 13 and 25 points less than those who are not bullied, corresponding to a 3% to 6% decrease, given average scores of 380 points.

Figure 4: Effects of weekly bullying in South Africa on academic performance, PSM estimate



Note: Data provided by IEA's PIRLS and TIMSS 2011. Reading scores are available for 4th graders; Math and Science for 8th graders.

Additional Influences that Impact Academic Performance

In addition to bullying, academic performance of students can be affected by other socio-economic conditions related to school and family specific effects. More specifically, students' sex and age, teachers' experience, parents' education, and urban/rural geographical location can also impact academic performance significantly. Hence, we also examine the effects of these variables.

Table 1 provides the summary results of individual effects of these additional variables. Variables labeled "Sig" indicate that the variable is statistically significant at the 10% level. "Not Sig" indicates when a variable does not reach conventional levels of statistical significance in at least one model. Complete results discussions are available in the main text. Country-specific effects are briefly discussed.

We find statistical significance for students' age and parents' education on students' test scores in all three countries. In general, our analysis shows that younger students perform better academically. Higher levels of education among parents also enhance students' test scores in science, math, and reading across the three countries. The influence of parents' education is weaker in Ghana than in South Africa and Botswana.

We find that schools in urban and suburban locations are associated with higher academic performance on the part of students in comparison to those in rural locations. In our analysis, geographic location of schools has a statistically significant effect on

students' test scores for all tested disciplines and all countries, apart from South African fourth-grade students and Ghanaian eighth-grade students.

Students' sex, teachers' sex, and teachers' experience provide contradictory evidence. For example, teachers' experience in South Africa is associated with higher performance in math but with lower performance in science. A similar pattern emerges in Botswana. These inconsistent results are potentially due to a number of factors about which the TIMSS and PIRLS do not provide information, including student-to-teacher ratio, school curriculum, or different levels of participation and encouragement given to students based on sex. Future research is needed to understand these dynamics better.

Table 1: Variables associated with academic performance when accounting for bullying

	Botswana		Ghana	South Africa	
	4th grade	8th grade	8th grade	4th grade	8th grade
Students' sex (female)	Sig* (+)	Sig * (+)	Sig ** (+/-)	Sig ** (+)	Sig ** (-)
Students' age	Sig ** (-)	Sig ** (-)	Sig ** (-)	Sig ** (-)	Sig ** (-)
Teachers' experience	Sig * (+/-)	Sig ** (+/-)	Sig * (-)	Not Sig	Sig ** (+/-)
Teachers' sex (female)	Sig ** (-)	Sig ** (-)	Sig ** (+/-)	Sig ** (-)	Sig ** (+)
Parents' education (more education)	Sig ** (+)	Sig * (+)	Sig ** (+)	Sig ** (+)	Sig ** (+)
School location (urban)	Sig * (+)	Sig ** (+)	Not Sig	Not Sig	Sig** (+)

Note. Please refer to the regression results in Appendix III for additional details.
** indicates statistical significance at the 10% level across all subjects.
* indicates statistical significance at the 10% level only in certain subjects.
(+) refers to a positive relationship between the variable and achievement, (-) refers to a negative relationship between the variable and achievement, and (+/-) refers to mixed evidence which varies by subject.

In sum, our analysis demonstrates the effect of bullying as a key factor that drives a decrease in academic performance. In most of the analyses, bullying statistically overpowers other influences on student performance, particularly in Botswana and South Africa. We examine the validity of causal conclusions[6] through Directed Acyclic Graph (DAG) that use modern innovations in computer science. A DAG is a pictorial illustration using arrows and vertices to represent the causal flow among a set of variables. DAGs are used to validate the causal structure and direction of the variables used in this analysis emanating from Bayesian networks. The DAG results depict that bullying is one of the root causes of lower academic performance and nullify the notion of any reverse causality (meaning the interpretation that lower academic performance

makes students more likely to be bullied). The graphical analysis also verifies that bullying in most cases is not affected by student-, teacher-, and school-specific attributes that were collected through the PIRLS and TIMSS surveys.

Conclusion and Recommendations

This study sheds new light on the effects of school violence, measured through bullying, on academic performance in Botswana, Ghana, and South Africa. Our research leads to three primary conclusions. First, we find that bullying in these developing countries is pervasive and has severe ramifications on student academic performance by as much as 8%. Second, we find that when we control for bullying, student academic performance is also influenced by students' sex and age, teachers' sex and experience, parents' education, and geographical location. However, in all countries the effect of bullying is more influential than the individual effect of these other variables. Third, our analysis identifies country-specific effects that should be further explored in future research. Overall, we offer strong evidence of the detrimental effects of bullying and identify it as one of the key drivers of lower academic performance. The analysis focuses on developing countries, but bullying is pervasive in many educational contexts. We recommend policies and programs designed to enhance student safety and well-being and academic performance by reducing bullying. Furthermore, we suggest follow-up studies to better understand the drivers and effects of bullying as well as its interaction with other sociodemographic factors and to identify successful practices for reducing bullying and other forms of SRGBV and their harmful effects.

Notes

[1] Certain data for these countries are not available. For example, in 2011, the TIMSS, but not the PIRLS, was administered in Ghana.
[2] It is worth noting that our analysis cannot examine who is doing the bullying. It is likely that students both perpetrate and experience bullying in many cases. Some students must be both bullies and victims of bullying. Future research should investigate the dynamic between being bullied and engaging in bullying.
[3] Cross-sectional data does not capture pre-test and post-test changes of a particular individual over time.
[4] We report all data analysis. Missing age categories are due to variation in PIRLS and TIMSS administration.
[5] The data do not track students over time, so it is not currently possible to conduct times-series analysis.
[6] We also check for reverse causality.

CHAPTER ONE

INTRODUCTION: BACKGROUND AND PURPOSE

Violence in and around educational settings, such as school-related gender-based violence, is a global phenomenon. While sexual harassment and abuse may be the most well-known forms of SRGBV, it can take many other forms: SRGBV includes violence or abuse that is based on gendered stereotypes or that targets students on the basis of their sex, sexuality, or gender identities. The underlying intent of this violence is to reinforce gender roles and perpetuate gender inequalities. It includes rape, unwanted sexual touching, unwanted sexual comments, corporal punishment, bullying, and verbal harassment. Unequal power relations between adults and children and between males and females contribute to this violence, which can take place in the school, on school grounds, on the way to and from school, or in school dormitories and may be perpetrated by teachers, students, or community members. Both girls and boys can be victims as well as perpetrators. School-related gender-based violence results in sexual, physical, and/or psychological harm to girls and boys.

It is important to note that all of these forms of violence, including bullying, should be conceptualized as gendered, as gender-related stereotypes that persist in society affect the frequency with which boys or girls become targets of or engage in different types of violence. For example, boys and girls are bullied at similar rates (Carrera-Fernandez et al., 2013; Due et al., 2005; Hussein, 2010), but boys are more often perpetrators than girls (Hussein, 2010) and the type of bullying that girls and boys experience is different: girls more often experience psychological bullying (Carrera-Fernandez et al., 2013) and boys more often experience physical bullying (Roman & Murillo, 2011). Conformity with heterosexual gender norms also affects who gets bullied (Drury et al., 2013; Gruber & Fineran, 2008; Navarro et al., 2011; Toomey et al., 2010).

Global data on SRGBV are scarce, fragmented, and mostly generated from many smaller-scale studies that investigate different aspects of violence, use different methodologies, and are difficult to compare. While there is some evidence of the harmful effects of SRGBV, its impact on academic achievement in particular has not

been studied extensively. However, the IEA's PIRLS and TIMSS are examples of large-scale research that provides internationally comparable data on bullying as one form of SRGBV.

USAID commissioned the Strategic Analytics Lab of the Center on Conflict and Development (ConDev) at Texas A&M University to empirically assess the effects of bullying on student academic achievement using data from the PIRLS and TIMSS conducted in 2011 in Botswana, Ghana, and South Africa.[1] ConDev is a multidisciplinary center sponsored by USAID's HESN. The primary goal of this research is to identify and quantify the (negative) effects of bullying on academic performance. We adopt an analytical approach that enables differentiation between the effects of bullying and demographic and economic factors on academic performance in an effort to inform educational policy.

The datasets are internationally comparative, and enriched by comprehensive background information related to students and their households, teachers, and schools. The exams are administered in the fourth and eighth grades, enabling comparisons between cohorts of students. Over 36,000 students participated in the exams in 2011.

Bullying

Bullying can be defined as any non-sexual form of intimidation, which is perpetrated with intention to harm, either physically or psychologically. The act of bullying is grounded in the power differential that exists between perpetrator and victim. Acts of physical bullying range from severe acts of physical violence, such as beatings, to acts such as pulling at someone's clothes or hair or grabbing someone's belongings. Acts of psychological bullying include name-calling, public humiliation, and teasing. Intentional exclusion of a peer from social circles (sometimes referred to as "relational bullying") and theft are also forms of bullying. Bullying, or intimidation, as a form of SRGBV can be perpetrated by peers, teachers, other school staff, or persons encountered on the way to and from school (RTI International, forthcoming).

Bullying is one form of SRGBV that is extensive in educational settings. For instance, by analyzing data from a representative sample of 15,686 U.S. students in sixth through 10th grade, Nansel et al. (2001) show that almost 30% of the students in the sample reported moderate or frequent involvement in bullying. In the 2011 PIRLS, which comprises more than 300,000 students from 48 developed and developing countries, more than 50% of students reported that they experienced bullying at school; furthermore, 33% of the sample said that they were bullied "approximately weekly" (Mullis, Martin, Foy, & Drucker, 2012). Bullying has been shown in smaller studies to affect students in Ghana, the United Kingdom, Denmark, Italy, and other European countries (Ammermueller, 2012; Brown & Taylor, 2008; Dunne et al., 2013; Eriksen et al., 2012; Ponzo, 2013) and bullying likely occurs in other countries where data are not available.

There is limited economic research on the consequences of bullying, despite the prevalence of bullying observed around the world. Educational economists have performed numerous studies of the influence on student performance of individual, household, school, and teacher characteristics—such as students' sex and age, school quality, enrollment, and location, and teachers' sex, experience, and education level (Card & Krueger, 1992; Dearden et al., 2002; Ehrenberg & Brewer, 1994; Hanushek, 1986; Kukla-Acevedo, 2009). However, the psychological and educational literature has devoted more attention to the topic of bullying for several decades. Olweus (1978) began to systematically study bullying at school in Scandinavia in the 1970s and proposed the definition of bullying that is widely accepted by subsequent researchers and on which we base our understanding of bullying as described in the beginning of this section. According to Olweus (1993), a student is being bullied at school "when he or she is exposed, repeatedly and over time, to negative actions on the part of one or more other students." These negative actions include attacking or causing discomfort to someone physically or verbally, spreading rumors about someone, and intentionally excluding someone from a group. Since bullying is also characterized by asymmetric power relationships among peer students, students being victimized struggle to protect themselves from such negative actions. One of the contributions of the psychological literature is to describe the linkages between school bullying and educational achievement. Although Woods and Wolke (2004) found no association between direct bullying and educational achievement, many studies have shown that bullying leads to school avoidance and poor attendance, inability to concentrate, negative attitudes, lack of academic engagement, depression and reduced self-esteem, and even physical health problems (Barrett et al., 2012; Dunne, 2013; Hazel, 2010; Hemphill et al., 2011; Kosciw et al., 2013; Ouellet-Morin et al., 2011; Ripski & Gregory, 2009).

A few economists have recently analyzed the impact of school bullying on academic achievement and lifetime earnings beyond school. Brown and Taylor (2008) made the connection between bullying and academic achievement using a sample from the British National Child Development Study data. Furthermore, they showed that the effects of bullying outweigh the effects of class size, which has been a key determinant of educational attainment in the economics literature (for example, see Card & Krueger, 1992; Dearden et al., 2002). Such empirical findings suggest that more economic studies should be carried out on the linkage between bullying and educational attainment. Ammermueller (2012) used a much broader dataset, comprising data from 11 European countries, to analyze the determinants of bullying and its effects on student attainment. Similarly, it has been found that being bullied has a significantly negative impact on students' contemporary and later performance in both school and the labor market. Ponzo (2013), using the PIRLS and TIMSS, employed a non-parametric method, in addition to using an OLS model, for schools in Italy and concluded that bullying decreased student performance in both the fourth and eighth grades. Notwithstanding the significant correlation between bullying and attainment that has been investigated in the above studies, the causal direction remains unclear. In other words, it is possible that a student has lower academic performance due to being a victim or that the likelihood of a student being bullied is higher if he or she performs poorly.

This research report adds to the existing literature by quantifying the effects of being bullied on student academic performance in three developing countries in sub-Saharan Africa. Due to the development community's robust investments in basic education in sub-Saharan Africa, this research is especially relevant to ensuring that development programming addresses the most crucial factors linked to student academic performance.

The following chapter describes the summary of our main findings. Chapter Three presents the parametric and non-parametric research methodologies. Chapter Four shows the results and interpretations. In Chapter Five, we provide discussion, followed in Chapter Six by our conclusion, policy recommendations, and directions for future research.

Notes

[1] Certain data for these countries are not available. For example, in 2011, the TIMSS, but not the PIRLS, was administered in Ghana.

CHAPTER TWO

SUMMARY OF MAIN FINDINGS

This study demonstrates that bullying is pervasive in Botswana, Ghana, and South Africa, where in each country approximately 80% of the students of the sample population reported that they had been victimized by some form of bullying. Recalling that the low international benchmark for the PIRLS and TIMSS is set to 400 and considering the observed average scores for each country (400 for Botswana, 321 for Ghana, 380 for South Africa), we confirm that the academic performance of the students was not up to international standards. Hence, along with bullying, we explore some other potential factors that may contribute to their low academic performance.

We commence our analysis with an OLS estimation. The dependent variable for the analysis is student performance, while the independent variables are bullying, students' age and sex, schools' geographic location and facilities, parents' education level, students' socioeconomic background, and various teacher attributes. The results reveal that bullying is associated with a statistically significant decrease in academic performance for all grades and disciplines. In Botswana, we observe that the effect is largest for students' science scores. In Ghana, we discover that bullying also has the highest impact on science scores. In South Africa, though, we find that the effect is highest for fourth-grade students' reading scores. Table 2 presents a summary of the estimated point differences that bullying causes on academic performance while controlling for other variables.[1]

Table 2: Summary of bullying impact on academic performance, OLS estimation

	Botswana		**Ghana**	**South Africa**	
	4th grade	8th grade	8th grade	4th grade	8th grade
Reading	-7.8**			-22.9***	
Math	-8.4***	-13.2***	-15.7***		-11.4***
Science	-10.5**	-24.2***	-18.7***		-22.1***

*$p < .10$, **$p < .05$, ***$p < .01$.

To validate the results on the impact of bullying on academic performance, we utilize PSM methods. Through the PSM procedures we search and match students of similar characteristics who differ only in whether or not they are victims of bullying. We are able to identify the influence of bullying by comparing the average difference in academic performance between the two groups of students. The impact of bullying identified through PSM estimations is very similar to the OLS coefficients.

