A Cross-National Study of School Violence

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ABSTRACT

This study examines the predictors of school violence cross-nationally, testing the applicability of criminological theories of adult violence to violence in the school setting. Using hierarchical linear modeling (HLM), a method of multi-level linear analysis, of the 2007 Trends in International Math and Science Studies (TIMSS) data augmented with data from UN Human Development Reports, UN Demographic Yearbook, CIA World Factbook and the World Health Organization Mortality Database, I examine predictors of school violence at the school and national levels to determine what variables account for cross-national variation in the level of school violence. Hierarchical linear modeling (HLM) takes into account the structure of nested data, and this study examines schools nested within nations.

The relationships between school and national level inequalities, social disorganization, institutional anomie, social support, resource deprivation theories and school violence are tested. Violence is operationally defined as a continuum of aggression ranging from non-physical to physical (see Yu 2003), incorporating low-level as well as more serious forms of interpersonal violence. I find that measures of social disorganization, institutional anomie and resource deprivation at both the school and national levels predict higher levels of violence within schools. Surprisingly, homogeneity rather than heterogeneity is a significant predictor of physical bullying. In addition, math achievement and achievement score variation significantly predict the level of school violence cross-nationally. At the national level, placing too much

emphasis on students' achievement on standardized tests may inadvertently create a culture conducive to school violence. Emphasizing a diverse range of ways to measure students' achievement other than standardized testing may reduce the likelihood that students experience strain and engage in violent behavior at school. This research is the first to use multi-level linear analysis to discern the school and national level predictors of school violence.

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It is my sincerest hope that my dissertation and future research on violence, particularly school violence, will help to reduce the problem so that students can coexist peacefully and learn without fear.

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CHAPTER 1: Statement of the Problem

In 1996, the World Health Organization declared violence a worldwide public health concern, defining it broadly as:

> The intentional use of physical force or power, threatened or actual, against oneself, another person, or against a group or community, that either results in or has a high likelihood of resulting in injury, death, psychological harm, maldevelopment or deprivation (WHO Global Consultation on Violence and Health 1996).

Violence in schools is a unique public health problem because it primarily affects children and young adults, and the negative consequences undermine the primary purposes of education (Centers for Disease Control and Prevention 2004). Put simply, the presence or even the threat of school violence significantly inhibits teaching and learning (NSBA 1993; Gorski and Pilotto 1993; Shakoor and Chalmers 1991; CDC 2004).

As a long-time "Hokie," Virginia Tech student, and member of the Blacksburg, Virginia community, the problem of school violence reached my own backyard on April 16, 2007. That morning Seung-Hui Cho perpetrated one of the deadliest mass murders that has ever taken place at a school, killing 32 and wounding 17 others before killing himself. Like "Columbine" before it, "Virginia Tech" is now a school synonymous with a horrific tragedy. However, while highly publicized mass murders are incredibly painful for many involved, including members of the surrounding communities, homicide and mass murders in schools are relatively rare (DeVoe et al. 2005; DeVoe et al. 2002; Anderson et al. 2001; Astor et al. 1999; CDC 1998; Hyman and Snook 1999; Kachur et al. 1996). Much more common is the kind of "low level" violence that

students experience, perpetrate, hear about, dread, avoid, or ignore in their hallways and classrooms every day. Teasing, bullying, and other classroom disturbances can likely be found to some degree in every school the world over.

In the early 1990's, a period of relatively high levels of school violence in the United States, fully one third of teachers in a national poll reported that due to the threat of violence, both teachers and students are less eager to go to school. In addition, one fourth of students reported that violence lessened the quality of their education (Harris and Associates 1993). As a result of increasing concerns, many American schools instituted "get tough" and "zero tolerance" policies to combat school violence (Elliott et al. 1998), but the resulting organizational practices may have led to increased levels of school violence (Mayer and Leone 1999), and, further, these policies could be considered a form of violence themselves.

The consequences of homicide and serious school violence are obvious in terms of the bodily injury and death of victimized individuals, as well as the mental and emotional harm to victims' classmates, families, and communities (Newman et al. 2005). It is also important to consider the consequences of "low-level" violence such as bullying and teasing, which are wide-ranging and affect the entire educational process (Arsenault et al. 2006; Bierman 2004; Boxer et al. 2003; Ladd 2003; Limber 2006; Nansel et al. 2001; Skiba et al. 2004). Bullying has been defined as aggressive, unwanted negative behavior involving a power balance that is sustained over time creating a pattern of abuse (Olweus 1993; 1994) and is the most prevalent form of school violence experienced in schools world-wide (Diaz-Aguado 2006; Whitted and Dupper 2005). This low-level violence doesn't just interfere with students' learning, but can cause mental anguish and even suicide (Dupper and Meyer-Adams 2002). Disruptive behavior interferes with teaching; negative psychological reactions to violent victimization disrupt

students' learning as do fears about safety at school (Greene 2005; Chandler et al. 1995; Chandler et al. 2001; AAUW 2001; NRC and Institute of Medicine 2001).

Victims of bullying exhibit higher levels of truancy and are more likely to drop out and experience difficulty in social and sexual relationships (Hazler et al. 1991). In addition, victims experience lowered self-esteem and social isolation that persists into adulthood (Hazler 1994). Bullied students also exhibit more aggression themselves, have more negative expectations of the future, and lower perceptions of safety at school than non-victimized students do (Boxer et al. 2003). Peer victimization and chronic peer maltreatment have been shown to lead to avoidance of and disinvestment in school (Ladd 2003; Buhs et al. 2006). In addition, students characterized as bullies in middle school are more likely to engage in violent criminal behavior as adults (Olweus 1993; 1994). Even youth who are not directly bullied may be psychologically victimized by the chronic presence of violence (American Psychological Association 1993). Notably, around two-thirds of school shooters examined by the U.S. Secret Service felt attacked, bullied, threatened or injured by other students prior to perpetrating their attacks (Vossekuil et al. 2000).

School violence is clearly a public health concern that warrants empirical study. Violence occurs at multiple levels due to a confluence of risk factors and social processes at the individual, peer, family, school, and national levels (Mayer and Leone 2007; Osher et al. 2006; Osher et al. 2004). Although the effects can be devastating for individuals, it is important to examine the wider context of school violence rather than focusing solely on individual-level predictors of violent behavior (Henry 2000; Greene 2005). Most studies of school violence are conducted at the individual, student or teacher level. Very few studies have examined the

relationship between macro-level characteristics of communities and school violence (Elliott et al. 1998), and even fewer have examined school violence cross-nationally (Denmark et al. 2005).

Despite the fact that school violence is a serious problem for teachers, students and administrators worldwide, it is rarely studied cross-nationally (Denmark et al. 2005). Cross-national research is imperative because school violence is a global problem. The recent school shootings in Finland in Jokela on November 7, 2007 (Räsänen et al. 2008) and in Kauhajoki on September 23, 2008 drew international media attention, as did shooting incidents in Germany and stabbings in elementary schools in China over the past several years. As in the United States, bullying is problematic and prevalent throughout the world. Cross-national research is important and necessary to identify patterns that are generalizable across nations and to determine what characteristics of both schools and nation-states can predict violence.

It is important to consider the influence of structural inequalities that affect the level of violence within schools (Greene 2005; Furlong and Morrison 2000; Kozol 1991). Cross-national studies of adult homicide rates indicate the Gini coefficient is a consistent predictor (see Pridemore and Trent 2010). Akiba et al. (2002) found inequalities in achievement scores predicted higher levels of school violence cross-nationally. It is important to determine if measures of inequality as well as measures of anomie, strain and social disorganization that have been shown to predict adult violence may be applicable to school violence.

The purpose of this study is to examine the relationship between school and national level inequalities, institutionalized anomie, strain and social disorganization and school violence. The specific research questions addressed in this study are: (1) What predicts the level of school violence cross-nationally? (2) How do school and national contexts affect the amount of violence

in schools? In other words, what accounts for cross-national variation in the levels of school violence, and what school-level effects vary randomly across nations? And (3) Do major criminological theories of adult violence apply to the school context?

I employ a multi-level analysis using hierarchical linear modeling to determine the characteristics of schools and nations that predict higher levels of school violence in the 2007 Trends in International Mathematics and Science Studies (TIMSS) data. I define violence operationally as a continuum of aggression ranging from non-physical to physical (see Yu 2003), incorporating low-level as well as more serious forms of interpersonal violence, and examine whether inequalities at both the school and national levels will predict higher levels of violence within schools. This is the first study employ a multi-level linear analysis to discern the school and national level predictors of school violence.

CHAPTER 2: Review of the Literature

Introduction: The Study of School Violence

Definitions of school violence have both a spatial and an interpersonal component. The term *school* violence implies the location of the violence is a school building, on school grounds, or a school bus (Henry 2000). Moreover, "school-associated" violence occurs on school grounds, in route to or from school, or during school-sponsored events (Furlong and Morrison 2000). *Violence* is generally defined as the use of force that results in harm. In general, interpersonal violence is behavior by persons against other persons with the intent to harm, including threats to cause harm (Reiss and Roth 1993).

In the school context, violence is usually studied in terms of students victimizing other students or teachers (Henry 2000). The U.S. Department of Justice defined violent victimization at school as "physical attacks or taking property from the student directly by force, weapons, or threats," on school property or on the way to or from school (US DOJ 1998; 2002; 2005). This definition clearly ignores forms of violence against teachers and administrators. Elliott, Hamburg and Williams (1998) defined school violence as the threat or use of physical force with the intent to cause physical injury, damage or intimidation of another person at school, excluding the use of physical force among friends (i.e. hitting or shoving in "good fun").

A broad definition of school violence would take into account all forms of abuse, including abuses of power and psychological trauma. Conventional definitions of school violence tend to ignore emotional and psychological pain and consequences of multiple forms of victimization including verbal and psychological abuse (Felix et al. 2009; Henry 2000). In addition, they focus solely on visible forms of violence and exclude the violence perpetrated on

individuals by organizational practices, such as discrimination and tracking that perpetuate institutionalized racism and sexism (Yogan 2000). These definitions also ignore the prevalence and consequences of teachers harming students, administrators harming teachers and students, and other combinations of potential victimizations (Henry 2000; Yogan 2000). A more inclusive definition of school violence includes the recognition of psychological distress, intimidation, and behaviors intended to induce fear in the victim (Loeber and Stouthamer-Loeber 1998), as well as indirect forms of aggression such as rumors and ostracizing (Crick and Bigbee 1998; Smith and Sharp 1994). However, most conventional understandings of school violence ignore the harm caused to students by inequitable school funding (see Kozol 1991) that can be considered a "hidden crime" perpetrated by the power elite (Henry 2000). I define violence operationally as a continuum of aggression ranging from non-physical to physical (see Yu 2003), and focus on interpersonal forms of violence (see Elliott et al. 1998).

Prevalence of School Violence in the United States

Violence has been present to some degree in schools throughout the history of education (Aries 1962), although the perception of school violence as a major problem is a relatively recent phenomenon. Prior to the 1970's, school violence was not considered a problem. A study in the United States in the 1940s found that none of the school principals surveyed considered interpersonal violence a problem in their schools (Hennings 1949). Starting in the 1970's, however, school violence began to be seen as a problem in the U.S. Two landmark studies were commissioned in response to growing public concern, the Bayh Report and the Safe School Study. The Bayh Report noted an increase in school crime including homicide and attempted rape between 1970 and 1973 (Bayh 1975). Congress mandated The Safe School Study to determine the prevalence and seriousness of crime in elementary and secondary schools nation-

wide. This study found that around 282,000 students and over 5,000 teachers were physically assaulted in secondary schools every month (National Institute of Education 1978).