Table 3: Summary of bullying impact on academic performance, PSM estimation

	Botswana		Ghana	South Africa	
	4th grade	8th grade	8th grade	4th grade	8th grade
Reading	-16.2***			-24.5***	
Math	-14.1**	-18.8***	-17.1***		-12.6***
Science	-15.0*	-32.2***	-22.7***		-23.1***

*p < .10, **p < .05, ***p < .01.

Table 3 summarizes the results of the PSM estimations in the nearest neighbor approach. In the nearest neighbor matching method, each bullied student is matched with a non-bullied student with closest propensity score. The propensity score is the probability of a student being bullied given a set of observed covariates, comprising school and student characteristics. Therefore, students who are bullied are matched with students who share similar characteristics and are not bullied. Similar to Table 2, we find that bullying most affects science scores for eighth-grade students, but in all subjects and grade levels, performance suffered due to bullying. Essentially, the results in Table 3 confirm our OLS results and ultimately our hypothesis that bullying decreases student academic performance significantly.

After confirming the significant impact of bullying on academic performance, we turn our attention to other sociodemographic indicators that affect student academic performance. In South Africa, we discover that students' sex and age and parents' education all have statistically significant impact on student performance across all subjects and grade levels. Teachers' experience and school geographical location have a statistically significant impact on student performance for eighth graders, but not for fourth graders. For Botswana, we find that students' age, teachers' experience, and parents' education have statistically significant impact on academic performance across all disciplines and grades. However, students' sex affects performance in reading and math only. Students' age and sex, parents' education, and school geographical location impact academic performance for eighth-grade students in Ghana, while teachers' experience has an effect only on math scores.

To explore possible mitigating factors of the effects of bullying, we utilize PSM to examine how students' performance changes if bullying is conditioned upon some significant choice variables. To explain the process we used, we discuss the influence of teachers' sex on academic performance. The sample of bullied students is separated

into two groups based on whether students had access to female teachers. We then apply PSM on each subsample to identify factors influencing academic performance. This conditional PSM approach enables us to estimate the possible mitigating influences of bullying on student performance. Table 4 summarizes the changes in bullied students' academic performance due to a change in one choice variable – for example, in Ghana, bullied students with female teachers performed better, by on average 14.49 points, than those who did not have at least one female teacher.[1] To have more confidence in the results, we intend to consider only students who had appeared in at least two tests. Thus, we include students who participated in math and science exams in each country. For variables that can have more than two values, such as parents' education, we perform the estimation for each value. We compared different coefficients of each variable on academic performance. For example, we compared the difference in the effects of teachers' sex on academic performance. For the sake of simplicity, we dichotomize all the variables (i.e., 0 if parents have less than post secondary education, 1 if more). We report the difference in size of the effects in Table 4. Coefficients that are significant under each specification are denoted using the symbol ◊. The symbol does not denote statistical significance, but provides a guideline for evaluating the individual effects of variables. A coefficient is deemed significant if it is at least equal to 1 standard deviation point of students' mean score.

Table 4: Summary of individual variable difference in different models of academic performance

	Botswana	Ghana	South Africa
Students' sex	-6.48 ◊	-3.18	7.34 ◊
School location	2.25	4.49	6.31 ◊
Parents' education	-4.85	8.56 ◊	3.33
Students' economic background	8.05 ◊	-3.11	-7.75
Teachers' experience	11.83 ◊	8.09 ◊	-2.56
Teachers' sex	-2.31	14.49 ◊	-2.26

◊ denotes that the difference is significant in each model specification.

We find that bullying affects female and male students differently in South Africa and Botswana but not in Ghana. The direction of the effect, however, is interesting. In South Africa, females perform better, while males perform better in Botswana. This result suggests that differences in culture, educational environment, home environment, and other stimuli are influencing academic performance of girls and boys differently in the

[1] The non-bullied students who had access to female teachers also performed better than their peers who were not taught by female teachers.

two countries. Identification of why female and male students academically perform differently in each country will benefit future policy formation.

In terms of parents' education level, we see a weak difference in Ghana, where children with parents who have at least post-secondary education do better in school. A likely explanation is that parents with higher education may see the importance of children's education and may provide more encouragement and support to their children to do well in school despite the bullying that may occur. While we do not see any effect of teachers' experience in academic performance of bullied students, we do see a strongly significant result in Ghana for teachers' sex. Specifically, we see that the impact of bullying on students who have access to at least one female teacher is smaller than on those who are taught by only male teachers. Research shows that female teachers tend to possess victim-centered attitudes and deal with conflict resolution by involving school authorities and that they encourage more peer collaboration, all of which may decrease the effects of bullying (see Chudgar & Sankar, 2008; Hirdes, 2010).

Notes

[1] Complete estimation results are found in Appendix III. Additional analysis using the "monthly" category will be found in the online appendix available at condevcenter.org.

CHAPTER THREE

RESEARCH METHODOLOGY

In light of the existing literature, to investigate the effect of bullying on academic performance in this study we test the following primary hypothesis:

H1. Bullying in Botswana, Ghana, and South Africa will have a statistically significant causal impact on male and female students' academic performance, adjusting for differences in demographics, geographic location, parent and teacher attributes, students' family background, and school facilities.

The primary hypothesis of our study is that bullying in Botswana, Ghana, and South Africa will have a statistically significant negative causal impact on male and female students' academic performance. We control for different demographics, geographic locations, parent and teacher attributes, family backgrounds, and quality of school facilities. Additionally, we establish sub-hypotheses structured around characteristics that likely influence academic performance: besides bullying, we hypothesize that four primary factors affect student achievement in reading, math, and science. The first of these factors is the individual characteristics of students, such as students' age and sex. The second factor is the household characteristics of students, including parents' education level as well as five indicators of home support for education. These indicators are possession of a computer, possession of a study desk, own room for each child, internet accessibility, and number of books at home. The third factor is teacher characteristics, consisting of teachers' experience, sex, and education level. The fourth factor affecting student academic performance is school characteristics, comprising school location, school enrollment, percentage of students coming from economically disadvantaged families, and school facilities (for example, school library size and number of school computers).

Data Description and Summary Statistics

This section provides the summary statistics of the data used in the analysis. Over the past two decades, the IEA has regularly conducted two international student assessments, namely the PIRLS and the TIMSS, with the first PIRLS assessment

conducted in 2001. PIRLS was implemented to measure fourth-grade students' reading achievement, while TIMSS measures students' mathematics and science achievements in the fourth and eighth grades. Both datasets are internationally comparable, enriched by comprehensive background information related to students and their households, teachers, and schools. Student achievement in reading, math, and science are reported on a scale of 0 to 1000; however, typical scores fall in the range of 300 to 700. PIRLS and TIMSS set four threshold scores as international benchmarks: advanced international benchmark (625); high international benchmark (550); intermediate international benchmark (475); and low international benchmark (400).

For our empirical analysis, data is collected from IEA's latest surveys, conducted in 2011. The selected countries in Africa were Botswana, Ghana, and South Africa.[1] In Botswana, 4,197 students participated in the 2011 PIRLS, and 9,598 students participated in the 2011 TIMSS. In Ghana, 7,323 students participated in the 2011 TIMSS. In South Africa, 3,515 students participated in the 2011 pre-PIRLS, and 11,969 students participated in the 2011 TIMSS. All students and their associated schools were randomly chosen. Both PIRLS and TIMSS administered a set of questions to determine whether students suffer from school violence (i.e., bullying in this context) in the background questionnaire. Table 5 lists the six questions that are used to construct variables on whether a student experienced bullying.

Table 5: Questions used to determine if a student has experienced bullying

"During this year, how often were you made fun of or called names at school?"
"During this year, how often were you left out of games or activities by other students at school?"
"During this year, how often did someone spread lies about you at school?"
"During this year, how often was something stolen from you at school?"
"During this year, how often were you hit or hurt by other student(s) at school?"
"During this year, how often were you made to do things you didn't want to do by other students at school?"

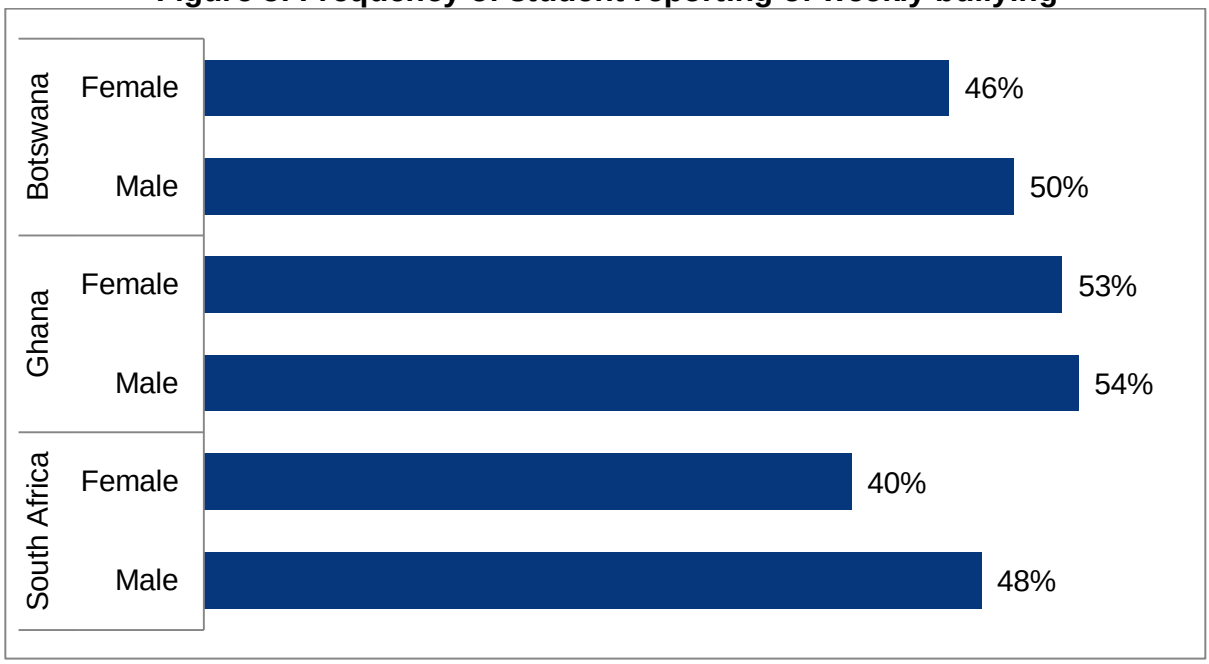
Each respondent was asked to select one of the following options: "once a week," "once or twice a month," "a few times a year," or "never." Based on the answers collected from the respondents, the TIMSS dataset generates a derived variable indicating school bullying, that is, a student is graded as being "*bullied weekly*" if he/she at least

experienced each of three of the six bullying behaviors “once or twice a month” and each of the other three “a few times a year.”

As described above, we also analyze if students’ sex and age, teachers’ experience and sex, school location, and parents’ education influence student performance. Appendix I provides a complete summary of the variables used in the analysis. We briefly discuss descriptive statistics for key variables discussed above for Botswana, Ghana, and South Africa, respectively.[2] In Botswana, the ratio of females to males is close to 1:1. The average age of fourth-grade students is approximately 12 years and the average age of eighth-grade students is approximately 16 years. Average reading scores for fourth-grade students from South Africa (419) and Botswana (417) are slightly higher than the low international benchmark (400). Only Botswana provided for the participation of fourth-grade students in the TIMSS survey, with these students scoring approximately 417 and 365 for math and science, respectively. We then compared eighth-grade students’ math and science performance across all three countries. The statistics show that students from Botswana have the highest scores, which are around the low international benchmark (396 for math and 403 for science), while students from Ghana were 63 and 94 points behind (333 for math and 309 for science) and students from South Africa on average scored 30 and 50 points lower (366 for math and 353 for science).

The analysis examined the effects of bullying on academic performance. Students could identify a time frame of “never,” “weekly,” “monthly,” or “a few times a year” for each of the six indicators. The variable “bullied” is coded 1 when students report that they experience at least three of the six questions related to bullying on a weekly basis.[3] Bullying is consistently pervasive for all three countries: about 80% of students surveyed are bullied monthly while almost 50% of students are bullied weekly. Overall, Ghanaian schools have the most victims (53% were bullied weekly). We do not observe a large difference between the number of bullying victims in the fourth and eighth grades. Figure 5 depicts the percentage of students that experience weekly bullying instances depending on students’ sex, and country. Male and female students experience different levels of weekly bullying in Botswana and South Africa, but not in Ghana. In Botswana and South Africa, male students experience bullying more frequently. Bullying is most prevalent in Ghana with over 50% of the students exposed to weekly bullying.[4]

Figure 5: Frequency of student reporting of weekly bullying



Note: Data provided by IEA'S PIRLS and TIMSS 2011. In total, 36,602 students are in the bar graph. By country, Botswana includes 13,795, Ghana 7,323, and South Africa 15,484 students.

Among all three countries, we find that the least prevalent acts of bullying involve victims "being hurt by other students" and "being forced to do things." (Roughly 50% of students answered "never" to these questions.) The most prevalent acts of bullying involve having "things stolen" and "being made fun of," with generally more than one half of the students experiencing such behaviors at least once or twice a month. The summary of the acts of bullying students experience can be found in Appendix II.

Estimation Strategy

Both parametric and non-parametric approaches are used in our econometric framework in order to eliminate confounding effects. Moreover, we take advantage of the rich data to identify possible demographic and economic covariates that influence academic performance in developing areas. We also conduct a heterogeneity analysis to investigate the effects of bullying on student performance conditioned on other variables.

We estimate a model for student achievement using OLS as has been done in previous work (Ponzo, 2013).[5] However, OLS estimation may suffer from several econometric shortcomings that arise when using cross-sectional data. Of particular concern is endogeneity—the correlation between academic performance and the error term of the estimate. Endogeneity may occur because of omitted variable bias, selection bias, simultaneity, and autoregressive characteristics of the data. For example, due to simultaneity a bullied student may perform poorly academically because he or she is bullied and be bullied because he or she performs poorly academically. Alternatively,

endogeneity arises because of omitted variable bias. Omitted variable bias occurs when variables that should be included in the model are not, a situation that is typically the result of data limitations. Other models need to be used to overcome the endogeneity problem and check the robustness of the estimations.

In addition, the data on bullying is cross-sectional observational survey data. Obviously, bullying is not an assigned treatment and participants are not randomly selected to be bullied by their peers. The lack of randomization of students bullied and the implementation of OLS estimations may produce overestimates of the impact of bullying on academic performance.[6] Overestimation of the effects may occur because many attributes that make students targets for bullies may be the same attributes that do not allow them to perform well in school. For example, a child may be the target of bullying because he or she is smaller than other children due to poor nutrition. Poor nutrition may also contribute to poor academic performance. We employ several statistical techniques to isolate the factors that impede student academic achievement from the factors that make them targets for bullies.

A matching method, for instance, grouping units based on a single variable (Dehejia & Wahba, 2002), was adopted to overcome the problems. By matching pairs of individuals with the same characteristics from control and treatment groups, we can make a comparison between treatment and control groups while reducing selection bias. Nevertheless, problems arise when the number of covariates is high, a situation deemed the curse of dimensionality in the literature. Therefore, the method of PSM proposed by Rosenbaum and Rubin (1983) was employed to reduce this problem. PSM refers to the conditional probability (given a vector of covariates X) of being assigned to treatment. That is, the propensity score takes into account the multidimensional covariates and compresses them into a single dimension, facilitating the matching process (Abadie & Imbens, 2009). Thus, the key advantages of PSM are that by using a linear combination of covariates for a single score, it balances treatment and control groups on a large number of covariates without losing a large number of observations. Again, the pair-matched individuals in control and treatment groups with the same propensity score are essentially comparable, since their only difference is whether they have been assigned to the treatment or the control group.

Formally, a propensity score is the probability of a unit (i.e., a student, in our research) being assigned to a particular treatment (i.e., being bullied), given a set of observed covariates, including school and student characteristics. Propensity scores reduce selection bias by equating groups based on these covariates. Suppose that we have a binary treatment T (T=1 if bullied, and 0 otherwise), an outcome Y (academic performance), and background variables X. The propensity score is defined as the conditional probability of treatment given background variables.[7]

The treatment assignment is, then, (conditionally) unconfounded if potential outcomes are not dependent on the treatment, conditional on background variables.[8] In technical terms, we obtain the average treatment effect (ATE) as the mean difference in outcome between the treated and the control students, and the average treatment effect on the

treated (ATT), which is the average effect from treatment for those who actually were treated.

In order formally to define the ATE, we define two potential outcomes.[9] This process will enable us to examine the experience of bullying by students as a "treatment" and investigate the effect of violence on the treated group. Essentially, the PSM method will allow us to compare two groups of students with similar characteristics, with one of the groups comprising victims of school bullying. Intuitively, the effect of bullying can be identified as the treatment effect shown by the deviation in academic performance.

To check the robustness of the PSM, matching algorithms are implemented, e.g., nearest neighbor, radius, and kernel (Caliendo & Kopeining, 2008; Imbens, 2015). In the nearest neighbor matching method, each bullied student is matched with a non-bullied student with closest propensity score. The propensity score is the probability of a student being bullied given a set of observed covariates, comprising school and student characteristics, while a radius approach matches each bullied student with all non-bullied students whose propensity score falls in a predefined neighborhood of the propensity score of the bullied student. In layman's terms, students who are bullied are matched with students who share similar characteristics and are not bullied. In kernel matching, each bullied student is matched with a weighted average of all non-bullied students, with weights declining with the distance between propensity scores of bullied and non-bullied students.[10]

Besides the main effects of school bullying on student academic performance discussed in the above section, we are also interested in the heterogeneous (differential) effects of bullying. Specifically, we examine if bullying has a significant differential impact on the performance of female and male students, of students from rural and urban areas, of students who attend schools with different quality of facilities, of students who attend schools with different proportions of fellow students from poor backgrounds, of students whose parents differ by education levels, of students who have access to teachers of different levels of qualifications, and of students who attend schools with different enrollment sizes. The heterogeneous treatment (bullying) effects are of great interest because it is possible that the relationship between academic achievement and the variable "bullied" depends on the value of one or more other control variables. For example, it might be the case that students bullied at school who are instructed by more qualified teachers lose fewer points than those who are educated by less qualified teachers.

To investigate the heterogeneous treatment effects of bullying on academic performance, we apply a PSM approach instead of OLS. The reason is that it is highly possible that the effects of bullying on student performance are affected by more than one covariate. In such a case, using OLS becomes cumbersome and would not guarantee unbiased results. For example, we assume that female and male students suffer differentially from bullying; furthermore, we assume that female students in rural areas suffer severely. If we merely add one interaction term into the OLS model to capture the correlation between bullying and students' sex, we will have omitted the

rural-area effects on female students being bullied, thus obtaining biased results. In contrast, by separating the sample into two parts given students' sex, we can apply PSM on each subsample, and compare the performance loss of female students who were bullied to the performance loss of male students who were bullied. All other possible interactive variables related to bullying and students' sex are ruled out in PSM.

To validate the direction of causality (i.e., that bullying affects student academic performance and not the other way around) we employed a machine-learning algorithm. DAGs, developed by Pearl (2009) and Spirtes et al. (2000), are graphical causal models that uncover and reveal qualitative causal directions among variables in diagrams. Graphical analysis has recently been used in social research to explore causality (Bessler, Kibriya et al. 2014; Chen, Kibriya et al. 2014; Haigh and Bessler, 2004; Bryant, Bessler et al. 2009). These graphs are especially useful when there is an endogeneity or identity problem among variables. This occurs, for example, when variables appear to be interrelated but an independent variable cannot be identified. Lines with arrowheads are used to represent causal flows; the graph A→B indicates that variable A causes B. A line connecting two variables, say C–D, indicates that C and D are connected by information flow but we cannot tell if C causes D or vice versa.

Notes

[1] Ghana did not participate in the 2011 PIRLS, but did participate in the 2011 TIMSS.

[2] Full summary statistics for all variables used in the analysis are available in Appendix I.

[3] Additional analysis uses the "monthly" category. The results are substantively consistent with the presented analysis and can be found in the online appendix.

[4] The data do not identify who is doing the bullying. It is likely that some students simultaneously experience and perpetrate bullying.

[5] $Y_i = \beta_0 + \beta_1 bullied_i + \beta_2 X_i + \varepsilon_i$, where Y_i denotes the academic performance of student *i* (including scores of reading literacy, math, and science), $bullied_i$ is a dichotomous variable indicating whether or not the student has been a victim of school bullying within a given period, X_i is a vector of student and school characteristics (such as sex, family socioeconomic background, enrollment), and ε_i is an error term capturing shocks and characteristics that are specific to the student or are unobserved. β_1 is our major interest in the project, i.e., the expected mean gap in academic performance between bullied students and non-bullied students. The coefficient for the constant, β_0, provides the intercept of the regression model's estimation. We also add control variables, such as students' and teachers' sex, in vector *X*.

[6] TIMSS and PIRLS both use two-stage random sample designs. Schools are randomly selected in the first stage and specific classes are randomly selected in the second stage. This randomization procedure is not designed to randomize on bullying, however. TIMSS and PIRLS are excellent data sources; the lack of randomization on our key variable reduces the causal conclusions we can deduce.

[7] $P(x) = \Pr(T = 1|X = x)$. Let Y(0) and Y(1) denote the potential outcomes under control and treatment, respectively. That is, Y(0) and Y(1) are the expected academic performance, respectively, of a student not being bullied and a student being bullied.

[8] This can be written compactly as $Y(0), Y(1)(T|X)$, where $\perp$ denotes statistical independence. If unconfoundedness holds, then the potential outcomes are independent of the treatment, conditional on the propensity score, compactly written as $Y(0), Y(1)(T|P(X))$.

[9] The ATE is given by $E(\mathrm{Y_{1i}} - \mathrm{Y_{0i}})$, where Y_{0i} is the *value academic performance* (in this case, test score) for individual *i* if s/he is not treated and Y_{1i} is the value of the outcome variable for individual *i* if s/he is treated. The ATT is given by $E[(\mathrm{Y_{1i}} - \mathrm{Y_{0i}})|\mathrm{T} = 1]$.

[10] For example, the treatment effect on the treated by the nearest neighbor estimator is $ATT^{NN} = \frac{1}{N^T}\sum_{w_i}\left[\boldsymbol{y_i^{obs}} - \sum_{\boldsymbol{j \in C(i)_m}} \boldsymbol{w_{ij} y_j^{obs}}\right]$, where N^T is the number of observations in the treated group, N_i^C is the number of controls matched with treated observation *i*, w_{ij} is equal to $\frac{1}{N_i^C}$ if j is a control unit of *i* and zero otherwise, and $w_j = \sum_i w_{ij}$. The other two matching algorithms are similar in principle but use different weighted averages.

CHAPTER FOUR

EMPIRICAL RESULTS

This section provides the main empirical results generated by OLS and PSM for Botswana, Ghana, and South Africa. “Bullied weekly,” which is a binary variable, is used for our analysis. “Bullied monthly” is used for the robustness check and the associated results for this are placed in the online appendix. In all OLS specifications, standard errors are adjusted for school-level clustering and heteroskedasticity, that is, for the grouping of observations at the school level and the different variances in the variables included in the model. In all matching specifications, we use a bootstrapping procedure to construct the standard errors for the ATT.

Botswana

The dataset for Botswana consists of the reading, math, and science performance of fourth-grade students and the math and science performance of eighth-grade students. A variety of specifications are applied in our OLS analysis. Column (1) in Table 6 shows the simplest specification; nothing else is included in the model but “bullied.” In Column (2), we add several variables to control for individual and household characteristics: students’ age, students’ sex, parents’ highest education level, number of books at home, computer possession, study desk possession, own room, and internet accessibility. In Column (3), we include additional variables to control for teacher characteristics: teachers’ age, sex, and experience. In Column (4), we control for school characteristics as well: school enrollment, proportion of students coming from disadvantaged families, school location, and number of school library books. In Column (5), we use an alternative way to control for school characteristics: school-fixed effects are employed instead of a set of variables representing school characteristics. Compared to the specification in Column (4), the specification in Column (5) presents a more parsimonious model and includes the effects of potential unobserved school characteristics.

From Column (1) to Column (5), the statistical measure R-squared increases as more and more variables are added into regression, meaning that the model accounts for more observations as more variables are added, improving the model. Adjusted R-squared is a statistical tool that provides a rough estimate of the variation of academic performance explained by the model. Higher adjusted R-squared values are often said to provide better “fit” of the data. Although the coefficients of “bullied” remain statistically significant at the 1% level across all five specifications, the magnitudes of the

coefficients are decreasing while the models become more and more comprehensive (from -17.492 to -7.801). This is reasonable because some control variables may be correlated with bullying, leading to overestimating the impact of bullying in the less comprehensive specifications. Column (5) represents the most comprehensive specification, implying that the school fixed effects capture additional unobserved school characteristics that are correlated with bullying. Thus, the decrease in scores in Column (5) provides the best estimate of the magnitude of the impact of bullying. Generally speaking, being bullied weekly at school has a significant negative effect on fourth-grade students' reading performance. As shown in Column (5), students being bullied scored almost eight fewer points than students not being bullied.

Table 6—a condensed version of Table 33 in Appendix III—demonstrates the impact of being bullied weekly at school on reading performance for fourth-grade students in Botswana. In the most comprehensive model, being a victim of school violence leads to a decrease of 7.8 points, which corresponds to a reduction of 0.09 standard deviation. Younger and female students tend to have better achievement in reading. Parents' education also plays an important positive role in explaining student performance. In addition, male teachers are associated with higher academic performance in reading compared with their female peers. Another finding is that students' reading scores increase by almost 10 points if their teacher had one additional year of teaching experience. Finally, it is observed that students in urban areas perform better than students in rural areas. For details, please refer to Table 33 in Appendix III.

Table 6: Impact of weekly bullying on 4th-grade reading literacy in Botswana

	(1)	(2)	(3)	(4)	(5)
Bullied	-17.492***	-13.559***	-13.770***	-13.515***	-7.801**
	(3.754)	(3.271)	(3.372)	(3.509)	(3.362)
Students' age		-22.254***	-21.994***	-19.982***	-18.179***
		(1.830)	(1.991)	(1.845)	(1.963)
Students' sex (female)		14.999***	16.311***	19.349***	17.514***
		(3.121)	(3.212)	(3.286)	(3.061)
Controls	No	Individual	Individual, Teacher	Individual, Teacher, School	Individual, Teacher
School fixed effects	No	No	No	No	Yes
Observations	4197	2514	2153	1858	2153
R-squared	0.010	0.975	0.976	0.977	0.982

Note. Standard errors are adjusted for school-level clustering and heteroskedasticity.
*p < .10, **p < .05, ***p < .01.

Table 7: Impact of weekly bullying on 4th-grade math performance in Botswana

	(1)	(2)	(3)	(4)	(5)
Bullied	-17.211***	-13.317***	-14.125***	-12.728***	-8.384***
	(3.621)	(3.231)	(3.396)	(3.429)	(3.033)
Students' age		-24.722***	-24.110***	-22.671***	-20.587***
		(1.555)	(1.675)	(1.599)	(1.685)
Students' sex (female)		7.561**	9.335***	10.633***	10.113***
		(2.957)	(3.152)	(3.241)	(2.876)
Controls	No	Individual	Individual, Teacher	Individual, Teacher, School	Individual, Teacher
School fixed effects	No	No	No	No	Yes
Observations	4198	2512	2136	1839	2136
R-squared	0.011	0.976	0.977	0.978	0.982

Note. Standard errors are adjusted for school-level clustering and heteroskedasticity.
*p < .10, **p < .05, ***p < .01.

Tables 7 and 8, corresponding with Tables 34 and 35 in Appendix III, present the impact of school bullying on math achievement for fourth-grade and eighth-grade students, respectively, in Botswana. The existence of a dataset that is comprised of two different grades allows us to investigate whether bullying has different effects on students as they grow older. The data suggest that the impact of bullying on math performance becomes progressively greater as students get older. Specifically, fourth-grade students who suffer from bullying lose about eight points in math (0.1 standard deviation), while being a victim of bullying costs eighth-grade students approximately 13 points (0.18 standard deviation).

Table 8: Impact of weekly bullying on 8th-grade math performance in Botswana

	(1)	(2)	(3)	(4)	(5)
Bullied	-25.288***	-19.723***	-17.778***	-16.369***	-13.233***
	(2.832)	(2.388)	(2.581)	(2.511)	(2.247)
Students' age		-32.908***	-32.419***	-29.764***	-29.062***
		(1.473)	(1.562)	(1.612)	(1.431)
Students' sex (female)		1.040	2.242	4.586**	4.038*
		(2.066)	(2.163)	(2.256)	(2.193)
Controls	No	Individual	Individual, Teacher	Individual, Teacher, School	Individual, Teacher
School fixed effects	No	No	No	No	Yes
Observations	5400	4043	3376	2968	3376
R-squared	0.030	0.976	0.976	0.978	0.980

Note. Standard errors are adjusted for school-level clustering and heteroskedasticity.
*p < .10, **p < .05, ***p < .01.

We consistently find that younger and female students perform better in math; however, the benefits of being female decrease in the eighth grade. The effects of other control variables on math achievement are summarized as follows: household characteristics

such as parents' education level, students' possession of a study desk, students' having their own room, and books in the home are positively correlated with student performance. Teachers who are male or receive better education are beneficial to students; surprisingly, teaching experience seems not to be helpful in improving student performance. Finally, schools located in urban areas and having fewer students from disadvantaged families tend to foster better math achievement.

Tables 9 and 10, corresponding with Tables 36 and 37 in Appendix III, reveal the influence of bullying on science performance for fourth- and eighth-grade students in Botswana. Again, it is found that the impact of bullying is worse for eighth-grade students than for fourth-grade students. Quantitatively, school violence leads to a decrease of approximately 10 points for the fourth-grade students, corresponding to a reduction of 0.085 standard deviations of fourth-grade science scores; and it leads to a decrease of approximately 24 points for the eighth-grade students, corresponding to a reduction of 0.245 standard deviations.