Despite these reports of relatively high rates of school violence, violence in general and school violence in particular did not become a major public concern until an upsurge in actual rates of violence starting in the late 1980's that lasted into the mid-1990's. In 1982, only three percent of adults in a national poll considered crime and violence the most important problem facing the nation, but by 1994, over fifty percent did (Maguire and Pastore 1996). Violence became a top concern for schools (Elam and Rose 1995; Rose et al. 1997). From the early 1980's to the early 1990's there was an upsurge in school violence. From the mid-1990's to today, school violence is widely perceived as a very serious social problem, although actual rates of victimization at school have been declining consistently since 1994 (US DOJ 2005).

School violence in the 1990's has been described as an epidemic (Elliott et al. 1998). According to the Monitoring the Future study of high school seniors, there was an 18 percent increase in the proportion of students reporting victimization by serious assault between 1984 and 1994 (Maguire and Pastore 1996). During this same period, youth violence in general increased in the United States; the homicide rate for teens doubled and nonfatal victimizations rose 20 percent (Mercy and Rosenberg 1998; Snyder and Sickmund 1995). Additionally, there was a 62 percent increase in juvenile arrests for weapon violations between 1987 and 1991 (NSBA 1993). This rise in youth violence occurred even as the homicide rate for other age groups was decreasing.

Hostile confrontations between youth became more lethal in the late 1980's and early 1990's due in large part to an increasing number of youth with guns, particularly handguns (Katz

1988; Gorski and Pilotto 1993; Mercy and Roseberg 1998; Esbensen and Huizinga 1997; Snyder and Sickmund 1995). Young, urban African-American males faced the highest risk of victimization (Fingerhut 1993; Snyder and Sickmund 1995). In the early 1990's, homicide became the second leading cause of death among teenagers and the leading cause of death among African-American male teenagers (Fingerhut 1993; Snyder and Sickmund 1995). In addition, the 1990's saw an increase in random shootings, which increased the fear of violence throughout the general population (Elliott et al. 1993; Fox 1996; Agnich 2010), as well as increases in violence in suburban and middle class schools (Roper 1991; Agnich 2010). The fear of school violence among parents, students, and teachers rose nationwide throughout the 1990's (Children's Institute International 1996; Harris and Associates 1993; Walker et al. 1996; Elliott 1994a; Maguire and Pastore 1995).

In 1991, over half of all juvenile victimizations occurred at school or on school grounds, mostly for theft, vandalism, and threats of violence without a weapon (Richters 1993; Snyder and Sickmund 1995). In 1993, a CDC study of 9th through 12th graders found that nine percent of males and five percent of females had been threatened or injured on school property in the last year (Maguire and Pastore 1995). Additionally, 78 percent of school districts reported student-on-student and student–on-teacher assaults (NSBA 1993). That same year the National Education Association called on federal, state, and local governments to work together to increase efforts to combat the problem of increasing school violence.

Despite increasing fear and incidents of violence in schools, schools are actually safer than neighborhoods, communities, and homes (Hanke 1996; Maguire and Pastore 1996). In 1993, for example, only 13 percent of juvenile violent crime took place at school, and most of it was for minor assault (Hanke 1996; Harris et al. 1993; Maguire and Pastore 1996). Teenagers in

1991 were three times more likely to encounter a weapon-related crime on the streets in their neighborhood than they were to encounter such a crime at school (DOJ 1991). Furthermore, school-associated homicides are extremely rare. Between 1992 and 1994, there were 105 violent deaths at or on school properties nationwide, which translate to a school-associated homicide rate of .09 per 100,000 students. Seventy two percent of the victims were students and 96 percent of victims were males (Kachur et al. 1996).

Since 1994, violent crime in schools has decreased (DeVoe et al. 2005; Dinkes et al. 2006; Kingery et al. 1998; Steinberg 1996). The annual rate of violent crime in schools in 2007 was less than half of the rate it was in 1994 (DOJ NCVS 2007). Compared to the 1990's, the rate of homicides in U.S. schools has generally declined in the 2000's (National School Safety Center 2009). This corresponds with a decline in juvenile homicides in the United States in general (FBI UCR 2009). Non-fatal school violence has leveled off since the 1990's, remaining mostly stable or in some years declining (DeVoe et al. 2002). Despite decreasing incidents of school violence since, the fear of school violence has increased since the 1990's (U.S. DOE and DOJ 2000). In addition, certain forms of violence have remained salient; since 1993, the overall percentage of students threatened with a weapon or injured at school has remained stable, around 10 percent (Indicators of School Crime and Safety 2009). Additionally, bullying has remained a serious problem in schools, with almost half of all sixth graders reporting they had been bullied at school during 2007 (Indicators of School Crime and Safety 2009).

Bullying is the most frequently reported discipline problem in U.S. schools (Indicators of School Crime and Safety 2007). In particular, verbal bullying and sexual harassment are the most common forms of school violence experienced by American students (AAUW 2001; DeVoe et al. 2002; Gottfredson et al. 2000; Greene 2000; Nansel et al. 2001). An estimated 15-

20 percent of the U.S. student population is victimized by verbal teasing and intimidation that could be considered bullying. Bullying is most common among boys (Furlong et al 1995), and bullying victimization peaks in middle school (Batsche and Knoff 1994), as do most forms of victimization at school (NIE 1978). In one study, 88 percent of middle school students reported having seen instances of bullying, and 76.8 percent reported having been victims of bullying (Hoover et al 1992).

Predictors of School Violence in the United States

Western studies of school violence find that males are more likely to be both victims and perpetrators of school violence (Kingery et al. 1998; Baldry 2003; Bosworth et al. 1999; Kumpulainen et al. 1998; Nansel et al. 2001; Rigby 2005). However, girls are likely to experience sexual harassment victimization more than boys are (Crick and Bigbee 1998; Felix and McMahon 2007; Finkelhor et al. 2005). Boys report being victimized by sexual harassment as well, though, often by other boys (Felix and McMahon 2006; McMaster et al. 2002). In general, the chances of being victimized by bullying decreases with age (Eslea and Smith 1998; Olweus 1994). Experiences of school violence generally peak in early adolescence and decrease in high school (Espelage and Swearer 2003; Nansel et al. 2001; Pellegrini and Long 2002; Pepler et al. 2006), but the number of sexual harassment victimizations increase with age (AAUW 2001).

Racially, most victims of school violence in the U.S. were African American males in the 1990's (Maguire and Pastore 1996), but Spriggs et al. (2007) recently found that African American students had lower victimization rates than white and Latino youth in a nationally representative sample. Felix et al. (2009) point out that Native American and Asian American

students are underrepresented in studies of school violence, and Native American students are particularly vulnerable to victimization (Harwell et al. 2003; Stevens et al. 2005).

Finkelhor et al. (2005) note that the body of U.S. youth-victimization literature is fragmented, underestimates the prevalence and impact of victimization, and ignores the co-occurrence of multiple forms of victimization. Studies have found that victims of school violence tend to experience multiple forms of victimization simultaneously (Felix and McMahon 2007; Finkelhor et al. 2005). Cluster analyses show that some students chronically experience multiple forms of victimization (Felix and McMahon 2006; Furlong et al. 2000; Holt and Espelage 2003; Holt et al. 2007). Felix et al. (2009) identified subgroups of students victimized at schools in California and found that victimization was related to perceptions of school safety, depression, and lower grades. Another study found that involvement in classroom-related extracurricular activities increases the risk of students' violent victimization (Peguero 2009).

As for the perpetrators of school violence, violent youth exhibit poor coping skills (Gorski and Pilotto 1993), attention deficit problems, and impulsivity (Farrington 1988; Reiss and Roth 1993). Students with poor grades were found to be three times more likely to carry a gun to school as compared to students with "fair grades" (Harris and Associates 1993). This relationship is often explained with the argument that lower levels of academic success can lower self-esteem, which in turn leads teenage boys to exhibit violent behavior (Gorski and Pilotto 1993). The inability to achieve academic success can also be considered in terms of Agnew's (1992) General Strain Theory whereby strain, in this case caused by the failure to achieve something positive, academic success, leads to frustration and violence.

Youth from single-parent homes are more likely to exhibit aggressive and violent behavior at school (Gorski and Pilotto 1993; Dornbusch et al. 1985). Violent youth are more likely to have experienced family conflict, lower levels of parental monitoring, and a higher likelihood of having experienced prior abuse in their homes (Gorski and Pilotto 1993). The influence of peers has also been found to play an important role in bullying. Students' peers are present in the vast majority of bullying incidents, and their presence serves to reinforce bullying rather than to intervene or help the victim (Craig and Peplar 1995; 1997).

Rates of school violence vary between schools because of the effects of individual school contexts (Astor et al. 2002; Benbenishty and Astor 2005; Benbenishty et al. 2002). Rates of violent victimization vary by type of school; they are lowest in elementary schools followed by high schools, and are highest in junior high schools (NIE 1978; DOJ NCVS 2005; 2007). Schools in low income neighborhoods exhibit significantly higher levels of school-associated violence (NSBA 1993; Warner et al. 1999; Sheley et al. 1995; Laub and Lauritsen 1998; Huff and Trump 1996; McLean Parks 1997), and larger schools are more criminogenic than smaller schools are (US DOJ 1998; Sheley et al. 1995). Large schools may seem impersonal to students who then become alienated from other students and teachers, becoming more likely to engage in violent behavior (Goldstein et al. 1984). Feeling distant from people at school was found to be connected to weapon carrying (Kingery et al. 1998). Additionally, a competitive school environment where individual achievement is stressed has been found to promote aggressive behavior (West 1975).

One result of increasing concerns and rising fears about school violence starting in the late 1980's and early 1990's was the proliferation of "get tough" and "zero tolerance" programs in America's schools (Warner et al. 1999; Elliott et al. 1998). The increase in these programs

and resulting practices has been linked to an increase in fear of violence, measures of incivility in schools, and school-avoidance behaviors (Mayer 2001; Mayer 2010). These programs may have created a "lockdown environment" in schools that in itself has a deleterious effect apart from the effects of school violence alone (Fuentes 2003). In fact, several studies have shown that characteristics of schools' organization either promote or inhibit school violence (Gaddy 1988; Lab and Clark 1996; Leone and Mayer 2004). School climate, including the goals, rules, and procedures of a school's organization (Aleem and Moles 1993) have been linked to violence and disruption (Gottfredson 1995; Leone and Mayer 2004). Schools that utilize overly controlling or restrictive approaches to maintain order actually promote aggression and disorder within the school (Colvin et al. 1993; Noguera 1999). The use of metal detectors and building security measures have not been found to reduce classroom violence or levels of in-school fighting (Aleem and Moles 1993; CDC 1993), and have even been shown to increase school violence (Mayer and Leone 1999). Students' view of a school's rules as illegitimate has been linked to school violence as well (Toby 1993).

Brown et al. (2009) found that students in "culture of honor" states in the Southern and Western United States were more likely to carry a weapon to school, and that these states were significantly more likely than Northeastern and Mid-western states to have had a school shooting in the past 20 years. "Culture of honor" states had twice as many school shootings per capita than non-culture of honor states. Theoretically, the "culture of honor" thesis proposes that school violence results from threats to students', mostly males', social identity resulting in retaliatory acts of aggression, and that a culture that promotes this aggression is more likely to be present in Southern and Western states due to their particular history (Brown et al. 2009; Nisbett 1993; Nisbett and Cohen 1996).

It is well-documented that African Americans are over-represented among both victims and perpetrators of violent crimes in general. However, it is notable that most perpetrators of "rampage" school shootings have been white males (Newman et al. 2005; Agnich 2010). The Shooting Incidents in Educational Settings Database developed by Agnich (2010) includes data on 204 identified cases of "school shooting" incidents in the United States from 1764 through February 2010 involving 268, mostly white male perpetrators[1]. Without a doubt mass murders or "rampage-style" shootings are the most-feared form of school violence, and are most often perpetrated by white males, but it is important to again point out that low-level forms of aggression such as bullying and harassment are by far the most prevalent forms of school violence (DeVoe et al. 2005; DeVoe et al. 2002; Anderson et al. 2001), and that school violence is a global problem.