Table 9: Impact of weekly bullying on 4th-grade science performance in Botswana

	(1)	(2)	(3)	(4)	(5)
Bullied	-27.463***	-20.626***	-20.941***	-18.277***	-10.455**
	(5.394)	(4.966)	(5.357)	(5.404)	(4.898)
Students' age		-36.088***	-35.507***	-33.084***	-29.361***
		(2.446)	(2.785)	(2.536)	(2.806)
Students' sex (female)		-2.382	-0.742	1.692	0.895
		(4.488)	(4.807)	(4.774)	(4.313)
Controls	No	Individual	Individual, Teacher	Individual, Teacher, School	Individual, Teacher
School fixed effects	No	No	No	No	Yes
Observations	4198	2512	2136	1839	2136
R-squared	0.012	0.938	0.941	0.944	0.956

Note. Standard errors are adjusted for school-level clustering and heteroskedasticity.
*p < .10, **p < .05, ***p < .01.

Table 10: Impact of weekly bullying on 8th-grade science performance in Botswana

	(1)	(2)	(3)	(4)	(5)
Bullied	-36.343***	-30.938***	-29.841***	-27.855***	-24.215***
	(3.762)	(3.080)	(3.148)	(3.237)	(2.909)
Students' age		-44.419***	-44.862***	-41.659***	-40.337***
		(1.942)	(1.853)	(1.895)	(1.737)
Students' sex (female)		-6.050**	-4.963*	-2.527	-2.953
		(2.808)	(2.854)	(3.008)	(2.819)
Controls	No	Individual	Individual, Teacher	Individual, Teacher, School	Individual, Teacher
School fixed effects	No	No	No	No	Yes
Observations	5400	4043	3677	3281	3677
R-squared	0.034	0.960	0.960	0.962	0.966

Note. Standard errors are adjusted for school-level clustering and heteroskedasticity.
*p < .10, **p < .05, ***p < .01.

Besides bullying, higher student age and female teachers are also associated with significant negative effects on students' science performance. Students whose parents have received better education score higher in science. Moreover, schools that have fewer students from disadvantaged families realize better achievement in science for both the fourth and eighth grades. Schools located in urban areas show significant benefits only for eighth-grade students. Male teachers are associated with better performance in science than are female teachers in both grades.

Table 11: Impact of weekly bullying on academic performance in Botswana, PSM

	Outcomes				
Matching methods	4th-grade reading scores (1)	4th-grade math scores (2)	4th-grade science scores (3)	8th-grade math scores (4)	8th-grade science scores (5)
Nearest neighbor	-16.229***	-14.0966**	-15.042*	-18.844***	-32.301***
	(5.602)	(6.325)	(9.016)	(4.351)	(4.509)
Number of treated	862	844	844	1481	1617
Number of controls	951	954	954	1467	1640
Radius/caliper	-12.484***	-11.113***	-11.903*	-14.068***	-29.241***
	(4.644)	(3.377)	(6.462)	(2.928)	(3.295)
Number of treated	834	827	827	1475	1611
Number of controls	947	948	948	1436	1607
Kernel (Epanechnikov)	-11.794***	-11.933***	-14.132***	-14.067***	-30.167***
	(3.906)	(3.468)	(5.047)	(2.649)	(3.285)
Number of treated	862	844	844	1481	1617
Number of controls	951	954	954	1467	1640

Note. Balancing property and common support are satisfied. Nearest neighbor matching is applied with replacement. Standard errors, estimated by 100 bootstrap replications, are reported in parentheses.
*p < .10, **p < .05, ***p < .01.

Table 11 reports the results from the PSM approach. We employ three matching criteria.[1] Column (1) reports the ATT on fourth-grade reading literacy scores in

Botswana. Nearest neighbor matching results suggest that the students being bullied at school achieve 16.2 points less than their non-bullied fellows in reading literacy scores. The estimates by radius matching and kernel matching are slightly lower, at 12.5 and 11.8 points, respectively. But they are still statistically significant and large in magnitude. Columns (2) to (5) report the ATT for fourth- and eighth-grade math and science scores in Botswana. For instance, nearest neighbor matching results suggest that the fourth-grade students being bullied at school achieve 14.1 points less than their non-bullied fellows in math scores. Radius matching and kernel matching provide an even larger ATT estimate, about 11.1 and 11.9 points, respectively. A salient larger effect is found in Column (5), describing eighth-grade science scores. Eighth-grade students being bullied at school achieved about 30 points less than their non-bullied fellows in science scores. Overall, the PSM results show the significantly negative effect of bullying on academic achievement, confirming the results from the OLS models. As briefly discussed above, PSM estimates are substantively smaller than the OLS results, but the results better isolate bullying from the other factors that may lead to lower academic achievement and therefore provide a better estimate of the magnitude of the impact of bullying.

Ghana

The dataset for Ghana comprises the math and science performance of eighth-grade students. All the specifications follow an identical pattern to those used in the above section.

Table 12: Impact of weekly bullying on 8th-grade math performance in Ghana

	(1)	(2)	(3)	(4)	(5)
Bullied	-18.144***	-20.440***	-19.630***	-18.634***	-15.731***
	(3.275)	(2.663)	(2.885)	(2.777)	(1.737)
Students' age		-13.969***	-13.081***	-10.454***	-6.192***
		(1.455)	(1.378)	(1.115)	(0.678)
Students' sex (female)		-28.785***	-27.910***	-28.048***	-27.223***
		(2.820)	(2.993)	(2.902)	(1.933)
Controls	No	Individual	Individual, Teacher	Individual, Teacher, School	Individual, Teacher
School fixed effects	No	No	No	No	Yes
Observations	7323	5503	5002	4514	5002
R-squared	0.013	0.960	0.960	0.964	0.978

Note. Standard errors are adjusted for school-level clustering and heteroskedasticity.
*p < .10, **p < .05, ***p < .01.

Tables 12 and 13, corresponding with Tables 38 and 39 in Appendix III, demonstrate the impact of school bullying on the math and science performance of eighth-grade students in Ghana. The math score of an eighth-grade student who is the victim of bullying decreases by almost 16 points, which corresponds to a reduction of 0.20 standard deviations of sample mean. In terms of science scores, an eighth-grade student who is bullied at school will lose almost 19 points, corresponding to a reduction

of 0.18 standard deviations. It is also found that younger and male students perform better in math and science. The other factors that significantly improve student performance are higher parental education level and suburban or urban school location. For details, please see Tables 38 and 39 in Appendix III.

Table 13: Impact of weekly bullying on 8th-grade science performance in Ghana

	(1)	(2)	(3)	(4)	(5)
Bullied	-23.496***	-25.705***	-25.308***	-24.453***	-18.744***
	(4.306)	(3.445)	(3.509)	(3.443)	(2.333)
Students' age		-17.886***	-15.704***	-13.298***	-8.546***
		(1.762)	(1.721)	(1.334)	(0.977)
Students' sex (female)		-37.334***	-39.277***	-39.977***	-36.551***
		(3.493)	(3.567)	(3.529)	(2.703)
Controls	No	Individual	Individual, Teacher	Individual, Teacher, School	Individual, Teacher
School fixed effects	No	No	No	No	Yes
Observations	7323	5503	5033	4519	5033
R-squared	0.013	0.924	0.927	0.935	0.957

Note. Standard errors are adjusted for school-level clustering and heteroskedasticity.
*p < .10, **p < .05, ***p < .01.

Table 14 reports the results from the PSM approach. Column (1) reports the ATT on eighth-grade math scores in Ghana. Nearest neighbor matching results suggest that the students being bullied at school achieve 17.1 points less than their non-bullied fellows in math scores. The estimates by radius matching and kernel matching are slightly larger, at 18.5 and 18.3 points, respectively.

Column (2) lists the ATT on eighth-grade science scores in Ghana. Nearest neighbor matching results suggest that eighth-grade students being bullied at school achieve 22.7 points less than their non-bullied fellows in science scores. Radius matching and kernel matching provide slightly larger effects, about 24.5 and 25.0 points, respectively. Overall, the PSM results show the significantly negative effect of bullying on academic achievement, confirming the results from the OLS models, as seen in the other countries.

Table 14: Impact of weekly bullying on academic performance in Ghana, PSM

	Outcome	
Matching methods	**8th-grade math scores**	**8th-grade science scores**
	(1)	(2)
Nearest neighbor	-17.137*** (3.643)	-22.723*** (4.076)
Number of treated	2357	2378
Number of controls	2081	2112
Radius/Caliper	-18.547*** (2.025)	-24.474*** (2.815)
Number of treated	2341	2359
Number of controls	2024	2042
Kernel (Epanechnikov)	-18.300*** (2.074)	-25.007*** (2.762)
Number of treated	2357	2378
Number of controls	2081	2112

Note. Balancing property and common support are satisfied. Nearest neighbor matching is applied with replacement. Standard errors, estimated by 100 bootstrap replications, are reported in parentheses.
*p < .10, **p < .05, ***p < .01.

South Africa

The dataset for South Africa consists of reading performance for fourth-grade students as well as of math and science performance for eighth-grade students. We first analyze the impact of bullying on student academic achievement through an OLS approach. Table 15 presents the OLS results relating to the effect of bullying on the reading performance of fourth-grade students.[2] For details, please see Table 40 in Appendix III.

Table 15: Impact of weekly bullying on 4th-grade reading literacy in South Africa

	(1)	**(2)**	**(3)**	**(4)**	**(5)**
Bullied	-55.079***	-34.680***	-31.242***	-25.453***	-22.915***
	(6.212)	(4.833)	(5.251)	(5.897)	(4.142)
Students' age		-13.324***	-12.866***	-8.539*	-15.422***
		(3.443)	(3.628)	(4.733)	(2.128)
Students' sex (female)		18.425***	18.479***	20.413***	21.844***
		(3.474)	(3.44)	(3.372)	(2.803)
Controls	No	Individual	Individual, Teacher	Individual, Teacher, School	Individual, Teacher
School fixed effects	No	No	No	No	Yes
Observations	3515	2293	2010	1305	2010
R-squared	0.068	0.964	0.966	0.968	0.981

Note. Standard errors are adjusted for school-level clustering and heteroskedasticity.
*p < .10, **p < .05, ***p < .01.

Tables 16 and 17, pertaining to Tables 41 and 42 in Appendix III, show the impact of bullying on the math and science performance of eighth-grade students in South Africa. The specifications have the same patterns as the previous tables delineating the impact of bullying on eighth-grade math and science performance for other countries.

Still, control variables are slightly different: due to data availability, we use four dummy variables of computer accessibility instead of school library size to indicate quality of school facilities.[3] The results demonstrate that at the eighth-grade level, victims of weekly bullying achieve lower scores in both math and science than non-bullied students. To summarize, being bullied results in a reduction of 22.9 points in reading score at the fourth-grade level, 11.4 points in math score at the eighth-grade level, and 22.0 points in science score at the eighth-grade level. This corresponds to a reduction of 0.22 standard deviations in reading at the fourth-grade level, 0.13 standard deviations in math at the eighth-grade level, and 0.20 standard deviations in science at the eighth-grade level.

Table 16: Impact of weekly bullying on 8th-grade math performance in South Africa

	(1)	(2)	(3)	(4)	(5)
Bullied	-43.336***	-27.311***	-26.515***	-17.750***	-11.426***
	(3.216)	(1.954)	(2.069)	(1.949)	(1.212)
Students' age		-19.384***	-19.970***	-16.402***	-12.662***
		(1.028)	(1.117)	(1.108)	(0.703)
Students' sex (female)		-11.549***	-12.770***	-13.075***	-11.173***
		(3.033)	(3.265)	(2.574)	(1.355)
Controls	No	Individual	Individual, Teacher	Individual, Teacher, School	Individual, Teacher
School fixed effects	No	No	No	No	Yes
Observations	11969	8116	7003	6001	7003
R-squared	0.063	0.970	0.970	0.977	0.986

Note. Standard errors are adjusted for school-level clustering and heteroskedasticity.
*p < .10, **p < .05, ***p < .01.

The effects of control variables affecting math and science scores can be summarized as follows: younger and male students perform better; household characteristics such as parents' education level, provision of a study desk, and internet accessibility are positively related to student performance; schools that are located in rural areas, which have a larger proportion of students coming from disadvantaged families and/or are in short supply of instructional computers, are negatively related to student performance; and, finally, teachers with higher education levels have a positive impact on student academic achievement in math and science.

Table 17: Impact of weekly bullying on 8th-grade science performance in South Africa

	(1)	(2)	(3)	(4)	(5)
Bullied	-64.364***	-42.013***	-42.874***	-32.458***	-22.058***
	(4.012)	(2.536)	(2.636)	(2.557)	(1.686)
Students' age		-25.455***	-26.414***	-21.983***	-16.811***
		(1.330)	(1.420)	(1.340)	(0.979)
Students' sex (female)		-12.627***	-12.562***	-12.821***	-12.985***
		(3.288)	(3.241)	(2.899)	(1.853)
Controls	No	Individual	Individual, Teacher	Individual, Teacher, School	Individual, Teacher
School fixed effects	No	No	No	No	Yes
Observations	11969	8116	7069	6063	7069
R-squared	0.083	0.951	0.953	0.963	0.976

Note. Standard errors are adjusted for school-level clustering and heteroskedasticity.
*p < .10, **p < .05, ***p < .01.

Table 18 reports the results from the PSM. Nearest neighbor matching results suggest that students being bullied at school score 24.5 points lower than their non-bullied peers in reading literacy. The similar results generated by radius matching and kernel matching support the robustness of our findings. Nearest neighbor matching results suggest that students being bullied at school score 12.6 points lower than their non-bullied peers in math. Radius matching and kernel matching provide even larger ATT estimates, about 16 and 17 points, respectively. The three methods provide similar estimates regarding the science scores of students being bullied at school, who achieve 24 points less than their non-bullied peers.

Table 18: Impact of weekly bullying on academic performance in South Africa, PSM

	Outcomes		
Matching methods	4th-grade reading scores (1)	8th-grade math scores (2)	8th-grade science scores (3)
Nearest neighbor	-24.520***	-12.627***	-23.063***
	(9.011)	(2.849)	(3.838)
Number of treated	575	2424	2445
Number of controls	720	3522	3562
Radius/caliper	-25.524***	-16.147***	-24.432***
	(6.280)	(1.647)	(2.214)
Number of treated	562	2425	2437
Number of controls	680	3562	3530
Kernel (Epanechnikov)	-23.521***	-17.025***	-24.718***
	(4.346)	(1.458)	(2.020)
Number of treated	575	2424	2445
Number of controls	720	3522	3562

Note. Balancing property and common support are satisfied. Nearest neighbor matching is applied with replacement. Standard errors, estimated by 100 bootstrap replications, are reported in parentheses.
*p < .10, **p < .05, ***p < .01.

Common effects across countries

In all three countries, female and younger students in the fourth grade typically perform better than male and older students. As expected, students whose parents are better educated also perform better. Other positive household characteristics include whether a student has a study desk at home. In terms of school and teacher characteristics, we find that schools that have more than 5,000 books in the library have a significantly positive effect on student reading achievement. School location, along with teachers' qualifications and experience seem not to be significantly correlated with test scores.

Effect of other socio-demographic factors on academic performance conditioned upon bullying

Now we extend our analysis to other socio-demographic variables that may affect the effects of bullying. It is possible that bullying not only directly influences academic performance, but also that its effects are not equally distributed across the range of each variable. For example, parents' education may influence the effects of bullying on a student. We examine the following categories: students' sex (female or male); school location (urban or rural); parents' education (post-secondary or below post-secondary); schools' proportion of disadvantaged students (low or high); teachers' level of experience (less or more); and teachers' sex (female or male). Such analysis illustrates the most vulnerable group of students and possible channels to alleviate the effects of bullying, which ultimately can lead to meaningful programming implications. In order to make all three countries comparable, we use the math and science scores of the eighth-grade students as a proxy of academic performance.