Prevalence of School Violence Cross-Nationally

School violence is a growing concern for students and school staff across the world (Jenson and Howard 1999). Around five months after the tragic mass murder at Virginia Tech in 2007, an 18 year old boy killed eight and wounded one before killing himself at Jokela High School in Tuusula, Finland. In March of 2009, seventeen year old Tim Kretschmer opened fire on two classrooms in his high school in Winnenden, Germany killing twelve inside the school. He then shot a bystander, fled to a neighboring town where he killed two more bystanders, and engaged in a gun battle with police before committing suicide. These crimes and several others brought the global nature of the problem of school violence to public attention, but the problems

[1] A shooting incident is defined as an actual or attempted first-degree multiple homicide incident involving two or more victims in a school or on school grounds, including murder-suicides and hostage situations. The database does not include single homicides, off-campus homicides, killings caused by government actions, militaries, terrorists or militants. Only cases that have been reported in major newspapers were identified. The data were drawn from news reports, published interviews, and online databases and published research, including information about the incident, victims, perpetrators and school contexts (Agnich 2010).

of everyday violence, aggression, bullying and intimidation are also global and warrant empirical analysis (Baker et al 2005). As in the U.S., students worldwide are far less likely to be exposed to extreme violence compared to everyday "low-level" forms of violence at their schools (Akiba et al. 2002; Baker et al. 2005). Yu (2004) found that, across all grade levels, the most frequent type of violence reported by school principals worldwide was intimidation or verbal abuse of students and the least frequent was injury to teachers or staff.

Except for a few studies, everyday school violence is rarely studied globally (IBE 1997; Baker et al. 2005; Akiba et al. 2002, Yu 2001; 2003; 2004). Student victimization data provides the best common measure of violence in schools world-wide. These data are better than official data, particularly for cross-national studies, because low-level violence is rarely reported to school officials. Further, non-students, teachers and principals, do not provide the best estimates of a school's level of violence. A study of school violence in Germany revealed the teachers were unaware of how much violence was present in school and that student reports were more accurate (Wolke et al. 2001). Similarly, a comparative study of school violence in the U.S. and South Korea found that student reports were not associated with principals' reports of violence in schools (Akiba and Han 2007).

Student victimization data tend to provide a conservative estimate of the actual level of violence since they do not take into account the wide range of people affected by school violence (i.e. bystanders and witnesses), (Baker et al. 2005). In addition, there are cultural differences in perceptions and definitions of school violence (Yu 2001). For example, a recent study of sexual harassment in Nigerian universities found the majority of female students did not consider unwanted touching by their peers to be a form of sexual harassment (Popoola and Awolowo 2010). Despite these limitations, student victimization reports remain the best indicator of

school violence for cross-national studies and have shed light on the fact that from students' perspectives, school violence is a common phenomenon worldwide (Baker et al. 2005).

As in the U. S., the mid-1990's saw a rise in school violence worldwide (IBE 1997). Using victimization data derived from the 1995 Trends in International Math and Science Study (TIMSS) among seventh and eighth grade students in 37 nations, Akiba et al. (2002) examined the cross-national incidence of school violence using several indicators of types of school violence. The authors found that the majority of students in Hungary, Romania, and the Philippines reported being victims of school violence in the previous month. Students in countries such as New Zealand, Canada, Korea, Spain, and Australia reported higher rates of school violence than did students in the United States. Seventh and eighth graders in the U.S. reported less school violence than their global peers in 1995, although the U.S. has higher rates of juvenile violence outside of schools than many countries do (Baker et al. 2005). In approximately half the nations that Akiba et al. (2002) analyzed in 1995, half the students reported that a friend had been a victim of violence in the previous month. There is considerable cross-national variation, however, as 80 percent of Hungarian students compared to only 15 percent of Singapore's students reported a friend having been a victim of violence in the previous month (Baker et al. 2005).

School violence is a problem in developing nations such as Guatemala, Nicaragua, and Ethiopia as well. Sixty percent of students in a 1996 study of Ethiopian schools reported that violence had a negative impact on the teaching and learning process as well as their emotions; and fully forty percent of Ethiopian students reported dropping out or repeating classes as a result of violence (IBE 1997). School violence is also widespread in East Asian countries (Ando et al. 2005; Wei and Chen 2009; Yang et al. 2006; Chen and Astor 2009), although U.S. students

reported higher rates of school violence than South Korean students did in 1999 (Akiba and Han 2007). The first nationally representative study of school violence in Taiwan found that 71.2 percent of males and 48.5 percent of females were involved in at least one violent act in school in 2000 (Wu et al. 2000; Chen and Astor 2009). In Israel, almost one third of students reported perpetrating violence toward their peers, and one in five reported perpetrating violence against their teachers (Khoury-Kassabri et al. 2009).

Teachers worldwide also report high levels of classroom disruptions due to violence and misbehavior (Anderson 1998). In Israel, teachers reported being exposed to a great deal of verbal and physical violence, but most reported feeling safe and did not view violence as a serious problem at their school (Zeira et al. 2004). According to TIMSS 1995 data, in many nations, up to 40 percent of teachers report their teaching is limited by student disruptions in the classrooms. U.S. teachers score above the international mean on this measure. Teachers worldwide generally do not perceive a threat to their own or students safety as limiting their teaching, but again, low-level forms of violence disrupt the teaching-learning process (Baker et al. 2005).

In the European Union, concerns over violence have led to legal requirements and the circulation of materials such as leaflets in schools to reduce violence in some countries. Belgium, Finland, France, Ireland, Luxembourg, Malta, Sweden, and the UK have passed legislation designed to reduce violence and/or bullying in schools (Ananiadou and Smith 2002). In the UK, school violence is a top political concern (Cowie et al. 2008; Cowie et al. 2002; 2003; Smith 2003). As in the U.S., everyday violence is a daily reality in the U.K. and there is widespread public belief that school safety has been declining (Gill and Hearnshaw 1997). Additionally, a recent study of Turkish school children's drawings revealed the students, age 12-

13, were affected by violence. They mostly depicted scenes of student-on-student and teacher-on-student violence occurring at various places on school grounds (Yurtal and Artut 2009).

Predictors of School Violence Cross-Nationally

Most cross-national studies have found males are more often victims and perpetrators of school violence. Similar to Western countries, in Taiwan, male students are more likely to be involved in incidents of school violence (Chen and Astor 2009; Hu and Lin 2001), as are students in junior high (Wei et al. 2007; Chen and Astor 2009). Males and younger students are also more likely to have self-reported perpetrating acts of school violence in Israel (Khoury-Kassabri et al. 2009). A study of teachers' perceptions of school violence in Israel revealed that teachers were victimized more in high school, and by more serious violence than junior high and elementary school teachers (Zeira et al. 2004).

While school violence is widespread around the world, it is important to note that violence is not evenly distributed within or between nations (Baker et al. 2005). That is, school and national level differences affect the level of violence in schools. Differences related to the production of social inequalities are particularly salient in the cross-national literature on school violence. A study of Jewish and Arab 7th through 11th grade students in Israel revealed the best predictor of reported acts of violence towards others was low SES (Khoury-Kassabri et al. 2009). Studies have found that the production of inequalities in achievement scores produces more school violence within nations (Baker et al. 2005; Akiba et al. 2002). That is, national systems of education that produce greater differences in achievement scores between high-achieving and low-achieving students tend to report more violence.

A comparative study of the U.S. and South Korea using data from the 1999 TIMSS revealed that in South Korea, schools with academic tracking were more violent, while in the

U.S., students in low-achieving schools reported more violence (Akiba and Han 2007). Inequalities at the school and national levels affect the level of school violence. To ensure students' safety globally, then, high quality instruction and equality of opportunities to learn must be provided (Akiba et al. 2002). Since violence is a serious global problem with numerous deleterious effects, it is important to examine why, theoretically, violence occurs in schools.

CHAPTER 3: Toward a Theory of School Violence

The major research questions addressed in this study are: (1) What predicts the level of school violence cross-nationally? (2) What accounts for cross-national variation in the levels of school violence, and what school-level effects vary randomly across nations? And (3) Do major criminological theories of adult violence apply to the school context? In this chapter I discuss the major criminological theories I test in this study.

Swearer et al. (2006) noted that theoretical understandings of school violence have benefited in recent years from a shift from an individualistic approach to understanding why children are victims or bullies to examining the social contexts in which victimization and bullying occur. There is a rich history within criminology research linking social disorganization and violence at the neighborhood level (Sampson and Groves 1989; Sampson et al. 1997; Veysey and Messner 1999), and recent research indicates this is a fruitful area of theory for examining adolescent violent victimization (Kaylen and Pridemore 2008) and juvenile arrest rates (Lee and Schulenberg 2007). In addition, the relationship between institutionalized anomie, strain and violence has been examined in terms of adult criminality (e.g. Messner and Rosenfeld 1994; Messner et al. 2008), but not school violence.

Existing Criminological Theories

Social Disorganization Theory

Influenced by Park and Burgess' (1925) social ecological approach whereby crime is linked to neighborhoods, not individuals, racial or ethnic groups, or some biological or cultural shortcoming, Shaw and McKay (1942) studied criminality at the neighborhood level, specifically the breakdown of norms due to rapid social change at the neighborhood level. Social disorganization theory posits that these characteristics lead to the breakdown of community

controls and ties to normative institutions, which leads to higher rates of crime in disorganized neighborhoods (Shaw and McKay 1942). Rather than asserting that crime was the result of deviant immigrant or racial/ethnic cultures, they argued that any ethnic or racial group living in a socially disorganized urban neighborhood would experience higher rates of crime and delinquency. They found that "delinquency areas" were urban neighborhoods characterized by residential instability, ethnic heterogeneity and poverty. According to Shaw and McKay, these structural factors led to the development of a deviant subculture of violence, particularly with respect to child care, education and family life. In contrast to normative values, violence is considered an acceptable method of interaction in "delinquency areas" due to the structural characteristics of high-crime urban neighborhoods that lead to the development of a cultural value system conducive to violence.

The characteristics of social disorganization, poverty, heterogeneity, and population mobility can explain school violence, which in the U.S. has been shown to be more prevalent in disorganized urban areas (Fingerhut 1993; Snyder and Sickmund 1995). Schools are often characterized by a high degree of mobility and heterogeneity and, like neighborhoods; schools characterized by disorganization may be more prone to violence due to the breakdown in social control at the school and national levels. In this study, I will test whether characteristics of disorganization, including poverty, heterogeneity, and school and class size predict school violence cross-nationally.

Strain/Anomie Theories

Several macro-level strain theories are useful to examine school violence. Merton's (1938) concept of anomie, institutionalized anomie theory (Messner and Rosenfeld 1994), and the theoretical perspectives of resource deprivation (relative and absolute deprivation) can be

used to analyze the prevalence of school violence cross-nationally.

Merton's Anomie

Merton (1938) re-conceptualized Durkheim's concept of anomie. To Durkheim (1893), anomie was the breakdown of norms due to rapid social change associated with modernization and the shift from mechanical to organic solidarity and increasing functional differentiation in the division of labor. Anomie could result in suicide if individuals' desires were not regulated and left unfulfilled (Durkheim 1897). Merton theorized that crime is the result of individuals' and groups' adaptations to a disjunction between cultural goals deemed desirable in a given society and the normative institutionalized (structural) means for achieving the goals.

In American society, for adults, the most important goal is the accumulation of wealth, and the legitimate institutionalized means of achieving that goal is getting a job. Since some individuals have blocked access to the opportunity structure for achieving the goal of monetary success, they experience frustration, alienation and strain. To Merton, anomie results in deviance when either too much emphasis is placed on the goals, or the available means are inadequate to reach the goals; in other words, anomie results from blocked opportunities to normative success (Merton 1938). In the school context, the socially valued goal may be excellence in achievement scores, which is a way for students to secure future jobs and therefore monetary success in many nations.