The following tables include summary results for each country for which there are data. The results for each variable are listed in each column. We detail the number of bullied and non-bullied students for each variable under review. The difference between two variables (for example: female bullied student vs. male bullied student) is deemed significant if it exceeds .1 standard deviation point. Table 19 lists the results for female and male students separately. In South Africa, bullied female students are less affected compared to bullied male students. In contrast, the negative effect of being bullied in Botswana is higher for females than for males. These data imply that a systematic differential impact on female and male students does not exist. The differential effect is not significant in Ghana.

Table 20 presents the differential effects of bullying in schools in urban and rural areas. For the sake of generating subsamples that have proper sizes, we treat schools located in urban, suburban, and large towns (medium-sized cities) as "urban" schools, and schools located in villages and remote rural areas as "rural" schools. Generally, the negative effect of bullying is attenuated in urban schools, implying that the disadvantage of school bullying is amplified in less prosperous areas. Specifically, the urban-rural difference is larger in South Africa than in Botswana or Ghana.

Table 19: Impact of bullying on academic performance; influence of students' sex

		Female	Male	Diff.
Botswana		-28.081*** (6.123)	-21.602*** (6.746)	-6.48*
	Number of treated	691	701	
	Number of controls	756	637	
Ghana		-26.389*** (5.435)	-23.212*** (5.035)	-3.18
	Number of treated	1071	1161	
	Number of controls	939	984	
South Africa		-19.931*** (4.749)	-27.271*** (4.662)	7.34*
	Number of treated	911	1184	
	Number of controls	1652	1394	

Note. Balancing property and common support are satisfied. Nearest neighbor matching is applied with replacement. Standard errors, estimated by 100 bootstrap replications, are reported in parentheses. The asterisk beside the differences indicates that it exceeds .1 standard deviation and is significant.

Table 20: Impact of bullying on academic performance; influence of school location

		Urban	Rural	Diff.
Botswana		-15.783* (8.921)	-18.034*** (4.497)	2.25
	Number of treated	291	1131	
	Number of controls	332	1088	
Ghana		-15.339*** (4.974)	-19.833*** (6.139)	4.49
	Number of treated	1177	1070	
	Number of controls	980	976	
South Africa		-11.249** (6.110)	-17.557*** (3.895)	6.31*
	Number of treated	835	1312	
	Number of controls	1754	1394	

Note. Balancing property and common support are satisfied. Nearest neighbor matching is applied with replacement. Standard errors, estimated by 100 bootstrap replications, are reported in parentheses. The asterisk beside the differences indicates that it exceeds .1 standard deviation and is significant.

Table 21 shows the differential effects of bullying dependent on parents' education level. As explained above, we reduce the dimensions of parents' education into two groups to simplify our analysis while ensuring that we still have large groups: the first group includes parents who have at least post-secondary education while the second group consists of parents who have secondary-level education or below. We hypothesize that parents with some post-secondary education would be able to support their children better in their education, giving their children more confidence in a learning environment. We find that the differential effects in South Africa and Botswana are trivial. In Ghana, there is a statistically significant gap between the two groups, indicating that students with better-educated parents suffer less from bullying.

Table 21: Impact of bullying on academic performance; influence of parents' education

		Post-secondary	Secondary or lower	Diff.
Botswana		-25.405*** (7.186)	-20.557*** (4.464)	-4.85
	Number of treated	561	1238	
	Number of controls	513	1323	
Ghana		-15.539* (8.264)	-24.098*** (4.106)	8.56*
	Number of treated	606	2016	
	Number of controls	522	1705	
South Africa		-18.556*** (6.204)	-21.890*** (3.017)	3.33
	Number of treated	768	2156	
	Number of controls	1491	2480	

Note. Balancing property and common support are satisfied. Nearest neighbor matching is applied with replacement. Standard errors, estimated by 100 bootstrap replications, are reported in parentheses. The asterisk beside the differences indicates that it exceeds .1 standard deviation and is significant.

Table 22 measures the influence of students' economic background on the effects of bullying. If more than half of the students at a school come from disadvantaged families, the school is regarded as having a high proportion of poor students. Otherwise, it is regarded as a school with a low proportion of poor students. The only significant result is found in Botswana, suggesting that schools located in wealthier areas show a reduced impact of bullying. Note that the ATEs of bullying in schools with a high proportion of poor students in South Africa are not statistically significant. Hence, such differential effects in South Africa are not significant.

Table 22: Impact of bullying on academic performance; influence of students' economic background

		Low proportion of poor students	High proportion of poor students	Diff.
Botswana		-15.759** (6.291)	-23.806*** (5.945)	8.05*
	Number of treated	732	677	
	Number of controls	750	650	
Ghana		-24.334*** (6.870)	-21.224*** (4.523)	-3.11
	Number of treated	822	1425	
	Number of controls	712	1243	
South Africa		-21.103*** (3.540)	-13.357 (8.213)	-7.75*
	Number of treated	1686	468	
	Number of controls	2015	1132	

Note. Balancing property and common support are satisfied. Nearest neighbor matching is applied with replacement. Standard errors, estimated by 100 bootstrap replications, are reported in parentheses. The asterisk beside the differences indicates that it exceeds .1 standard deviation and is significant.

Table 23 shows the differential effects of school bullying given teachers' experience. None of the effects are significant across the three countries. Finally, Table 24 presents the differential effects of school bullying dependent on teachers' sex. In Ghana, we find

significantly strong results that female teachers alleviate the harm of bullying on student performance. Such effects for South Africa and Botswana are not significant.

Table 23: Impact of bullying on academic performance; influence of teachers' experience

		Less teacher experience	More teacher experience	Diff.
Botswana		-21.539*** (4.139)	-9.714 (12.513)	11.83*
	Number of treated	1394	222	
	Number of controls	1374	259	
Ghana		-19.096*** (4.414)	-11.010 (9.965)	8.09*
	Number of treated	2012	380	
	Number of controls	1753	373	
South Africa		-20.604*** (4.112)	-23.166*** (4.969)	-2.56
	Number of treated	1317	920	
	Number of controls	1800	1496	

Note. Balancing property and common support are satisfied. Nearest neighbor matching is applied with replacement. Standard errors, estimated by 100 bootstrap replications, are reported in parentheses. The asterisk beside the differences indicates that it exceeds .1 standard deviation and is significant.

Table 24: Impact of bullying on academic performance; influence of teachers' sex

		At least one female teacher	No female teacher	Diff.
Botswana	8th grade	-16.907*** (5.721)	-14.596* (8.582)	-2.31
	Number of treated	947	462	
	Number of controls	951	449	
Ghana	8th grade	-12.465* (7.582)	-26.955*** (4.057)	14.49*
	Number of treated	417	1830	
	Number of controls	340	1616	
South Africa	8th grade	-21.967*** (4.449)	-19.710*** (5.865)	-2.26
	Number of treated	1582	536	
	Number of controls	2270	831	

Note. Balancing property and common support are satisfied. Nearest neighbor matching is applied with replacement. Standard errors, estimated by 100 bootstrap replications, are reported in parentheses. The asterisk beside the differences indicates that it exceeds .1 standard deviation and is significant.

Notes

[1] Nearest neighbor matching uses an algorithm that matches each bullied student with the non-bullied student with the closest propensity score. Nearest neighbor matching is applied with replacement, since a non-bullied student can be a best match for more than one bullied student. Since each bullied student is matched with only one non-bullied student, the number of matched students might be less for statistical efficiency. By using radius matching, we match each bullied student with all non-bullied students whose propensity score falls into the predefined neighborhood of the propensity score of the bullied student. We set the radius of the neighborhood as 0.005. Finally, we also apply kernel matching, with which each bullied student is matched with a weighted average of all non-bullied students with weights declining with

the distance between propensity scores of bullied and non-bullied students. In our analysis, we use the Epanechnikov kernel function, where the bandwidth is 0.06.

[2] Complete results are available in Appendix III.

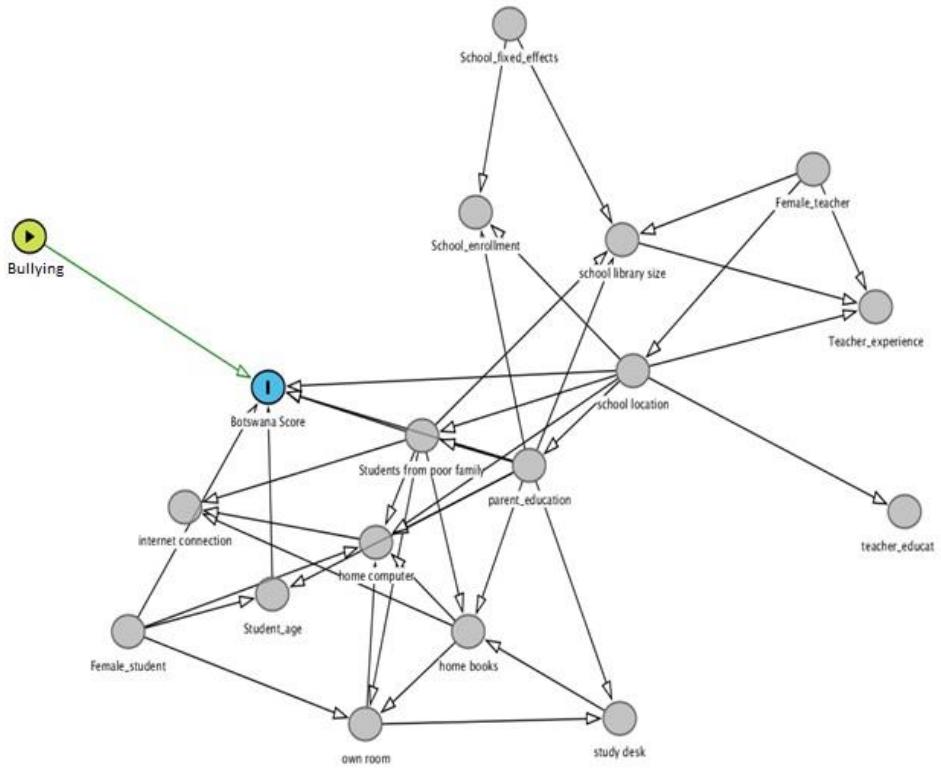
[3] The question about access to school libraries is missing in significant portions of the South African data.

CHAPTER FIVE

DIRECTION OF CAUSALITY

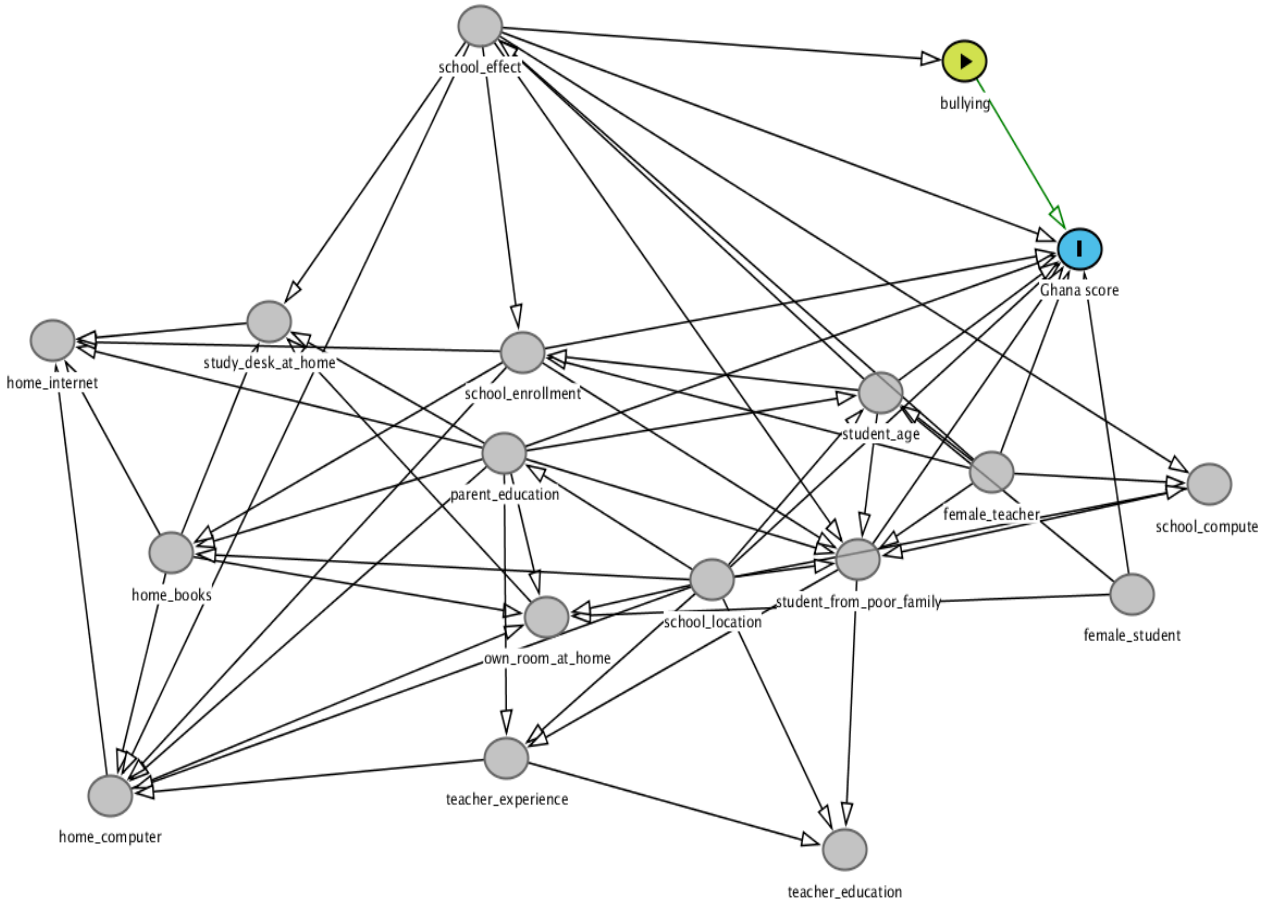
Directed Acyclic Graphs are used to validate the causal structure and direction of the variables used in this analysis. Figures 6, 7 and 8 present the results of the graphical analysis emanating from Bayesian networks. For South Africa, bullying appears to be one of the main drivers of student academic performance. Along with bullying, we find that teachers' and students' sex, teachers' experience, and students' family background are drivers of exam scores. In Botswana, we discover bullying and teachers' and students' sex to be the main drivers of student performance. For both countries, we discover bullying to be independent of the other variables considered in this analysis. The performance of Ghanaian students appears to be affected by bullying but also other factors such as school specific effects and students' sex and age and teachers' sex. Most importantly, for all three countries we do not find any evidence of student performance affecting or causing bullying. Thus, the results presented through the DAG analysis nullify the possibility of any reverse causality and support our interpretation of the data that bullying has a causal effect on students' performance.