Like social disorganization theory (Shaw and McKay 1942), Merton's anomie theory could explain the higher rates of criminality among people in lower socioeconomic strata, since their opportunities for successfully achieving the goal of making money through the legitimate means of working are limited. This strain can be applied to the problem of school violence cross-nationally. While concerns about making money may not necessarily apply to juveniles,

standardized achievement tests can be conceptualized as a source of strain applicable to youth violence in schools.

Institutional Anomie Theory and Social Support

Merton's theory has also been extended by Messner and Rosenfeld's (1994) institutional anomie theory which argues that crime results from the American cultural values of achievement, individualism, universalism and the fetishism of money. These values form the basis of the "American dream" ideology, in which economic success is of primary importance and supposed to be available universally. The American dream ideology purports that everyone has an opportunity for success, which exerts pressure on rich and poor individuals alike to make money, often by any means necessary. At the same time, the ability for non-economic institutions (such as schools, families, churches, etc.) to exert social control is undermined by the dominance of the economic institution, thus enabling criminality. Notably, a competitive school environment where individual achievement is stressed has been found to promote aggressive behavior (West 1975).

Institutional anomie theory (Messner and Rosenfeld 1994) can help explain school violence by pointing out how the economic institution has devalued and penetrated the educational institution, which has in turn made accommodations for the economy. Standards-based education reform (such as the No Child Left Behind Act of 2001) can be seen as a way in which the educational institution has been undermined by the economy- in the interest of enhancing human capital to create a desirable workforce, standards of education have been increasingly stressed. The emphasis on standardized testing undermines the traditional social control found in schools, fostered by teacher-student and teacher-parent-student relationships. Rather than democratic principles of pragmatism that informed education policy in the 1930's,

which was concerned with educating a holistic, moral individual (see Hickman and Alexander 1998), education increasingly serves the interests of the economy rather than individuals. Now the teacher has less control over students in the classroom.

In cross-national studies of adult violence outside of the school context, Institutional Anomie is rarely tested in the manner initially theorized by Messner and Rosenfeld (1994; 2001), but a related theoretical concept has emerged- social support. Since according to Institutional Anomie Theory, the strength of non-economic pro-social institutions (i.e. schools, families, etc.) should buffer the relationship between inequality and violence, the conceptualization of "social support" has emerged to enable researchers to measure the cohesion of non-economic groups. Where social support is higher, rates of violence are lower. In cross-national homicide studies, social support is generally conceptualized as the level of social cohesion in a social aggregate, typically as shared values and the willingness to aid others (see Pridemore and Trent 2010). It is measured numerous ways- often as welfare provisions provided by the government, the cohesion of communities, neighborhoods, and kinship networks, and has found empirical support in cross-national studies of adult violence (Altheimer 2008; Pampel and Gartner 1995; Pratt and Godsey 2002; 2003; Messner and Rosenfeld 1997).

In the present study, since the aggregate groups under investigation are schools and nations- school and national-level measures of support for the institutions of education and the family may be particularly relevant to the investigation of school violence. Macro-level strain/anomie theories (Merton 1938; Messner and Rosenfeld 1994) can add to the study of school violence. Students cross-nationally may be more likely to experience strain due to a disjunction between culturally valued goals and institutionalized means for achieving those goals (Merton 1938), mainly due to the increasing emphasis placed on standardized achievement

scores and devaluation of non-economic institutions. In addition, it is important to consider social support, and support for the institutions of education and the family in particular, may relate to school violence.

Resource Deprivation Theories

Relative Deprivation

Studies of school violence using TIMSS 1995 data linked math achievement score variation to cross-national differences in levels of school violence (Akiba et al. 2002; Baker et al. 2005). In other words, inequalities in the educational system were found to be predictive of school violence at the national level. Theoretically, this links resource deprivation to school violence. This is not surprising considering cross-national studies of adult violence have consistently found national-level measures of absolute and relative resource deprivation to be predictive of cross-national differences in homicide rates (Pridemore and Trent 2010).

Relative deprivation is usually measured by the Gini coefficient as income inequality within nations and is the most consistent predictor of adult homicide rates at the national level (Pridemore and Trent 2010). Numerous studies have found a significant positive relationship between the Gini coefficient and cross-national homicide rates (Cole and Gramjo 2009; Stamatel 2009; Bjerregaard and Cochran 2008a, 2008b; Jacobs and Richardson 2008; Lin 2007; Chamlin and Cochran 2006; Lim, Bond and Bond 2005; Van Wilsem 2004; Fajnzylber et al. 2002; Lederman et al. 2002; Messner, Raffalovich and Shrok 2002; Gartner 1990; Messner 1989, 1985, 1980; Kick and LaFree 1985; Avison and Loring 1986; Krahn, Hartnagel and Gartrell 1986; LaFree and Kick 1986; Hansmann and Quigley 1982; Braithwaite and Braithwaite 1980; Krohn 1976). Additional measures of relative deprivation have also been found to significantly predict cross-national homicide rates. For example, the ratio of income of the richest to poorest

20 percent (Altheimer 2008; Pratt and Godsey 2002; 2003), the percentage of the nation's wealth held by the richest 20 percent (Lee and Bankston 1999; Lee 2001) and the ratio of income of the richest 10 percent to the poorest 20 percent of nations' populations (Neapolitan 1994; 1996) all significantly predict cross-national homicide rates.

The link between macro-level economic inequalities and micro-level acts of violence has been theorized in terms of social psychological frustration-aggression dynamics (Agnew 1999; Hansmann and Quigley 1982; Messner 1989). That is, economic inequality leads some individuals to experience poverty in comparison to the relative privileges of others. This macro-level inequality causes frustration and a sense of injustice that leads to aggressive and violent behavior at the micro-level. However, Chamlin and Cochran (2005) argued that theories of economic inequality such as relative deprivation theory are reductionist, offering social-psychological explanations for macro-social phenomenon.

At the school level, math achievement score variation represents the existence of wide variation between high and low scoring students. Thus it is a school-level measure of relative deprivation. The relationship between school-level inequalities and violence is particularly important to study. The famous "Coleman Study," conducted in the U.S. in 1966 in response to the Civil Rights Act of 1964 found persistent inequalities in educational opportunities along lines of social class, race, religion and national origin (Coleman 1966). Subsequent research has confirmed glaring inequities in education in the U.S. (i.e. Kozol 1991), so it is important to determine the effect of educational inequalities on levels of school violence.

Absolute Deprivation

It is unclear in the literature whether the cross-national effects of economic inequality on the homicide rate are due to relative or absolute deprivation. Compared to studies of relative

deprivation theory, relatively few researchers have examined the effects of poverty, or absolute deprivation, on rates of violence. Those that have either found a positive relationship (Conklin and Simpson 1985; Jacobs and Richardson 2008; Pridemore 2008; Wolf 1971) or relationships that were not statistically significant (Cole and Gramajo 2009; Groves et al. 1985; Lee and Bankston 1999). Recent studies have shown that model misspecification and the failure to control for poverty in cross-national studies of homicide rates could render the relationship between relative deprivation and national levels of violent crime spurious (Paré and Felson 2010; Pridemore 2010; 2008). Since poverty is an aspect of social disorganization theory, I consider it as a measure of absolute deprivation simultaneously in my hypotheses.

An Integrated Macro-Level Theory of School Violence

In the present study I test the applicability of macro-level theories to school violence cross-nationally using a two-level multi-level linear analysis of schools within nations. Since I am not using individual-level data, I am not testing micro-level theoretical explanations of violence. Rather than focusing on the characteristics of individual students who commit acts of violence, I am testing the effects of school and national-level characteristics on the level of violence within schools.

Social disorganization and macro-level anomie/strain theories need to be integrated to explain school violence. Following to the basic tenets of social disorganization theory, I would expect violence to be highest in schools with limited resources (i.e. poverty), and high levels of heterogeneity. Schools with these characteristics would theoretically develop a competing value system wherein violence is valued as a way to solve problems and interact. This theoretical relationship can exist at the national level as well, drawing on cross-national research that has

tested the effects of absolute deprivation, or poverty, on adult homicide rates (Pridemore 2008; 2010; Pridemore and Trent 2010).

Merton's (1938) strain theory can be applied to school violence as well. According to this perspective, when the means to attain a socially valued goal, such as making money, or, more applicable to the school setting, getting good grades or high scores on standardized tests, are blocked, violence can occur. Again, schools that lack resources result in blocked opportunities for conventional success, leading to strain and the potential for higher levels of violence. In addition, schools that have a high degree of variation between high and low scoring students, a school-level measure of relative deprivation, may indicate that the avenues for academic success are blocked for some students, leading to higher levels of strain and violence. Measures of relative deprivation at the national level may be indicative of Merton's (1938) concept of strain, explaining levels of school violence at the national level as well.

Institutional anomie theory asserts than an over-emphasis on economic goals at the macro-level undermines the ability of normative social institutions such as families and schools to enact social control and prevent violence. In the school context this means that schools that place a high level of importance on standardized testing, which is increasingly a tool that functions to determine students' future economic success will exhibit higher levels of violence due to traditional forms of social control being undermined. In a context where economic goals are emphasized to the exclusion of traditional values of courtesy and respect, violence is more likely. Since standardized testing is being instituted in education systems worldwide, one can argue that this indicates the valuing of an economic goal; to what degree standardized test scores predict violence at the school and national levels is an empirical question that I address in the present study. To determine the strength of the institutions of education and the family, I

include measures of the national divorce rates and educational expenditures as a percent of GDP. Where divorce rates are low and educational expenditures are high, there should be lower levels of institutional anomie and thus lower levels of violence. Conversely, nations characterized by high divorce rates and low education expenditures should have more school violence since these non-economic institutions are weakened, and indicate lower levels of social support.

Taken together, measures of social disorganization and strain/anomie theories, including standardized test scores, seem to offer the best explanation for school violence in a global context.

Hypotheses

Based on the research presented in Chapter 2 and the theoretical perspectives presented above, I hypothesize the following relationships between variables will predict school violence measured three different ways, as principals' reports of violence, and students' reports of physical and emotional victimization. I organize the following hypotheses by level (school and national) and by theory. Measures of social disorganization theory in this data address the theoretical constructs of poverty, heterogeneity and mobility. Absolute deprivation theory is primarily concerned with measuring poverty, and since poverty is a major facet of social disorganization theory, hypotheses about poverty are included under social disorganization. Strain and institutionalized anomie theories are concerned with opportunities to achieve economic success and inequality as strain. Since relative deprivation theory addresses the link between inequality as a source of strain and violence, I include measures of relative deprivation under the heading of strain/anomie theories. Hypotheses for covariates of age and gender composition of the school and interaction effects are included separately. See Appendix C for a table mapping the correspondence between theories, constructs and variables.

I hypothesize that an interaction effect between GDP per capita and math achievement scores will be negatively related to the level of violence in schools cross-nationally. This is because nations with higher GDP's and lower math achievement scores would exhibit institutional anomie and strain, which have been linked to violence. However, this is largely exploratory, and a positive interaction effect between GDP per capita and math achievement, where both covariates are negative may indicate lower levels of social support, and thus higher levels of violence.

School-level measures of social disorganization[2]

H_{1a} Larger schools will have higher levels of violence.

H_{1b} Schools with larger eighth grade sizes will have higher levels of violence.

H_{1c} Schools with a larger percent of low SES students will have higher levels of violence.

H_{1d} Schools with a larger percent of students who do not speak the native language will have higher levels of violence.

H_{1e} Schools located in larger sized cities will have higher levels of violence.

National-level measures of social disorganization[3]

H_{2a} Schools in nations with larger mean school sizes will have higher levels of violence.

H_{2b} Schools in nations with larger mean eighth grade sizes will have higher levels of violence.

H_{2c} Schools in nations with larger mean percentages of low SES students will have higher levels of violence.

H_{2d} Schools in nations with larger mean percentages of students who do not speak the native language will have higher levels of violence.

H_{2e} Schools in nations in which schools are, on average, located in larger sized cities will have higher levels of violence.

[2] Including measures of absolute deprivation (i.e. poverty)
[3] Including measures of absolute deprivation (i.e. poverty).

H_{2f} Schools in nations with a higher percent of international migrants will have higher levels of violence.

H_{2g} Schools in nations with lower GDP per capita will have higher levels of violence.

H_{2h} Schools in nations with lower adult literacy rates will have higher levels of violence.

H_{2i} Schools in nations with higher GDP growth rates will have higher levels of violence.

School-level measures of institutional anomie and strain[4]

H_{3a} Schools that track students by math ability will have higher levels of violence.

H_{3b} Schools with lower mean math achievement scores will have higher levels of violence.

H_{3c} Schools with higher math achievement standard deviations will have higher levels of violence.

National-level measures of institutional anomie and strain[5]

H_{4a} Schools in nations that contain a higher mean of schools that track students by math ability will have higher levels of violence.

H_{4b} Schools in nations with lower mean math achievement scores will have higher levels of violence.

H_{4c} Schools in nations with higher mean math achievement standard deviations will have higher levels of violence.

H_{4d} Schools in nations with a higher ratio of income inequality, measured by the Gini coefficient, will have higher levels of violence.

H_{4e} Schools in nations with higher divorce rates will have higher levels of violence.

H_{4f} Schools in nations with lower education expenditures as a percent of GDP will have higher levels of violence.

School-level Covariates

H_{5a} Schools with a larger percent of female students will have lower levels of violence.

[4] Including measures of relative deprivation as strain.
[5] Including measures of relative deprivation as strain.

H_{5b} Schools with a lower mean age of eighth grade students will have higher levels of violence.

National-level Covariates

H_{6a} Schools in nations with higher homicide rates will have higher levels of violence.

H_{6b} Schools in nations with a larger percent of female students will have lower levels of violence.

H_{6c} Schools in nations with a lower mean age of eighth grade students will have higher levels of violence.

Interaction effects

H_{7a} Schools in nations with lower mean math achievement scores and higher GDP per capita will have higher levels of violence.

CHAPTER 4: Methods

Data and Sample

I will conduct a 2-level cross-sectional organizational study of school violence using hierarchical linear modeling to analyze data derived from the 2007 Trends in International Mathematics and Science Study (TIMSS) of eighth graders, augmented with national-level data from the United Nations Human Development Report 2007-2008, UN Demographic Yearbook (2008), CIA World Factbook (2010) and World Health Organization 2007 Mortality Database. The level-1 unit in my analysis is schools, and level-2 units are nations.

The TIMSS 2007 was sponsored by the International Association for the Evaluation of Educational Achievement (IEA) to measure trends in fourth and eighth grade students' achievement in math and science in 58 countries. Data is collected from students, teachers and school principals to allow cross-national comparison of educational contexts, and includes information on the level of school violence (TIMSS User Guide 2007). The present study uses eighth grade data only, as students age 12-14 are more likely to be victims of violence than students in other age groups (DeVoe et al. 2004), and this age group is typically associated with the eighth grade in many countries.

Each participating nation was responsible for carrying out the TIMSS survey using a 2-stage sampling design. The first stage consisted of a probability-proportionate-to-size (PPS) sample of schools selected from a sampling frame of all schools in which most of the students in the targeted grade level were enrolled. The second stage sampled up to 2 mathematics classes per school with an equal probability of selection. All students in the sampled classrooms were included in the study. The questionnaires used in this study were designed to be comparable across nations, including achievement score tests and background information. Two U.S. states,

Massachusetts and Minnesota opted to be treated as nations in the sampling design. These states are considered separately, although national-level predictors based on data for the entire United States are used in this study. Similarly, Canada sampled Ontario, Quebec and British Colombia separately as "nation-units." Again, national-level predictors for these three nation-units are based on data for Canada as a whole.

In addition, the TIMSS developed sampling weights to adjust for disproportionate sampling of subgroups and to facilitate cross-national comparisons (Joncas 2007, TIMSS Technical Report). TIMSS data is collected using nationally representative random stratified samples of seventh and eighth grade students in 58 countries. The present study utilizes a sample of 36 to 39 nation-units which includes all nations that report on school violence and those for which there are both TIMSS and augmented national-level data available. For a list of nations that are included in the analysis, see Appendix A.

In the present study I aggregate students' data on age, gender, reported physical and emotional victimization and math achievement to the school level. I weighted students' data by calculating the relative students' weight before aggregating to the school level. To weight students' data, I first calculated the students' weight by dividing the total student weight (TOTWGT), which sums to the national population, by the school weight (SCHWGT), designed for use in school-level analyses[6]. These weight variables are provided in the TIMSS data. I then calculated the relative student weight by dividing the students' weight by the mean of students' weight[7]. Using the relative student weight, I aggregated student data to the school level. I use the school weight variable (SCHWGT) provided by the TIMSS to weight schools to calculate the

[6] TOTWGT/SCHWGT = Students' weight

[7] Students' weight/Mean of Students' weight= Relative student weight. The mean of students' weight was 4.922.

relative school weight by dividing SCHWGT by its mean[8] in order to aggregate school-level data to the nation-level, and to weight school-level data for univariate and bivariate statistics.

Analytic Strategy

In this study I use hierarchical linear modeling (HLM), or multi-level modeling, to examine the relationship between variables testing social disorganization, strain/anomie and resource deprivation theories and school violence. Multi-level analysis is necessary for a cross-national study of school violence because most previous studies of this kind, including those that have analyzed prior iterations of the TIMSS data have used standard regression analyses (i.e. Akiba et al. 2002; Yu 2003), which leads to inaccuracies in estimation and an impoverished conceptualization of the theory (Hox 2002). Surveys that employ a multistage sampling design where the probability of selection depends on membership in one or more groups are inherently nested (Raudenbush and Bryk 2002). The TIMSS (2007) is nested data that contains information collected at the student and school levels, so HLM is a preferable analytic strategy.

In the present study I analyze schools nested in nations, augmenting the TIMSS with national-level predictor variables. The dependent variables, measures of school violence, are measured at the school level and are constructed from aggregated student-level data. Predictor variables including students' age, gender and math achievement scores are aggregated from weighted students' scores to the school level as well. I conduct a 2-level HLM analysis because I am testing macro-level criminological theories of violence[9].

In this section I will first discuss why HLM is preferred over standard linear regression analysis for nested data. The main reasons are a reduction in aggregation bias, misestimated

[8] The mean of the SCHWGT variable was 38.0052 in Analysis 1 and 34.4322 in Analyses 2 and 3.
[9] In the future I will conduct 3-level analyses of students within schools within nations, which would provide a higher level of precision, without relying on aggregated data.

precision and heterogeneity of regression (Raudenbush and Bryk 2002; Hox 2002). Then I will discuss the results of the fully unconditional models with one-way ANOVAs with random effects (Raudenbush and Bryk 2002), and how the intra-class correlations for the present study are calculated and interpreted. Next I will discuss the logic and equations of HLM using a hypothetical example based on the hypotheses put forth in the present study. Finally, I will briefly discuss "centering," and how I plan to build models in my analysis of school violence.

Hierarchical Linear Modeling is used to analyze data that has a nested structure. Nested data structures contain 2 or more units of analysis in the same set, in the present study, school-level data and national-level data. Analysis of such a nested data structure should take into account the fact that schools within the same nation may share commonalities compared to schools in other nations. Traditionally researchers analyzing nested, or hierarchical, data structures ignore the nesting and conduct regression analyses at higher levels with aggregated data, or at lower levels by disaggregating, assigning higher level data to lower level units (Raudenbush and Bryk 2002; Hox 2002).

HLM is preferable over standard regression analysis for nested data because ignoring the hierarchical structure of data leads to aggregation bias, misestimated precision and heterogeneity of regression. Aggregation bias or the "ecological fallacy" is the assumption that phenomena and processes at one level of analysis are the same as the phenomena at a higher, or aggregated, level. Because ordinary least squares regression analysis does not take into account hierarchical data structures, researchers employing this method with nested data run the risk of aggregation bias when interpreting their models. Ignoring multiple levels of hierarchically structured data also leads to misestimated analytic precision. Standard regression analyses of nested data underestimate standard error, exaggerate degrees of freedom, estimate unrealistically narrow

confidence intervals and increase the likelihood of making a Type I error, or rejecting the null hypothesis when it is true. In addition, heterogeneity of regression occurs when the relationship between individual schools' characteristics and outcomes vary across nations. HLM enables researchers to estimate a separate set of regression coefficients for each organizational unit (i.e. schools and nations), and then to model variation among the schools in their sets of coefficients as multivariate outcomes to be explained by organizational factors at each level of analysis (Raudenbush and Bryk 2002; Hox 2002). Finally, I note that the estimation method employed in the HLM software is Restricted Maximum Likelihood estimation rather than Full Maximum Likelihood estimation[10].

To determine if HLM is necessary for my data, I ran a fully unconditional model or one-way ANOVA with random effects on each of the three dependent variables[11], represented by the equation:

$$Y_{ij} = \gamma_{00} + u_{0j} + r_{ij} \qquad (4\text{-}1)$$

The grand mean for school violence is represented as $\gamma_{00.}$ The level-2, or national-level effect, is represented as $u_{0j,}$ and the school-level (level-1) effect is represented by $r_{ij.}$ A one-way ANOVA with random effects is the simplest possible hierarchical linear model (Raudenbush and Bryk 2002). It produces a point estimate and confidence interval for the grand mean, $\gamma_{00,}$ and provides information about the outcome variability at each of the 2 levels. The goal of the one-way

[10] The HLM program uses RML by default, but the program enables the user to change the estimation settings, to FML for example, which may be used for conducting the Likelihood Ratio Test. In the present study I use Full Maximum Likelihood Estimation to perform the deviance test (see Chapter 5).

[11] The level-1 model for the one-way ANOVA with random effects can be represented by the equation $Y_{ij}= \beta_{0j} + r_{ij}$ where Y_{ij} represents a measure of school violence. This model predicts the outcome, Y_{ij}, within each level-1 unit (school) with just one level-2 parameter, the intercept, β_{0j} (which is the mean outcome for the *j*th nation). The level-2 model for the one-way ANOVA is $\beta_{0j} = \gamma_{00}+\mu_{0j}$ where γ_{00} represents the grand-mean outcome in the population of nations, and μ_{0j} is the random effect associated with nation *j* and is assumed to have a mean of 0 and variance τ_{00}. The combined one-way ANOVA model, then, is $Y_{ij}= \gamma_{00}+\mu_{0j} + r_{ij}$ with the grand mean $\gamma_{00,}$ level-2, or national-level effect $\mu_{0j,}$ and school-level (level-1) effect, $r_{ij.}$

ANOVA in HLM is to determine if there is significant cross-national variation in the distribution of school violence. The intra-class correlations (ICC) of the dependent variables, calculated from the variance components estimated in the one-way ANOVA models,[12] can be interpreted in two ways. First, the ICC can be interpreted as a correlation between schools within nations, indicating the dependency of the school level data, (i.e. that schools in the same nations share similar characteristics). Second, the ICC can indicate the percent of the score variance in the measures of school violence that lies between nations. The intra-class correlations for the 3 dependent variables in the present study, presented in Table 1, show there is indeed significant cross-national variation in school violence and dependence across schools within nations. Thirty one to forty one percent of the score variance in my measures of school violence lies between nations[13]. The results of the unconditional model indicate HLM is indeed necessary to analyze this hierarchically structured data.