Figure 6: DAG results for Illustrating Causal Relationships in Botswana



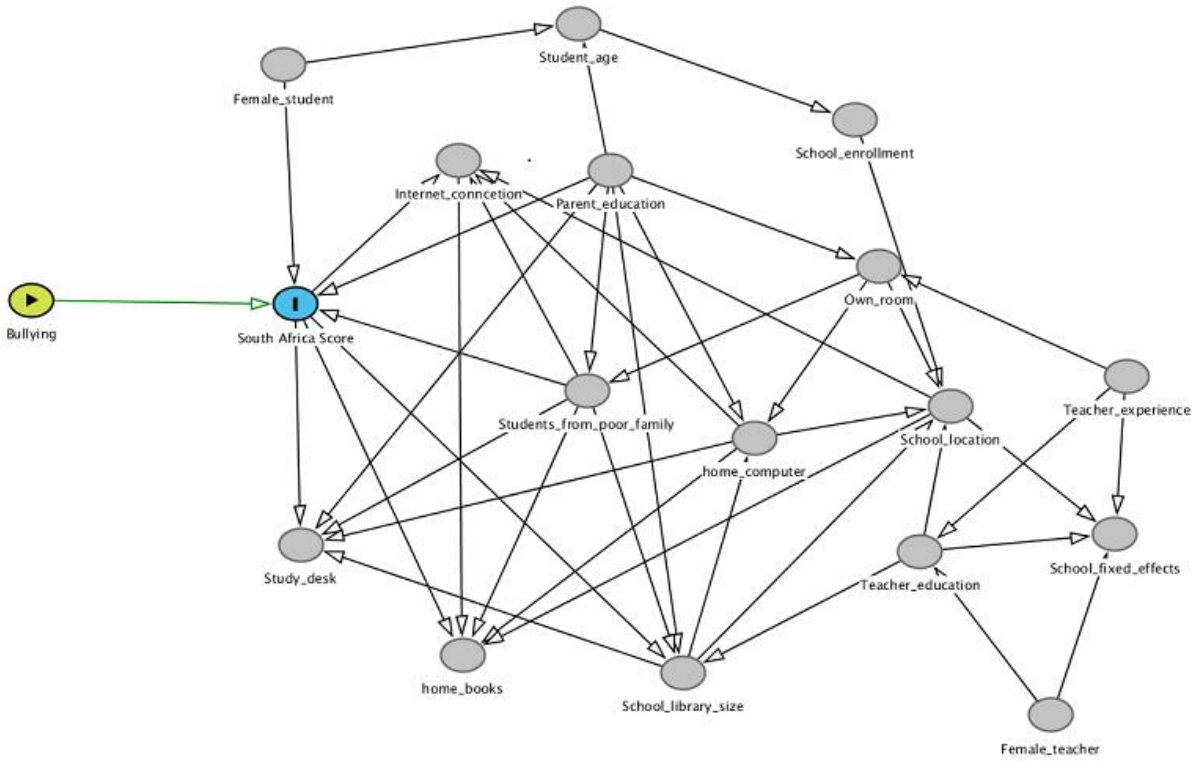
Note: Each node represents a variable of interest. Arrows from one node to another represent causal relationships between those two nodes. We use the green-colored arrow to display the causal relationship between bullying and academic performance.

Figure 7: **DAG results for Illustrating Causal Relationships in Ghana**



Note: Each node represents a variable of interest. Arrows from one node to another represent causal relationships between those two nodes. We use the green-colored arrow to display the causal relationship between bullying and academic performance.

Figure 8: DAG results for Illustrating Causal Relationships in South Africa



Note: Each node represents a variable of interest. Arrows from one node to another represent causal relationships between those two nodes. We use the green-colored arrow to display the causal relationship between bullying and academic performance.

CHAPTER SIX

THE WAY FORWARD

As noted in the introduction, SRGBV is a global phenomenon that has the potential for serious and significant effects on students' well-being and performance. It is based on and reinforces gendered stereotypes present in society and includes a variety of behaviors, such as sexual violence and harassment, corporal punishment, and bullying. The impact of school violence on students' health and psychological development has been well documented (Barrett et al., 2012; Dunne, 2013; Hazel, 2010; Hemphill et al., 2011; Kosciw et al., 2013; Ouellet-Morin et al., 2011; Ripski & Gregory, 2009). However, research on the consequences of school violence on academic achievement in different contexts was not addressed until recent times (Caputo, 2013; Perše et. al, 2011; Ponzo, 2013; USAID, 2013). Quantitative evidence of such phenomena for developing countries has been largely absent. Our study contributes to filling this gap in the literature by examining SRGBV through the lens of bullying in Botswana, Ghana, and South Africa.

Conclusions

Our research has three primary conclusions. First, we find that bullying affected almost 80% of the surveyed students of these countries, and that this bullying had severe ramifications on student academic performance consistently in all three countries. Second, we find that student academic performance is also influenced by students' sex and age, teachers' experience, parents' education, and geographical location, but the effect of these variables varied based on context. Third, our analysis identifies a few country-specific characteristics that influence the effects of bullying.

These results provide a strong caution on designing education programs that will not target bullying. Furthermore, programs should address bullying in contextually specific ways.

Recommendations and Future Research

On the basis of these conclusions we offer the following recommendations to USAID and the broader development community:

- To raise student academic performance, it is imperative for national policy makers, USAID, and other donor agencies to increase awareness of bullying in

schools and to reduce bullying. While we analyzed data from Botswana, Ghana, and South Africa, we expect the effects of bullying to be similar in other countries. Our results show that the effect of pervasive bullying on academic performance outweighs other factors commonly associated with academic performance, and bullying has a direct effect on academic performance that is not caused through an interaction with other socioeconomic determinants. Thus, programs should be designed and implemented to reduce bullying, not only to address it as a problem in itself, but also as a means to improve academic achievement.

- Efforts to increase awareness of bullying in schools and reduce its effects on student academic performance should carefully consider and be informed by the specific dynamics related to bullying in a given context. The effects of bullying vary by grade, subject, and country and interact with other factors differently depending on context. For example, in South Africa female students who are bullied perform better than bullied male students, whereas male students who are bullied perform better in Botswana. Further research is needed to fully understand the dynamics of these interactions.

- Further research using research instruments specifically designed to examine the negative effects of bullying are required. Bullying is a complex concept and the definition used by TIMSS and PIRLS, while appropriate, suffers from conceptual limitations. For example, the data does not provide means to track who is perpetrating the bullying and how that interacts with academic performance. Additionally, in countries with ongoing anti-bullying campaigns, randomized controlled trials of different potential policy and program alternatives are required to inform more specific recommendations.

- Specific analysis of the role of students' and teachers' sex is required because both variables influence academic performance. Reviews of different educational environments in each country are required. We encourage review of different educational environments, particularly those that utilize different approaches to students based on sex. For example, a systematic review of classrooms separated by sex may help to understand the results found for students' sex. Other factors may include different levels of teacher encouragement based on a student's sex, characteristics of teachers' training, and curriculum. General questions about how teachers' sex interacts with student performance are yet to be answered. We suggest multiyear studies designed to examine bullying and other forms of SRGBV be conducted, specifically focusing on different teacher, school, and education-system characteristics. Tracking cohorts of students will enhance our understanding of environmental factors and provide insight into changes over time for additional causal analysis.

Overall, we have provided strong evidence of the detrimental effects of bullying on academic performance in school and have identified it as one of the key drivers of academic performance. The analysis has focused on developing countries, but bullying

is pervasive in many educational contexts. We recommend policies and programs designed to enhance student safety, well-being, and academic performance by reducing bullying.

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APPENDIX I

OVERVIEW OF VARIABLES

Table 25: Descriptive statistics for all three countries

Variables	PIRLS 2011 4th grade		TIMSS 2011 4th grade		TIMSS 2011 8th grade	
	Mean	Std. dev	Mean	Std. dev.	Mean	Std. dev.
Botswana						
Reading score	417.192	85.485				
Math score			417.454	83.120	396.158	73.091
Science score			365.208	122.809	403.604	98.635
Bullied (monthly) (proportion)	0.887	0.317	0.887	0.317	0.814	0.389
Bullied (weekly) (proportion)	0.465	0.499	0.464	0.499	0.500	0.500
Students' age	12.836	1.023	12.835	1.025	15.849	0.894
Female students (proportion)	0.511	0.500	0.512	0.500	0.513	0.500
Ghana	Mean	Std. dev	Mean	Std. dev.	Mean	Std. dev.
Reading score						
Math score					333.007	78.497
Science score					309.002	103.367
Bullied (monthly) (proportion)					0.793	0.405
Bullied (weekly) (proportion)					0.530	0.499
Students' age					15.744	1.512
Female students (proportion)					0.478	0.500
South Africa	Mean	Std. dev	Mean	Std. dev.	Mean	Std. dev.
Reading score	419.363	105.139				

Math score			366.709	85.679
Science score			353.915	110.673
Bullied (monthly) (proportion)	0.832	0.374	0.745	0.436
Bullied (weekly) (proportion)	0.478	0.500	0.429	0.495
Students' age	11.452	0.826	15.928	1.172
Female students (proportion)	0.494	0.500	0.492	0.499

Source: PIRLS 2011; TIMSS 2011.

Table 26: Overview of the conditioning variables

Demographic	
Sex (female)	0=male; 1=female
Age	Numeric in years
Parents' education level	5 categories 1=university or above 2=post-secondary 3=upper secondary 4=lower secondary 5=primary or no school.
Home facilities	
Computer	1=the student has a computer, 0=otherwise
Study desk	1=the student has a study desk, 0=otherwise
Own study room	1=the student has a study room, 0=otherwise
Internet at home	1=the student has internet access at home, 0=otherwise
Books at home	5 categories 1=0-10 books 2=11-25 books 3=26-100 books 4=101-200 books 5= >200 books
School characteristics	
School location	5 categories (urban, suburban, large town, small town or village, remote rural)
Proportion of students from disadvantaged families	4 categories (0-10%, 11-25%, 26-50%, More than 50%)
School enrollment	Numeric, total number of students in school
School library books	4 categories 1=>5000 books 2=501-5000 books 3=1-500 books 4=no books
School computers	4 categories 1=1 computer for 1-2 students 2=1 computer for 3-5 students 3=1 computer for 6 or more students 4=no computers available
Teacher characteristics	
Teachers' sex (female)	0=male teacher; 1=female teacher
Years teachers have been teaching	Numeric, years of teachers' experience
Teachers' education level	6 categories 1=lower secondary or no education 2=upper secondary education 3=post-secondary non-tertiary level of education 4=short tertiary education 5=long tertiary education 6=university or higher

Table 27: Descriptive statistics for the main variables used for Botswana

Variables	PIRLS 2011 4th grade		TIMSS 2011 4th grade		TIMSS 2011 8th grade	
	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.
Reading score	417.192	85.485				
Math score			417.454	83.120	396.158	73.091
Science score			365.208	122.809	403.604	98.635
Bullied (monthly) (proportion of total students)	0.887	0.317	0.887	0.317	0.814	0.389
Bullied (weekly) (proportion of total students)	0.465	0.499	0.464	0.499	0.500	0.500
Students' age	12.836	1.023	12.835	1.025	15.849	0.894
Female students (proportion of total students)	0.511	0.500	0.512	0.500	0.513	0.500
Parents' education level						
university or above	0.098	0.298	0.098	0.298	0.194	0.396
post-secondary	0.165	0.371	0.166	0.372	0.202	0.401
upper secondary	0.138	0.345	0.137	0.344	0.217	0.412
lower secondary	0.182	0.386	0.182	0.386	0.225	0.417
primary or no school	0.417	0.493	0.417	0.493	0.163	0.369
Computer	0.305	0.461	0.304	0.460	0.251	0.434
Study desk	0.685	0.465	0.684	0.465	0.690	0.462
Own room	0.459	0.498	0.458	0.498	0.571	0.495
Internet at home	0.193	0.394	0.191	0.394	0.148	0.355
Books at home						
0-10	0.405	0.491	0.405	0.491	0.388	0.487
11-25	0.335	0.472	0.336	0.472	0.391	0.488
26-100	0.164	0.370	0.163	0.370	0.139	0.346
101-200	0.055	0.229	0.055	0.228	0.044	0.205
>200	0.040	0.197	0.041	0.198	0.039	0.193

School location						
urban	0.130	0.336	0.131	0.337	0.106	0.308
suburban	0.115	0.319	0.116	0.320	0.090	0.286
large town	0.066	0.248	0.065	0.247	0.038	0.191
small town or village	0.456	0.498	0.457	0.498	0.513	0.500
remote rural	0.233	0.423	0.231	0.422	0.252	0.434
Proportion of students from disadvantaged families						
0-10%	0.194	0.395	0.195	0.396	0.069	0.253
11-25%	0.247	0.431	0.248	0.432	0.157	0.364
26-50%	0.275	0.446	0.273	0.446	0.287	0.453
more than 50%	0.285	0.451	0.284	0.451	0.486	0.500
School enrollment	571.607	245.917	573.621	245.629	594.432	193.995
School library books						
>5000	0.027	0.162				
501-5000	0.113	0.317				
1-500	0.344	0.475				
no books	0.516	0.500				
School computers						
1 computer for 1-2 students			0.110	0.313	0.085	0.280
1 computer for 3-5 students			0.149	0.356	0.103	0.304
1 computer for 6 or more students			0.447	0.497	0.765	0.424
no computers available			0.293	0.455	0.047	0.211
Years teachers have been teaching						
reading	14.004	8.810				
math			13.076	9.039	8.463	5.303
science			13.076	9.039	7.177	5.318
Proportion of students with a female teacher						

reading	0.643	0.479				
math			0.556	0.497	0.431	0.495
science			0.556	0.497	0.407	0.491
Teachers' education level: reading						
lower secondary or no education	0	0				
upper secondary education	0.016	0.126				
post-secondary non-tertiary level of education	0.119	0.323				
short tertiary education	0.703	0.457				
long tertiary education	0.155	0.362				
university or higher	0.007	0.083				
Teachers' education level: math						
lower secondary or no education			0	0	0	0
upper secondary education			0.023	0.150	0	0
post-secondary non-tertiary level of education			0.089	0.285	0	0
short tertiary education			0.764	0.425	0.878	0.328
long tertiary education			0.117	0.321	0.111	0.315
university or higher			0.007	0.083	0.011	0.103
Teachers' education level: science						
lower secondary or no education			0	0	0	0
upper secondary education			0.023	0.150	0.014	0.116
post-secondary non-tertiary level of education			0.089	0.285	0	0
short tertiary education			0.764	0.425	0.674	0.469
long tertiary education			0.117	0.321	0.303	0.460
university or higher			0.007	0.083	0.009	0.093
Observations	4197		4198		5400	

Source: PIRLS 2011; TIMSS 2011.