Hierarchical linear models combine regression analyses at multiple levels. To understand the logic of HLM, I will explain how it differs from standard regression analysis. Hypothetically, I want to test the relationship between mean math achievement score, one of the key school-level independent variables of interest, and a school-level outcome variable, the level of violence. To test the hypothesis that lower math achievement scores predict higher levels of violence, and assuming that there is a linear relationship between these two variables, the relationship would be represented by a straight line with intercept β_0 and slope β_1. The regression equation for this example is:

$$Y_i = \beta_0 + \beta_1 X_i + r_i \qquad (4\text{-}2)$$

[12] The intra-class correlation coefficients are derived from the formula $\rho = \tau_{00}/(\tau_{00}+\sigma^2)$ where the σ^2 parameter represents the within-nation variability, and τ_{00} represents the between-nation variability. See Chapter 5 for how each ICC was calculated in the present study.

[13] Intra-class correlation values are reported in Table 1

Where Y_i is the level of school violence, X_i is the predictor variable, mean math achievement score, and the error term, r_i represents the unique effect associated with school *i*. This equation tells us about the relationship between schools' math achievement scores and level of violence within one nation, but I can consider separate regressions for two (or more) hypothetical nations. That is, I can examine the relationship between schools' math achievement scores and levels of violence in *J* nations.

The relationship between schools' math achievement scores and level of violence can be examined within a population of nations. First, consider the relationship within any given nation, *j,* which can be represented by the School Level (Level-1) equation:

$$Y_{ij} = \beta_{0j} + \beta_{1j}(X_{ij} - \overline{X}_{.j}) + r_{ij} \qquad (4\text{-}3)$$

Where X is the group (nation) mean of the school mean math achievement. The choice of group mean centering was made so that I can explore the contextual (i.e. nation-level) effects. The intercept and slope, now subscripted by *j*, allows each nation to have a unique intercept and slope. Consider a national-level predictor variable, W_j, say "tracking," where a value of 1 indicates all the schools in the nation track students by math ability and 0 indicates that none of the schools do[14]. Now I can test two hypothetical hypotheses: 1) W_j is positively related to the outcome, β_{0j}, where the intercept of the linear relationship between math achievement scores and level of school violence (i.e. nations that track students by math ability have higher levels of school violence within schools with lower math achievement scores) and 2) W_j is positively related to the slope, $\beta_{1j,}$ meaning the effects of math achievement on violence are larger in

[14] This hypothetical variable is being used as an example and is not the actual interpretation of the "tracking" variable included in my actual analysis. In the hypothetical example, for ease of explanation, "tracking" is a level-2 indicator ("dummy") variable, whereas the "tracking" variable in the analysis in the present study is a continuous variable representing the percent of sampled schools in the nation that report tracking students by math ability (See Chapter 4: Level-2 Independent Variables).

nations that track students by math ability. These 2 hypotheses can be represented in the following national-level (Level-2) regression equations:

$$\begin{aligned} B_{0j} &= \gamma_{00} + \gamma_{01} W_j + u_{0j}, \\ \beta_{1j} &= \gamma_{10} + \gamma_{11} + W_j + u_{1j} \end{aligned} \qquad (4\text{-}4)$$

Where γ_{00} is the mean level of violence for nations that do not track by math ability, γ_{01} is the mean difference in level of violence between nations that track and do not track, γ_{10} is the average math achievement score-violence slope in nations that do not track, and γ_{11} is the mean difference in math achievement score-violence slopes between nations that do and do not track. The values of u_{0j} and u_{1j} are the unique effects of nation *j* on mean level of violence holding W_j constant, and the unique effect of nation *j* on the math achievement score-violence slope holding W_j constant, respectively[15].

The school-level (level-1) equation and national-level (level-2) equations can be combined into a single prediction equation for the school-level outcome, Y_{ij}, or level of school violence. The combined equation, where the level-1 units are schools and the level-2 units are nations, is:

$$Y_{ij} = \gamma_{00} + \gamma_{01} W_j + \gamma_{10}(X_{ij} - \overline{X}_{.j}) + \gamma_{11}(X_{ij} - \overline{X}_{.j}) + u_{0j} + u_{1j}(X_{ij} - \overline{X}_{.j}) + r_{ij} \qquad (4\text{-}5)$$

The errors r_{ij} are the level-1 random effects and the errors u_{0j} and u_{1j} are the level-2 random effects. The β in the level-1 model are level-1 coefficients and the γs are the level-2 coefficients. Given a single level-1 predictor, X_{ij}, and a single level-2 predictor, W_j, the combined equation provides the simplest example of a full hierarchical linear model.

[15] The values of μ_{0j} and μ_{1j} are assumed to be random variables with zero means, variances τ_{00} and τ_{11}, respectively, and covariance τ_{01}. The variance-covariance components are residual, meaning they represent the variability in β_{0j} and β_{1j} remaining after controlling for W_j.

The combined equations for a hypothetical hierarchical linear model with a single level-1 predictor, X_{ij}, and a single level-2 predictor, W_j can be summarized as follows:

School-Level Model (Level-1):

$$Y_{ij} = \beta_{0j} + \beta_{1j}(X_{ij} - \overline{X}_{.j}) + r_{ij} \tag{4-6}$$

Nation-Level Model (Level-2):

$$\begin{aligned} B_{0j} &= \gamma_{00} + \gamma_{01}W_j + u_{0j}, \\ \beta_{1j} &= \gamma_{10} + \gamma_{11} + W_j + u_{1j} \end{aligned} \tag{4-7}$$

Single Equation (Combined):

$$Y_{ij} = \gamma_{00} + \gamma_{01}W_j + \gamma_{10}(X_{ij} - \overline{X}_{.j}) + \gamma_{11}(X_{ij} - \overline{X}_{.j}) + u_{0j} + u_{1j}(X_{ij} - \overline{X}_{.j}) + r_{ij} \tag{4-8}$$

It is important to "center" predictor variables in multi-level analyses. Basically, centering controls the placement of zero along a metric so that the zero-value is meaningful, for example, representing the mean of the variable. In multi-level analytic methods such as hierarchical linear modeling, centering controls the interpretation of β_{0j} (the expected value for the intercept, within nation *j*), adjusts β_{0j} for differences in level-1 characteristics between groups, maintains orthogonality between level-1 and level-2 models and reduces multicollinearity between level-1 and level-2 variables as well as cross-level interactions (Raudenbush and Bryk 2002). Both level-1 and level-2 variables may be centered, but only level-1 centering has significant consequences for modeling and interpretation, which I will discuss shortly.

There are three options with regard to centering independent variables in hierarchical linear models; 1) the variable can be left uncentered, 2) group-mean centering (X_{ij}-$\overline{X}_{.j}$) whereby

the group mean (i.e. school-level mean) of the independent variable is subtracted from the raw score, and 3) grand-mean centering (X_{ij}-$\bar{X}$ ..) where the grand, overall, mean of the independent variable is subtracted from the raw score. Group-mean centering is generally used if researchers are interested in differentiating the within- and between- relationship (i.e. within and between nations). In the present study, generally, group-mean centering is used at level-1 to differentiate between within-nation and between-nation effects (Raudenbush and Bryk 2002). Grand-mean centering is used for level-2 variables, unless otherwise specified.

I build hierarchical linear models to test my hypotheses by adding each level-1 independent variable, one at a time, to a random-coefficients regression model for each of the three analyses of school violence. Then, I add each level-2 independent variable to a means-as-outcomes regression model. The final model for each of the three analyses is determined based on the results of random-coefficients and means-as-outcome models testing the independent variables' significance, effect size and portion of the level-2 variance in the dependent variables that is explained.

Dependent Variables

I will build three hierarchical linear models testing three different outcome variables measured at and/or aggregated to the school level. The dependent variable that is used in Analysis 1, "School Violence Scale," is measured at the school level and is indicative of school principals' reports on violence. The "School Violence Scale" is measured at the school level and is constructed using 5 items asked of school principals, how often does each of the following problem behaviors occur among eighth-grade students in your school: (1) classroom disturbance, (2) intimidation or verbal abuse of other students, (3) physical injury to other students, (4) intimidation or verbal abuse of teachers or staff and (5) physical injury to teachers

or staff. Responses were coded as follows: Never=0, Rarely=1, Monthly=2, Weekly=3, Daily=4. The weighted schools' scale scores range from 0 to 20 with a mean of 3.30 among N=5150 schools in J=39 nations. The weighted Crohnbach's alpha for the scale is .781[16]. The weighted intra-class correlation for this measure of violence is .31; meaning that schools within a nation have a .31 correlation for this measure and that 31 percent of the variance in violence can be explained by national-level differences[17]. In multi-level analysis, intra-class correlations commonly fall between .05 and .20 (Snijders and Bosker 1999: 46); the cross-national variation in the dependent variables in the present study are extremely high.

It is important to note that this measure of school violence may be inaccurate. Social desirability bias is well-known in the social sciences (see Fisher 1993) and could apply to school principals, particularly since this cross-national study uses data collected in many different cultures. Principals may try to hide the true amount of violence that goes on in their school. Attempting to avoid social stigma for reporting inappropriately high levels of violence, they may underestimate the true amount of violence going on in the school. Cultural differences in social desirability may be particularly important in this cross-national study.

In addition, principals' reports of school violence may not provide an accurate depiction of the actual frequency of violent incidents in schools because violence, particularly among students, may not be reported to school principals. When examining Figure 1 in the Appendix, the rank ordering of national means of the "School Violence Scale "measure, one can also question the degree to which "school violence" itself may be a Western construct. Perhaps in Western nations principals are more likely to report higher frequencies of violence in their schools because it is socially acceptable to do so; the concept of school violence has been on the

[16] I weighted the schools using the *relative school weight* before determining the Crohnbach's alpha for the scale items.

"radar-screen" among educators and policymakers in Western nations, particularly the United States, since the 1970's.

Because the United States does ask students to report their victimization in the 2007 TIMSS three nation categories (United States, Massachusetts and Minnesota) and the schools within them are excluded from Analyses 2 and 3, which will examine the predictors of physical and emotional victimization characteristic of bullying as reported by students, aggregated to the school level in 4885 schools in 36 nations.

Analysis 2, "Students' Reports of Physical Victimization," tests the effects of the independent variables on students' reports of physical violent victimization aggregated to the school level; in other words, the percent of students in the school that reported yes (coded as 1; no = 0) to the following question, "I was hit or hurt by other students(s) (for example shoving, hitting, kicking)" in school in the past month. Schools' scores for this item ranged from 0 to .90, with a mean of .21 in N=4885 schools in J=36 nations. The weighted intra-class correlation for this measure of physical violence is .40, which, again, is extremely high (Snijders and Bosker 1999). Again, the United States, including Massachusetts and Minnesota did not include victimization items in the student questionnaires so the United States was excluded from analysis in Analyses 2 and 3.

Analysis 3, "Students' Reports of Emotional Victimization," tests the effects of the independent variables on students' reports of emotional violent victimization aggregated to the school level. This item asked students to respond to "I was made fun of or called names," in school in the past month (yes coded as 1, no as 0). This item was aggregated to the school level using the relative students' weight, ranges from 0 to .90 and has a mean of .26 in N=4885 schools in J=36 nations. The weighted intra-class correlation for this measure of emotional

violence is .41, again, extremely high (Snijders and Bosker 1999). See Figures 1 through 3 in the appendix for the national means of each violence measure listed by nation, rank-ordered from highest to lowest scores.

[TABLE 1 ABOUT HERE]

Independent Variables

Predictor variables are measured and/or aggregated at the school (level-1) and national (level-2) levels. Analyses 1, 2, and 3 will test the effects of the same school and national-level predictor variables on school violence measured three different ways, but because Analyses 2 and 3 exclude the United States from the analysis descriptive statistics for the independent variables are provided separately.

Analysis 1: What predicts principals' reports of school violence?

Level-1 Independent Variables

To test the effects of social disorganization on school violence, I include the following school-level predictor variables, all of which are measured at the school level, reported by schools' principals: school size, eighth grade size, the estimated percent of students from a low SES background, the estimated degree of language heterogeneity and the estimated size of the city or town in which the school is located. These are measures of social disorganization because they measure the constructs of poverty, heterogeneity, and mobility, which Shaw and McKay (1942) considered central structural characteristics of ecological units that lead to social disorganization (see Appendix C). In addition, measures of poverty test absolute deprivation theory.

Both school size, which ranges from 9 to 5184, and eighth grade size, which ranges from 1 to 1034, are continuous variables. Eighth grade size indicates the entire size of the eighth

grade in the school, not the class size of the eighth graders sampled. These two variables (school and eighth grade size) are highly positively skewed (with skewness statistics of 3.038 and 2.575 respectively in Analysis 1 and 3.133 and 2.677 in Analyses 2 and 3). I take the natural log of these variables to reduce the effects of their skewed distributions in the analysis. I hypothesize that schools with larger school and eighth grade sizes will have higher levels of violence. School and eighth grade size can be conceptualized similarly to population size, which is a significant predictor of the homicide rate in the U.S. (e.g. Land, McCall and Cohen 1990), and cross-nationally (see Pridemore and Trent 2010). Larger population sizes can lead to a greater division among groups, resulting in the breakdown of social control (Durkheim 1893; Messner 1982). Larger school and grade sizes, like highly mobile neighborhoods, may exhibit higher levels of violence due to the difficulty in establishing effective relational networks, resulting in the breakdown of informal social control (i.e. Bursik and Grasmick 1993).

The school's "percent low SES" is estimated by the principal in response to the question, "approximately what percentage of students in your school come from economically disadvantaged homes?" and is coded as follows: 0=0-10%, 1=11-25%, 2=26-50%, 3=greater than 50%. Although this is an indirect measure based on principals' estimates instead of direct data about the income of the students' families, it is the best measure to approximate the socioeconomic composition of schools that is available in the TIMSS 2007 data. This data limitation is largely due to the TIMSS being a large cross-national study. This measure will test social disorganization theory as well as absolute deprivation theory since it is an estimate of the composition of "economically disadvantaged" students.

The school's "language heterogeneity" is also measured at the school level; principals' responded to the question "approximately what percentage of students in your school have [the

language of the test] as their native language?" coded 0=More than 90%, 1=76-90%, 2=50-75%, 3=Less than 50%. This item is coded so that a higher score indicates greater the language heterogeneity in the school. According to social disorganization theory and the empirical findings of cross-national homicide studies (i.e. Avison and Loring 1986; Pratt and Godsey 2002; 2003), I hypothesize that higher levels of heterogeneity will predict higher levels of school violence.

The "city size" of the school's location is determined by principals' responses to "how many people live in the city, town, or area where your school is located?" coded -2=3,000 people or fewer, -1=3,001 to 15,000 people, 0=15,001-50,000 people, 1=50,001 to 100,000 people, 2=100,001 to 500,000 people, 3=More than 500,000 people. This variable was coded to "center" on a mid-size town, with smaller, more remote towns coded as negative and larger cities coded as positive. Land, McCall and Cohen (1990) found that population size directly affected homicide rates in the U.S. both over time and across units of analysis. Likewise, cross-national studies of homicide rates have found a significant positive relationship with population size (Conklin and Simpson 1985; Huang 2001), density (Neumayer 2003), and urbanization (Pratt and Godsey 2003), so I hypothesize that schools in larger cities will have higher levels of school violence.

To test the effects of institutional anomie and social support theories, I include the following level-1 predictor variables: tracking, math achievement mean and math achievement standard deviation. Tracking is measured at the school level as the principals' response to the question, "Are eighth grade students in your school grouped by ability for their mathematics classes?" Yes is coded as 1 and no=0. I hypothesize tracking will predict higher levels of school violence because it can be considered a measure of blocked opportunity for academic achievement. This is because students who are tracked into low-ability classes have fewer

opportunities to learn math (i.e. Lucas 2001; Oakes et al. 1990).

The schools' mean math achievement is aggregated to the school level from students' weighted scores, taken as the average of 5 plausible values for the math achievement test. The plausible values represent multiple imputations of students' achievement because students receive samples of questions rather than the same version of the test. As a result, a range of scores, or "plausible values," are calculated, and are considered better estimates of students' abilities, allowing researchers to employ a standardized technique for studying students' achievement using complex sample designs by facilitating the computation of standard errors. Taking the mean of plausible values is common in education research (see Wu 2005).

I hypothesize that schools with lower mean math achievement scores will have higher levels of violence because prior research has shown that students with poor grades are more likely to be delinquent (Kirk 2009; Payne 2008). According to strain theory, if academic achievement is considered the normative goal of education, then schools that have lower achieving students may exhibit higher levels of violence.

Math achievement standard deviation is a measure of the variation in math achievement at the school level, taken as the standard deviation of the students' aggregated math achievement scores. This is a measure of relative deprivation because it measures the variation within a school among students' math achievement scores: the larger the standard deviation, the greater the difference between the lowest-scoring and highest-scoring students. Schools that have a larger gap between high and low scoring students are expected to have higher levels of violence because relative deprivation has been linked to violence in studies of adult violence (see Pridemore and Trent 2010; Cole and Gramjo 2009; Stamatel 2009).

Furthermore, tracking, math achievement and the standard deviation of math achievement

within schools can illustrate the concept of social support. In cross-national homicide studies, social support is generally conceptualized as the level of social cohesion in a social aggregate, typically as shared values and the willingness to aid others (see Pridemore and Trent 2010). It is measured numerous ways- often as welfare provisions provided by the government, the cohesion of communities, neighborhoods, and kinship networks. In the present study, since the aggregate groups under investigation are schools and nations- schools that track students by math ability can be conceptualized as low in social support, particularly for low achieving students. Schools with low math achievement scores and schools with high math achievement standard deviations can be conceptualized as low in social support as well. Social support has been linked to students' math achievement in a relatively recent study of Chicago Public Schools using hierarchical linear modeling (Lee and Smith 1999), and numerous other studies link social support to student achievement more generally (i.e. Klem and Connell 2004; Becker and Luthar 2002; Lee and Wong 2004).

Students' age and gender are weighted and aggregated to the school-level as control variables. In the analysis, *mean age* indicates the mean age composition of the weighted eighth grade students sampled in the school, and *percent female* is the percent female composition of the weighted sampled students in the school. Aggregated to the national level these variables become "mean of mean age" and "mean percent female."

[TABLE 2 ABOUT HERE]

Level-2 Independent Variables

National-level predictor variables include Level 1 predictor variables aggregated from the school (weighted by *relative school weight*) to the national level. In addition, I include national-level measures of disorganization, institutional anomie and social support (see Appendix C)

taken from the United Nations Human Development Reports (2007/2008; 2009): the GINI coefficient, Gross Domestic Product (GDP) per capita, GDP growth rate, percent adult literacy, and, percent international migrants. Nations' divorce rates per 1,000 people and educational expenditures as a percent of the GDP were taken from the UN Demographic Yearbook (2008) and the CIA World Factbook (2010) respectively. The years for data recorded in the UN Human Development reports range from 2000-2009. I also include the year 2007 homicide rate per 100,000, to control for the nations' level of adult violence, taken from the World Health Organization Mortality Database. For a list of where each variable was obtained, see Appendix B.

The Gini coefficient is a measure of statistical dispersion of the inequality of income distribution within a nation, based on the Lorenz curve (see Firebaugh 1999). It is a ratio with values that can range between 0 and 1[18]. A Gini coefficient score of 0 would indicate perfect equality of income distribution (that is, everyone in the nation having the same income), and a score of 1 would indicate perfect inequality (that is, one person having all the income and everyone else having no income). The lower the Gini coefficient, the less income inequality exists in the nation (UN Human Development Report 2007/2008; 2009). The Gini coefficient scores for the 39 nations included in Analysis 1 and 36 nations included in Analyses 2 and 3 ranged from .25 to .61, with a mean of .38 in Analysis 1 and .37 in Analyses 2 and 3, and a standard deviation of .07 in all three analyses. As a measure of relative deprivation, I hypothesize

[18] As a ratio of the areas on the Lorenz curve, which graphically represents the proportion of the total income of the population (y axis) that is cumulatively earned by the bottom x% of the population. If the area between the line of perfect equality and the Lorenz curve is A, and the area under the Lorenz curve is B, then the Gini index is A/(A+B). Since A+B = 0.5, the Gini index, G = A/(0.5) = 2A = 1-2B.

that nations with higher Gini coefficients will have higher levels of school violence, consistent with the findings of major cross-national studies of homicide.

Gross Domestic Product (GDP) per capita is measured in U.S. dollars to allow for cross-national comparison and ranged from 646 to 49,622. I hypothesize that schools in nations with lower GDP's will have higher levels of violence, following the tradition of social disorganization testing the effects of poverty on violence.

GDP growth is measured as the annual percentage rate of growth of gross domestic product at market prices based on constant local currency. I hypothesize that schools in nations with higher GDP growth rates will have higher levels of violence, although GDP growth, when examined in cross-national homicide studies, has not been significant (Lim et al. 2005; Lin 2007), or has been negative in direction (Fajnzylber et al. 2002; Lederman et al. 2002; Messner et al. 2002). I consider GDP growth a measure of anomie, as high GDP growth rate can indicate rapidly changing social structures which can lead to a state of anomie, or normlessness due to the breakdown in consensus caused by social change (Durkheim 1893) wherein violence may become more acceptable.

The nations' adult literacy rate is measured as the percent of the population over ages 15 that are considered literate, and ranges from .56 to 1. A nation's percent adult literacy is an indicator of the degree to which a nation's population has access to quality education, and therefore can be considered a proxy measure of poverty. I hypothesize that schools in nations with lower adult literacy rates will have higher levels of violence because social disorganization and absolute deprivation theories predict that areas characterized by poverty will be more violent.

The percent international migrants is measured as the estimated number of international

migrants divided by the total population, expressed as a percentage, and is a measure of a social disorganization theory at the national level. This variable ranges from 0 to .42 with a mean of .1 and standard deviation of .12 among all the nations included in the sample in all three analyses. The percent of international migrants is not a direct measure of social disorganization; however, it is a reasonable proxy measure since immigration rates correlate with levels of social mobility and normative consensus (Hawdon 1996; Hawdon 2005), and according to social disorganization theory, a lack of normative consensus is a central cause of crime.

The divorce rate per 1,000 people was derived from the UN Demographic Yearbook (2008), and can be considered a measure of institutional anomie and social support. Divorce rates range from .40 to 4.50 with a mean of 1.75, and educational expenditures range from 2.64 to 7.96 percent with a mean of 4.76. A lower divorce rate indicates the strength of the institution of the family. The national divorce rate can be considered a measure of social support, as well, as it is a proxy measure of family cohesiveness. Nations with higher divorce rates have lower levels of social support. Land, McCall and Cohen (1990) found higher divorce rates significantly predicted homicide rates over time in the U.S. In cross-national studies, divorce rates have been found to be positively related to homicide (Bjerregaard and Cohchran 2008a; Pampel and Gartner 1995), although for the most part, when national divorce rates are included in cross-national homicide studies, it is not a significant predictor (Stamatel 2009; Bjerregard and Cochran 2008b; Krahn et al. 1986; Lim et al. 2005; Neapolitan 1998; Rosenfeld and Messner 1991). According to institutional anomie and social support theories, nations with higher divorce rates should exhibit higher levels of school violence.