Table 28: Descriptive statistics for the main variables used for Ghana

Variables	TIMSS 2011 8th grade	
	Mean	Std. dev.
Math score	333.007	78.497
Science score	309.002	103.367
Bullied (monthly) (proportion of total students)	0.793	0.405
Bullied (weekly) (proportion of total students)	0.530	0.499
Students' age	15.744	1.512
Female students (proportion of total students)	0.478	0.500
Parents' education level		
university or above	0.106	0.307
post-secondary	0.160	0.366
upper secondary	0.221	0.415
lower secondary	0.309	0.462
primary or no school	0.204	0.403
Computer	0.250	0.433
Study desk	0.506	0.500
Own room	0.318	0.466
Internet at home	0.112	0.316
Books at home		
0-10	0.401	0.490
11-25	0.368	0.482
26-100	0.139	0.346
101-200	0.043	0.204
>200	0.048	0.214

School location		
urban	0.178	0.382
suburban	0.166	0.372
large town	0.167	0.373
small town or village	0.392	0.488
remote rural	0.098	0.297
Proportion of students from disadvantaged families		
0-10%	0.066	0.248
11-25%	0.112	0.315
26-50%	0.161	0.367
more than 50%	0.662	0.473
School enrollment	265.153	213.922
School computers		
1 computer for 1-2 students	0.443	0.497
1 computer for 3-5 students	0.118	0.323
1 computer for 6 or more students	0.290	0.454
no computers available	0.149	0.356
Years teachers have been teaching		
math	8.266	6.557
science	7.790	6.967
Proportion of students with a female teacher		
math	0.121	0.326
science	0.099	0.298
Teachers' education level: math		
lower secondary or no education	0	0
upper secondary education	0.079	0.270
post-secondary non-tertiary level of education	0.450	0.498
short tertiary education	0.193	0.394

long tertiary education	0.274	0.446
university or higher	0.004	0.066
Teachers' education level: science		
lower secondary or no education	0	0
upper secondary education	0.104	0.305
post-secondary non-tertiary level of education	0.432	0.495
short tertiary education	0.231	0.421
long tertiary education	0.189	0.391
university or higher	0.045	0.206
Observations	7323	

Source: PIRLS 2011; TIMSS 2011.

Table 29: Descriptive statistics for the main variables used for South Africa

Variables	PIRLS 2011 4th grade		TIMSS 2011 8th grade	
	Mean	Std. dev.	Mean	Std. dev.
Reading score	419.363	105.139		
Math score			366.709	85.679
Science score			353.915	110.673
Bullied (monthly) (proportion of total students)	0.832	0.374	0.745	0.436
Bullied (weekly) (proportion of total students)	0.478	0.500	0.429	0.495
Students' age	11.452	0.826	15.928	1.172
Female students (proportion of total students)	0.494	0.500	0.492	0.499
Parents' education level				
university or above	0.157	0.363	0.227	0.419
post-secondary	0.221	0.415	0.181	0.386
upper secondary	0.359	0.480	0.334	0.472
lower secondary	0.123	0.328	0.129	0.335
primary or no school	0.141	0.348	0.129	0.335
Computer	0.561	0.496	0.418	0.493
Study desk	0.600	0.490	0.596	0.491
Own room	0.610	0.488	0.689	0.463
Internet at home	0.366	0.482	0.362	0.481
Books at home				
0-10	0.409	0.492	0.391	0.488
11-25	0.282	0.450	0.352	0.478
26-100	0.174	0.379	0.157	0.364
101-200	0.074	0.261	0.050	0.217
>200	0.061	0.239	0.049	0.216

School location				
urban	0.111	0.314	0.157	0.364
suburban	0.418	0.493	0.125	0.331
large town	0.157	0.364	0.167	0.373
small town or village	0.130	0.337	0.264	0.441
remote rural	0.185	0.388	0.287	0.452
Proportion of students from disadvantaged families				
0-10%	0.130	0.337	0.072	0.259
11-25%	0.196	0.397	0.103	0.304
26-50%	0.145	0.352	0.082	0.274
more than 50%	0.529	0.499	0.742	0.437
School enrollment	782.154	374.660	920.576	459.132
School library books				
>5000	0.168	0.374		
501-5000	0.355	0.479		
1-500	0.171	0.376		
no books	0.306	0.461		
School computers				
1 computer for 1-2 students			0.141	0.348
1 computer for 3-5 students			0.127	0.333
1 computer for 6 or more students			0.295	0.456
no computers available			0.437	0.496
Years teachers have been teaching				
reading	17.508	10.637		
math			13.987	8.949
science			13.987	9.144

Proportion of students with a female teacher				
reading	0.717	0.450		
math			0.561	0.513
science			0.439	0.496
Teachers' education level: reading				
lower secondary or no education	0	0		
upper secondary education	0.074	0.261		
post-secondary non-tertiary level of education	0.414	0.493		
short tertiary education	0	0		
long tertiary education	0.346	0.476		
university or higher	0.167	0.373		
Teachers' education level: math				
lower secondary or no education			0.003	0.055
upper secondary education			0.019	0.137
post-secondary non-tertiary level of education			0.009	0.096
short tertiary education			0.384	0.486
long tertiary education			0.422	0.494
university or higher			0.158	0.364
Teachers' education level: science				
lower secondary or no education			0.004	0.062
upper secondary education			0.014	0.118
post-secondary non-tertiary level of education			0.025	0.155
short tertiary education			0.385	0.487
long tertiary education			0.346	0.476
university or higher			0.226	0.418
Observations	3515		11969	

Source: PIRLS 2011; TIMSS 2011.

APPENDIX II

DESCRIPTIVE STATISTICS OF INDICATORS FOR BULLYING

Table 30: Descriptive statistics of the indicators for bullying for Botswana

A: PIRLS 2011 4th grade

Variables	Once a week		Once or twice a month		A few times a year		Never	
	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.
Being made fun of	0.351	0.477	0.160	0.366	0.170	0.375	0.320	0.467
Being left out of games	0.251	0.433	0.196	0.397	0.145	0.353	0.408	0.491
Having lies spread about	0.268	0.443	0.192	0.394	0.205	0.404	0.335	0.472
Having things stolen	0.357	0.479	0.226	0.418	0.201	0.401	0.216	0.411
Being hurt	0.223	0.417	0.183	0.387	0.170	0.376	0.424	0.494
Being forced to do things	0.195	0.397	0.144	0.351	0.139	0.346	0.521	0.500
Observations	4197							

B: TIMSS 2011 4th grade

Variables	Once a week		Once or twice a month		A few times a year		Never	
	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.
Being made fun of	0.351	0.477	0.160	0.366	0.170	0.375	0.320	0.466
Being left out of games	0.250	0.433	0.197	0.398	0.145	0.352	0.408	0.491
Having lies spread about	0.267	0.443	0.192	0.394	0.205	0.404	0.335	0.472

Having things stolen	0.356	0.479	0.225	0.418	0.201	0.401	0.217	0.412
Being hurt	0.224	0.417	0.183	0.386	0.170	0.376	0.424	0.494
Being forced to do things	0.196	0.397	0.143	0.350	0.138	0.345	0.523	0.500
Observations	4198							

C: TIMSS 2011 8th grade

Variables	Once a week		Once or twice a month		Few times a year		Never	
	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.
Being made fun of	0.321	0.467	0.147	0.355	0.204	0.403	0.327	0.469
Being left out of games	0.144	0.351	0.155	0.362	0.149	0.356	0.552	0.497
Having lies spread about	0.185	0.389	0.197	0.398	0.238	0.426	0.380	0.485
Having things stolen	0.326	0.469	0.262	0.440	0.232	0.422	0.180	0.384
Being hurt	0.149	0.356	0.145	0.352	0.164	0.371	0.542	0.498
Being forced to do things	0.122	0.327	0.104	0.305	0.130	0.336	0.645	0.479
Observations	5400							

Source: PIRLS 2011; TIMSS 2011.

Table 31: Descriptive statistics of the indicators for bullying for Ghana

A: TIMSS 2011 8th grade

Variables	Once a week		Once or twice a month		Few times a year		Never	
	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.
Being made fun of	0.429	0.495	0.154	0.361	0.112	0.315	0.304	0.460
Being left out of games	0.228	0.419	0.196	0.397	0.123	0.328	0.454	0.498
Having lies spread about	0.170	0.376	0.164	0.371	0.181	0.385	0.485	0.500
Having things stolen	0.271	0.445	0.223	0.416	0.206	0.404	0.300	0.458
Being hurt	0.172	0.377	0.156	0.363	0.140	0.347	0.532	0.499
Being forced to do things	0.190	0.393	0.140	0.347	0.128	0.334	0.542	0.498
Observations	7323							

Source: PIRLS 2011; TIMSS 2011.

Table 32: Descriptive statistics of the indicators for bullying for South Africa

A: PIRLS 2011 4th grade

Variables	Once a week		Once or twice a month		Few times a year		Never	
	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.
Being made fun of	0.412	0.492	0.148	0.355	0.183	0.387	0.257	0.437
Being left out of games	0.272	0.445	0.181	0.385	0.137	0.344	0.410	0.492
Having lies spread about	0.334	0.472	0.170	0.375	0.197	0.398	0.299	0.458
Having things stolen	0.360	0.480	0.203	0.402	0.209	0.407	0.228	0.420
Being hurt	0.275	0.447	0.153	0.360	0.188	0.391	0.384	0.486
Being forced to do things	0.211	0.408	0.116	0.320	0.120	0.325	0.553	0.497
Observations	3515							

B: TIMSS 2011 8th grade

Variables	Once a week		Once or twice a month		Few times a year		Never	
	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.
Being made fun of	0.301	0.459	0.176	0.381	0.204	0.403	0.319	0.466
Being left out of games	0.164	0.370	0.169	0.375	0.147	0.354	0.521	0.500
Having lies spread about	0.177	0.382	0.194	0.395	0.258	0.438	0.371	0.483
Having things stolen	0.272	0.445	0.230	0.421	0.237	0.425	0.261	0.439
Being hurt	0.098	0.298	0.108	0.311	0.153	0.360	0.641	0.480
Being forced to do things	0.123	0.329	0.100	0.299	0.129	0.335	0.648	0.478
Observations	11969							

Source: PIRLS 2011; TIMSS 2011.

APPENDIX III

IMPACT OF WEEKLY BULLYING, OLS ESTIMATION

Table 33: Impact of weekly bullying on 4th-grade reading literacy in Botswana

	(1)	(2)	(3)	(4)	(5)
Bullied	-17.492***	-13.559***	-13.770***	-13.515***	-7.801**
	(3.754)	(3.271)	(3.372)	(3.509)	(3.362)
Students' age		-22.254***	-21.994***	-19.982***	-18.179***
		(1.830)	(1.991)	(1.845)	(1.963)
Students' sex (female)		14.999***	16.311***	19.349***	17.514***
		(3.121)	(3.212)	(3.286)	(3.061)
Parents' highest education level					
university		96.232***	91.826***	74.377***	46.766***
		(8.326)	(7.858)	(7.551)	(6.799)
post-secondary		71.463***	65.768***	55.715***	44.819***
		(5.570)	(5.727)	(5.635)	(5.216)
upper secondary		36.753***	31.618***	27.986***	17.302***
		(4.811)	(4.930)	(4.884)	(4.343)
lower secondary		12.037***	7.449*	5.899	3.184
		(3.999)	(4.074)	(4.151)	(3.983)
Teachers' sex (female)			-12.530*	-14.357**	-64.414***
			(6.688)	(6.310)	(3.272)
Teachers' experience			0.656*	0.616*	9.430***
			(0.356)	(0.360)	(0.456)
School location					
urban				20.370*	
				(11.731)	
suburban				19.521*	
				(10.755)	
large town				22.848	

				(14.369)	
small town or village				5.068	
				(7.543)	
Controls	No	Individual	Individual, Teacher	Individual, Teacher, School	Individual, Teacher
School fixed effects	No	No	No	No	Yes
Observations	4197	2514	2153	1858	2153
R-squared	0.010	0.975	0.976	0.977	0.982

Note: Other individual controls consist of five dummies for number of books at home, computer, study desk, own room, and home internet access. Other teacher controls consist of teachers' education level. Other school controls consist of four dummies for proportion of students coming from disadvantaged families and four dummies for number of school library books. Standard errors are adjusted for school-level clustering and heteroskedasticity.
*$p < .10$, **$p < .05$, ***$p < .01$.

Table 34: Impact of weekly bullying on 4th-grade math performance in Botswana

	(1)	(2)	(3)	(4)	(5)
Bullied	-17.211***	-13.317***	-14.125***	-12.728***	-8.384***
	(3.621)	(3.231)	(3.396)	(3.429)	(3.033)
Students' age		-24.722***	-24.110***	-22.671***	-20.587***
		(1.555)	(1.675)	(1.599)	(1.685)
Students' sex (female)		7.561**	9.335***	10.633***	10.113***
		(2.957)	(3.152)	(3.241)	(2.876)
Parents' highest education level					
university		78.258***	78.411***	69.160***	39.277***
		(7.440)	(7.505)	(8.070)	(6.146)
post-secondary		59.070***	55.968***	48.719***	34.884***
		(5.134)	(5.358)	(5.266)	(4.536)
upper secondary		30.983***	27.186***	22.989***	13.032***
		(5.031)	(5.379)	(5.674)	(4.892)
lower secondary		13.756***	9.602**	9.896**	5.337
		(4.438)	(4.687)	(4.717)	(4.457)
Teachers' sex (female)			-16.571***	-18.196***	-37.437***
			(5.790)	(5.960)	(3.347)
Teachers' experience			0.132	0.316	-8.032***
			(0.363)	(0.353)	(0.731)
School location					
urban				18.437	
				(11.148)	
suburban				16.379	
				(15.277)	
large town				7.347	
				(14.939)	
small town or village				0.119	
				(8.744)	
Controls	No	Individual	Individual, Teacher	Individual, Teacher, School	Individual, Teacher
School fixed effects	No	No	No	No	Yes
Observations	4198	2512	2136	1839	2136
R-squared	0.011	0.976	0.977	0.978	0.982

Note: Other individual controls consist of five dummies for number of books at home, computer, study desk, own room, and internet access. Other teacher controls consist of teachers' education level. Other school controls consist of four dummies for proportion of students coming from disadvantaged families and four dummies for instructional computer accessibility. Standard errors are adjusted for school-level clustering and heteroskedasticity.
*p < .10, **p < .05, ***p < .01.

Table 35: Impact of weekly bullying on 8th-grade math performance in Botswana

	(1)	(2)	(3)	(4)	(5)
Bullied	-25.288***	-19.723***	-17.778***	-16.369***	-13.233***
	(2.832)	(2.388)	(2.581)	(2.511)	(2.247)
Students' age		-32.908***	-32.419***	-29.764***	-29.062***
		(1.473)	(1.562)	(1.612)	(1.431)
Students' sex (female)		1.040	2.242	4.586**	4.038*
		(2.066)	(2.163)	(2.256)	(2.193)
Parents' highest education level					
university		15.047***	16.110***	11.765***	7.812*
		(4.391)	(4.572)	(4.306)	(4.414)
post-secondary		1.444	4.357	3.201	0.399
		(3.341)	(3.682)	(3.987)	(3.924)
upper secondary		-3.694	-1.606	-2.357	-4.343
		(2.998)	(3.275)	(3.316)	(3.212)
lower secondary		-0.852	0.236	-1.211	-2.253
		(3.246)	(3.736)	(3.898)	(3.602)
Teachers' sex (female)			2.542	6.826	-96.157***
			(4.184)	(4.155)	(6.022)
Teachers' experience			0.645	-0.168	-19.322***
			(0.484)	(0.448)	(1.331)
School location					
urban				27.655***	
				(8.648)	
suburban				26.326***	
				(6.085)	
large town				30.555***	
				(10.328)	
small town or village				7.633	
				(5.516)	
Controls	No	Individual	Individual, Teacher	Individual, Teacher, School	Individual, Teacher
School fixed effects	No	No	No	No	Yes
Observations	5400	4043	3376	2968	3376
R-squared	0.030	0.976	0.976	0.978	0.980

Note: Other individual controls consist of five dummies for number of books at home, computer, study desk, own room, and internet access. Other teacher controls consist of teachers' education level. Other school controls consist of four dummies for proportion of students coming from disadvantaged families and four dummies for instructional computer accessibility. Standard errors are adjusted for school-level clustering and heteroskedasticity.
*p < .10, **p < .05, ***p < .01.

Table 36: Impact of weekly bullying on 4th-grade science performance in Botswana

	(1)	(2)	(3)	(4)	(5)
Bullied	-27.463***	-20.626***	-20.941***	-18.277***	-10.455**
	(5.394)	(4.966)	(5.357)	(5.404)	(4.898)
Students' age		-36.088***	-35.507***	-33.084***	-29.361***
		(2.446)	(2.785)	(2.536)	(2.806)
Students' sex (female)		-2.382	-0.742	1.692	0.895
		(4.488)	(4.807)	(4.774)	(4.313)
Parents' highest education level					
university		118.010***	117.343***	103.082***	56.340***
		(10.723)	(10.443)	(11.297)	(9.623)
post-secondary		94.198***	88.550***	75.588***	55.416***
		(7.551)	(7.738)	(7.505)	(6.719)
upper secondary		51.451***	44.839***	36.622***	20.809***
		(7.664)	(8.185)	(8.142)	(6.850)
lower secondary		21.140***	13.760*	13.275*	6.223
		(6.830)	(7.108)	(6.713)	(6.578)
Teachers' sex (female)			-19.733**	-24.048***	-40.002***
			(8.737)	(8.985)	(5.233)
Teachers' experience			0.180	0.476	-16.853***
			(0.560)	(0.562)	(1.197)
School location					
urban				27.470	
				(16.575)	
suburban				17.515	
				(21.485)	
large town				16.552	
				(23.249)	
small town or village				-3.898	
				(12.840)	
Controls	No	Individual	Individual, Teacher	Individual, Teacher, School	Individual, Teacher
School fixed effects	No	No	No	No	Yes
Observations	4198	2512	2136	1839	2136
R-squared	0.012	0.938	0.941	0.944	0.956

Note: Other individual controls consist of five dummies for number of books at home, computer, study desk, own room, and internet access. Other teacher controls consist of teachers' education level. Other school controls consist of four dummies for proportion of students coming from disadvantaged families and four dummies for instructional computer accessibility. Standard errors are adjusted for school-level clustering and heteroskedasticity.
*p < .10, **p < .05, ***p < .01.

Table 37: Impact of weekly bullying on 8th-grade science performance in Botswana

	(1)	(2)	(3)	(4)	(5)
Bullied	-36.343***	-30.938***	-29.841***	-27.855***	-24.215***
	(3.762)	(3.080)	(3.148)	(3.237)	(2.909)
Students' age		-44.419***	-44.862***	-41.659***	-40.337***
		(1.942)	(1.853)	(1.895)	(1.737)
Students' sex (female)		-6.050**	-4.963*	-2.527	-2.953
		(2.808)	(2.854)	(3.008)	(2.819)
Parents' highest education level					
university		20.655***	20.460***	13.455**	7.288
		(5.479)	(5.674)	(5.632)	(5.330)
post-secondary		1.258	-0.357	-0.316	-4.774
		(4.412)	(4.675)	(4.972)	(4.715)
upper secondary		-2.149	-3.245	-3.657	-7.348*
		(4.002)	(4.199)	(4.422)	(4.110)
lower secondary		-3.964	-6.461	-7.689	-9.456**
		(4.560)	(4.606)	(4.970)	(4.529)
Teachers' sex (female)			8.280	4.656	-28.184**
			(5.260)	(5.024)	(13.746)
Teachers' experience			0.485	-0.527	1.609***
			(0.429)	(0.389)	(0.460)
School location					
urban				46.101***	
				(10.544)	
suburban				43.713***	
				(7.159)	
large town				65.067***	
				(12.556)	
small town or village				17.600***	
				(6.325)	
Controls	No	Individual	Individual, Teacher	Individual, Teacher, School	Individual, Teacher
School fixed effects	No	No	No	No	Yes
Observations	5400	4043	3677	3281	3677
R-squared	0.034	0.960	0.960	0.962	0.966

Note: Other individual controls consist of five dummies for number of books at home, computer, study desk, own room, and internet access. Other teacher controls consist of teachers' education level. Other school controls consist of four dummies for proportion of students coming from disadvantaged families and four dummies for instructional computer accessibility. Standard errors are adjusted for school-level clustering and heteroskedasticity.
*p < .10, **p < .05, ***p < .01.

Table 38: Impact of weekly bullying on 8th-grade math performance in Ghana

	(1)	(2)	(3)	(4)	(5)
Bullied	-18.144***	-20.440***	-19.630***	-18.634***	-15.731***
	(3.275)	(2.663)	(2.885)	(2.777)	(1.737)
Students' age		-13.969***	-13.081***	-10.454***	-6.192***
		(1.455)	(1.378)	(1.115)	(0.678)
Students' sex (female)		-28.785***	-27.910***	-28.048***	-27.223***
		(2.820)	(2.993)	(2.902)	(1.933)
Parents' highest education level					
university		39.646***	36.792***	22.432***	5.894*
		(7.025)	(7.112)	(5.501)	(3.447)
post-secondary		20.218***	15.516***	7.291	0.369
		(4.537)	(5.163)	(4.766)	(2.945)
upper secondary		21.510***	17.320***	8.982*	6.371**
		(4.667)	(5.591)	(5.201)	(2.621)
lower secondary		14.214***	11.557**	5.674	4.126
		(4.331)	(4.982)	(4.795)	(2.612)
Teachers' sex (female)			-10.509	-13.724	22.814***
			(9.112)	(9.873)	(1.072)
Teachers' experience			0.938	-0.657	-29.716***
			(0.720)	(0.658)	(0.470)
School location					
urban				18.929	
				(13.850)	
suburban				48.276***	
				(14.511)	
large town				25.187*	
				(14.780)	
small town or village				11.541	
				(12.808)	
Controls	No	Individual	Individual, Teacher	Individual, Teacher, School	Individual, Teacher
School fixed effects	No	No	No	No	Yes
Observations	7323	5503	5002	4514	5002
R-squared	0.013	0.960	0.960	0.964	0.978

Note: Other individual controls consist of five dummies for number of books at home, computer, study desk, own room, and internet access. Other teacher controls consist of teachers' education level. Other school controls consist of four dummies for proportion of students coming from disadvantaged families and four dummies for instructional computer accessibility. Standard errors are adjusted for school-level clustering and heteroskedasticity.
*p < .10, **p < .05, ***p < .01.

Table 39: Impact of weekly bullying on 8th-grade science performance in Ghana

	(1)	(2)	(3)	(4)	(5)
Bullied	-23.496***	-25.705***	-25.308***	-24.453***	-18.744***
	(4.306)	(3.445)	(3.509)	(3.443)	(2.333)
Students' age		-17.886***	-15.704***	-13.298***	-8.546***
		(1.762)	(1.721)	(1.334)	(0.977)
Students' sex (female)		-37.334***	-39.277***	-39.977***	-36.551***
		(3.493)	(3.567)	(3.529)	(2.703)
Parents' highest education level					
university		56.650***	47.972***	29.565***	16.159***
		(8.726)	(8.086)	(6.880)	(5.011)
post-secondary		39.128***	31.254***	18.883***	15.884***
		(6.033)	(6.047)	(6.211)	(4.485)
upper secondary		24.341***	16.063***	6.714	6.994*
		(5.957)	(5.734)	(6.163)	(3.770)
lower secondary		18.499***	12.015**	6.113	7.782**
		(5.511)	(5.445)	(5.802)	(3.844)
Teachers' sex (female)			-9.369	-5.241	-13.362***
			(18.026)	(13.600)	(3.288)
Teachers' experience			0.774	-0.139	2.082
			(0.620)	(0.566)	(1.494)
School location					
urban				19.282	
				(21.715)	
suburban				46.193*	
				(23.956)	
large town				36.218*	
				(21.676)	
small town or village				5.849	
				(19.036)	
Controls	No	Individual	Individual, Teacher	Individual, Teacher, School	Individual, Teacher
School fixed effects	No	No	No	No	Yes
Observations	7323	5503	5033	4519	5033
R-squared	0.013	0.924	0.927	0.935	0.957

Note: Other individual controls consist of five dummies for number of books at home, computer, study desk, own room, and internet access. Other teacher controls consist of teachers' education level. Other school controls consist of four dummies for proportion of students coming from disadvantaged families and four dummies for instructional computer accessibility. Standard errors are adjusted for school-level clustering and heteroskedasticity.
*p < .10, **p < .05, ***p < .01.

Table 40: Impact of weekly bullying on 4th-grade reading literacy in South Africa

	(1)	(2)	(3)	(4)	(5)
Bullied	-55.079***	-34.680***	-31.242***	-25.453***	-22.915***
	(6.212)	(4.833)	(5.251)	(5.897)	(4.142)
Students' age		-13.324***	-12.866***	-8.539*	-15.422***
		(3.443)	(3.628)	(4.733)	(2.128)
Students' sex (female)		18.425***	18.479***	20.413***	21.844***
		(3.474)	(3.44)	(3.372)	(2.803)
Parents' highest education level					
university		89.151***	79.138***	41.190***	30.059***
		(11.083)	(11.717)	(14.442)	(7.433)
post-secondary		56.801***	50.727***	27.041**	11.683*
		(9.213)	(9.717)	(10.307)	(6.760)
upper secondary		22.858***	15.691*	-0.648	4.126
		(7.983)	(7.926)	(8.944)	(6.244)
lower secondary		3.041	-3.638	-10.855	-8.931
		(7.830)	(6.950)	(7.745)	(5.870)
Teachers' sex (female)			11.111	-0.123	-21.614***
			(11.97)	(14.553)	(5.198)
Teachers' experience			-0.601	-0.013	-1.828
			(0.628)	(0.711)	(1.326)
School location					
urban				32.175	
				(40.905)	
suburban				21.232	
				(37.077)	
large town				56.38	
				(37.856)	
small town or village				55.337	
				(37.042)	
Controls	No	Individual	Individual, Teacher	Individual, Teacher, School	Individual, Teacher
School fixed effects	No	No	No	No	Yes
Observations	3515	2293	2010	1305	2010
R-squared	0.068	0.964	0.966	0.968	0.981

Note: Other individual controls consist of five dummies for number of books at home, computer, study desk, own room, and internet access. Other teacher controls consist of teachers' education level. Other school controls consist of four dummies for proportion of students coming from disadvantaged families and four dummies for instructional computer accessibility. Standard errors are adjusted for school-level clustering and heteroskedasticity.
*p < .10, **p < .05, ***p < .01.

Table 41: Impact of weekly bullying on 8th-grade math performance in South Africa

	(1)	(2)	(3)	(4)	(5)
Bullied	-43.336***	-27.311***	-26.515***	-17.750***	-11.426***
	(3.216)	(1.954)	(2.069)	(1.949)	(1.212)
Students' age		-19.384***	-19.970***	-16.402***	-12.662***
		(1.028)	(1.117)	(1.108)	(0.703)
Students' sex (female)		-11.549***	-12.770***	-13.075***	-11.173***
		(3.033)	(3.265)	(2.574)	(1.355)
Parents' highest education level					
university		35.223***	34.346***	18.166***	6.766***
		(3.728)	(3.930)	(3.736)	(2.533)
post-secondary		11.872***	12.954***	5.506	2.487
		(3.235)	(3.503)	(3.626)	(2.571)
upper secondary		3.186	3.538	1.891	-0.278
		(2.342)	(2.477)	(2.764)	(2.096)
lower secondary		5.361*	6.452**	2.695	3.788
		(2.955)	(3.159)	(3.116)	(2.604)
Teachers' sex (female)			-19.460***	-20.379***	33.804***
			(5.445)	(5.234)	(0.846)
Teachers' experience			-0.333	-0.167	0.908***
			(0.311)	(0.315)	(0.061)
School location					
urban				32.424***	
				(8.077)	
suburban				29.805***	
				(8.510)	
large town				51.233***	
				(8.712)	
small town or village				14.211**	
				(6.354)	
Controls	No	Individual	Individual, Teacher	Individual, Teacher, School	Individual, Teacher
School fixed effects	No	No	No	No	Yes
Observations	11969	8116	7003	6001	7003
R-squared	0.063	0.970	0.970	0.977	0.986

Note: Other individual controls consist of five dummies for number of books at home, computer, study desk, own room, and internet access. Other teacher controls consist of teachers' education level. Other school controls consist of four dummies for proportion of students coming from disadvantaged families and four dummies for instructional computer accessibility. Standard errors are adjusted for school-level clustering and heteroskedasticity.
*p < .10, **p < .05, ***p < .01.

Table 42: Impact of weekly bullying on 8th-grade science performance in South Africa

	(1)	(2)	(3)	(4)	(5)
Bullied	-64.364***	-42.013***	-42.874***	-32.458***	-22.058***
	(4.012)	(2.536)	(2.636)	(2.557)	(1.686)
Students' age		-25.455***	-26.414***	-21.983***	-16.811***
		(1.330)	(1.420)	(1.340)	(0.979)
Students' sex (female)		-12.627***	-12.562***	-12.821***	-12.985***
		(3.288)	(3.241)	(2.899)	(1.853)
Parents' highest education level					
university		37.589***	36.222***	18.881***	5.864*
		(4.546)	(4.845)	(5.025)	(3.274)
post-secondary		19.494***	16.466***	7.148	7.310**
		(4.218)	(4.671)	(4.549)	(3.172)
upper secondary		7.022**	3.268	2.040	1.405
		(3.306)	(3.701)	(3.972)	(2.977)
lower secondary		1.648	-1.512	-5.285	-2.249
		(3.990)	(4.443)	(4.678)	(3.346)
Teachers' sex (female)			-6.910	-0.597	90.659***
			(6.705)	(6.065)	(1.425)
Teachers' experience			0.539	0.606	-12.380***
			(0.409)	(0.390)	(0.187)
School location					
urban				40.245***	
				(10.583)	
suburban				52.734***	
				(9.912)	
large town				65.360***	
				(10.799)	
small town or village				20.778**	
				(8.359)	
Controls	No	Individual	Individual, Teacher	Individual, Teacher, School	Individual, Teacher
School fixed effects	No	No	No	No	Yes
Observations	11969	8116	7069	6063	7069
R-squared	0.083	0.951	0.953	0.963	0.976

Note: Other individual controls consist of five dummies for number of books at home, computer, study desk, own room, and internet access. Other teacher controls consist of teachers' education level. Other school controls consist of four dummies for proportion of students coming from disadvantaged families and four dummies for instructional computer accessibility. Standard errors are adjusted for school-level clustering and heteroskedasticity.
*p < .10, **p < .05, ***p < .01.

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“If there’s one goal of this conference, it’s to dispel the myth
that bullying is just a harmless rite of passage
or an inevitable part of growing up.”

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