Finally, the national level of education expenditures, the percentage of nations' GDP spent on education, taken from the CIA World Factbook, is a measure of institutional anomie and

social support. Nations with higher levels of institutional anomie and lower levels of social support should exhibit lower percentages of the GDP spent on education. Schools within such nations should exhibit higher levels of violence, since according to Institutional Anomie Theory the economy weakens non-economic institutions, inhibiting their ability to control the level of violence. In addition, nations that spend lower percentages of their GDP on education can be conceptualized as having lower levels of social support, as it indicates a lower level of national support for the institution of education.

[TABLE 3 ABOUT HERE]

Analyses 2 and 3: What predicts students' reports of physical and emotional victimization?

Because the United States, including Massachusetts and Minnesota were excluded from the analysis for analyses 2 and 3, there are slight differences in descriptive statistics for the independent variables at the school and national levels. The descriptive statistics for the independent variables used in constructing these models are included in Table 4 and Table 5.

[TABLE 4 ABOUT HERE]

[TABLE 5 ABOUT HERE]

See Appendix D for correlation matrices for the school level (total) and between nation correlations for all the variables included in this study. Separate matrices for Analysis 1 and Analyses 2 and 3 are provided. It is interesting to note that the "school violence scale" (principals' reports) do not correlate with students' reports of physical victimization, and have a weak positive correlation with emotional victimization in the school-level total correlation matrix for Analyses 2 and 3. At the national level, principals' reports of school violence do not statistically significantly correlate with students' reports of victimization for either measure.

Students' reports of victimization strongly correlate with each other at both the school and national levels.

CHAPTER 5: Results

To build a final hierarchical linear model (HLM) for each of the three measures of school violence used in this study, I employ a three-step process. First, each Level-1 predictor variable is added one at a time to a HLM random-slope regression model, allowing all level-1 coefficients to vary randomly, to test the effects of each variable on the measure of school violence. This is to determine if the predictor variable should be included in the final model, and if the coefficient should be specified as random or fixed. Then, each Level-2 predictor variable is added one at a time to a means-as-outcomes regression model. Finally, based on the significance tests, effect sizes and proportion of variance explained in the first two steps, a final model is built for each of the three outcome variables studied: principals' reports of school violence, students' reports of physical victimization, and students' reports of emotional victimization.

The hypotheses presented in Chapter 3 were constructed to enable building models using HLM by determining what covariates have a significant fixed effect (γ) and whether the level-1 covariates' slope significantly varies from nation to nation (τ_{00}). In addition, I report the effect sizes of each variable, the Level-1 pseudo-R^2 and Level-2 pseudo-R^2, along with the level-2 variance-covariance components, and both the results of univariate chi-square significance tests, and of multivariate deviance significance tests of the level-2 variance components' parameters.

In each Analysis, I first present the results of the unconditional one-way ANOVA model, which is represented by the following equations, in hierarchical form:

Level-1:

$$Y_{ij} = \beta_{0j} + r_{ij},\ r_{ij} \overset{i.i.d.}{\sim} N(0, \sigma^2) \qquad (5\text{-}1)$$

Level-2:

$$\beta_{0j} = \gamma_{00} + u_{0j} \quad u_{oj} \overset{i.i.d.}{\sim} N(0, \tau_{00}) \tag{5-2}$$

For the purpose of comparison, the fixed effects in the unconditional model, γ_{00}, are presented in the first row of the tables that depict results of level-1 random slopes models and level-2 means-as-outcome models, with the random effects and σ^2 (the variance of r_{ij}) and $\tau_{00,}$ the variance of u_{0j}. The unconditional model is used to determine the dependent variables' intra-class correlation, which can be interpreted as the correlation between schools within nations, and also as the percent of score variance in the measure of school violence that lies between nations[19]. All the analyses were conducted in HLM v.6 software (Raudenbush et al. 2004) using full maximum likelihood estimation. The analyses are weighted using the *"Relative School Weight"* variable derived from the school weight provided by the TIMSS. Additionally, level-1 variables are group-centered and level-2 variables are grand-mean centered.

Level-1 Predictors: Random-Slope Regression Models

The Level-1 random slope models can be represented by the following equations, where $(X_{ij} - \overline{X}_{.j})$ is a group-centered level-1 predictor variable.

Level-1:

$$Y_{ij} = \beta_{0j} + \beta_{1j}(X_{ij} - \overline{X}_{.j}) + r_{ij} \quad r_{ij} \overset{i.i.d.}{\sim} N(0, \sigma^2) \tag{5-3}$$

Level-2:

[19] The intra-class correlation = $\tau_{00}/ (\tau_{00}+ \sigma^2)$

$$\beta_{0j} = \gamma_{00} + u_{0j} \quad \begin{pmatrix} u_{0j} \\ u_{1j} \end{pmatrix} \overset{i.i.d.}{\sim} N\left[\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} \tau_{00}\tau_{01} \\ \tau_{10}\tau_{11} \end{pmatrix}\right] \qquad (5\text{-}4)$$
$$\beta_{1j} = \gamma_{10} + u_{1j}$$

Tables 6, 11, and 16, report the results of Level-1 random slope models, specifically, the γ_{00} and γ_{10} coefficients and standard errors, the σ^2 (variance of r_{ij}) in the level-1 equation, the τ_{00} estimate of u_{0j} variance, and the τ_{11} estimate of u_{1j} variance, and τ_{01} estimate of covariance between u_{0j} and u_{1j}, the results of univariate chi-square significance tests for the random effects part of the models as well as the results of the multivariate deviance test. The deviance test is used to compare the fit of the models with and without the random slope *u*.

I also calculate and report the measure of the effect size of each fixed effect of level-1 independent variable. Following Cohen (1988)'s definition of effect size as the mean difference between experimental and control groups in standard deviation units, i.e.:

$$d = \overline{Y}_E - \overline{Y}_C \,/\, SD_y \qquad (5\text{-}5)$$

And along with the idea of standardized coefficients in regression analysis, i.e.:

$$\beta = b(SD_x / SD_y), \qquad (5\text{-}6)$$

The effect size of Level-1 independent variables in random-slope regression models can be calculated as follows:

$$E.S. = \gamma_{10}(SD_x / SD_y) \ , \qquad (5\text{-}7)$$

The effect size is useful to determine the relative importance of the independent variables. Cohen (1988) defined a small effect as d=0.2, a medium effect as d=0.5 and a large effect as d=0.8, which I follow, to describe the size of the effect, as a convention.

In addition, as another measure of effect size, I report the level-1 pseudo-R^2, which is denoted as $R^2_{L\text{-}1,}$ which can be used to examine the proportion of reduction in variance at level-1. This is calculated by comparing the σ^2 estimates from the model that includes a predictor variable to the unconditional one-way random ANOVA model. The proportion of level-1 variance explained, or pseudo- R^2 is calculated as follows:

$$R^2_{L\text{-}1} = \left\{\sigma^2(randomANOVA) - \sigma^2(RandomCoefficientsModel)\right\} / \sigma^2(randomANOVA) \qquad (5\text{-}8)$$

The level-1 pseudo R^2 is useful to understand the proportion of additional level-1 variance explained by the random-slope regression models[20], although they do not reflect the true variance explained in the model and should be interpreted with caution.

Finally, I present the results of multivariate deviance significance test (i.e. the chi-square test on the deviance statistic) in the tables for the variance components. The deviance statistic indicates how well the model fits the data; models with a lower deviance fit better than models with a higher deviance. The deviance test uses a chi-square test to determine if the larger model, with the level-2 *u* included, is a statistically significantly better fit than the smaller model in nested models. The multivariate deviance test is used in addition to a univariate chi-square test to examine whether the impact of a level-1 predictor significantly varies across nations. That is, in the current study, the multivariate deviance test is used to test the null hypothesis, H_0: $\tau_{11}=0$ and $\tau_{01}=0$, whereas the univariate chi-square test only tests H_0: $\tau_{11}=0$. In other words, the multivariate deviance test examines whether the impact of level-1 predictors significantly varies across

20 For example, in Analysis 1, "Principals' Reports of School Violence," the σ^2 in the unconditional ANOVA model is 5.16. The σ^2 in the random-coefficients regression model for the predictor variable log of eighth grade size is 4.69. The pseudo R^2 is therefore .09. That is, $R^2_{L\text{-}}1$=5.16-4.69/5.16=.09.

nations by taking into account the correlation between u_{0j} and u_{1j}, whereas the univariate chi-square test does not.

Level-2 Predictors: Means-as-Outcomes Regression Models

Tables 7, 12, and 17, present the results of significance tests of level-2 predictors in means-as-outcomes regression models, the effect sizes and pseudo-R^2's of level-2 predictor variables and results of the deviance significance test. Again, the first row in the tables presents the results of the unconditional one-way random ANOVA model to facilitate comparison. The following equations are used to test the significance of level-2 predictors, where W_j represents a grand-mean centered level-2 predictor variable:

Level-1:

$$Y_{ij} = \beta_{0j} + r_{ij} \quad r_{ij} \overset{i.i.d.}{\sim} N(0, \sigma^2) \tag{5-9}$$

Level-2:

$$\beta_{0j} = \gamma_{00} + \gamma_{01} W_j + u_{0j} \quad u_{0j} \overset{i.i.d.}{\sim} N(0, \tau_{00}) \tag{5-10}$$

To calculate the effect size of level-2 variables, again following Cohen (1988)'s definition of effect size and the rationale of standardized regression coefficients, the effect size can be calculated as follows:

$$E.S. = \gamma_{01}(SD_w / SD_\beta) \tag{5-11}$$

Where SD_w is the standard deviation of the level-2 predictor W, and SD_β is the standard deviation of the level-1 random intercept β_{0j} in the unconditional model, as in Equations 5-1 and 5-2. That is, $SD_\beta = \sqrt{\tau_{00}}$.

The level-2 pseudo-R^2 is calculated by comparing the τ_{00} estimates across the unconditional one-way random ANOVA model and the means-as-outcomes regression models and estimates the proportion reduction in variance at level-2. The level-2 pseudo-R^2, denoted as $R^2_{L\text{-}2}$, is calculated as follows:

$$R^2{}_{L-2} = \{\tau_{00}(randomANOVA) - \tau_{00}(means-as-outcomes)\}/\tau_{00}(randomANOVA) \qquad (5\text{-}12)$$

Final Models

Tables 8, 13 and 18 present the results of the final models for each dependent variable. A general form of the final models presented in each analysis of school violence can be expressed in the following simplified equations:

School-Level Model (Level-1):

$$Y_{ij} = \beta_{0j} + \beta_{1j}(X_{ij} - \overline{X}_{.j}) + r_{ij} \quad r_{ij} \overset{i.i.d.}{\sim} N(0, \sigma^2) \qquad (5\text{-}13)$$

Nation-Level Model (Level-2):

$$\begin{aligned} \beta_{0j} &= \gamma_{00} + \gamma_{01}W_j + u_{0j} \quad \begin{pmatrix} u_{0j} \\ u_{1j} \end{pmatrix} \overset{i.i.d.}{\sim} N\left[\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} \tau_{00}\tau_{01} \\ \tau_{10}\tau_{11} \end{pmatrix}\right] \\ \beta_{1j} &= \gamma_{10} + \gamma_{11}W_j + u_{1j} \end{aligned} \qquad (5\text{-}14)$$

Single Equation (Combined):

$$Y_{ij} = \gamma_{00} + \gamma_{01}W_j + \gamma_{10}(X_{ij} - \overline{X}_{.j}) + \gamma_{11}(X_{ij} - \overline{X}_{.j}) + u_{0j} + u_{1j}(X_{ij} - \overline{X}_{.j}) + r_{ij} \qquad (5\text{-}15)$$

where X_{ij} is a level-1 predictor, W_j is a level-2 predictor, r_{ij} is the level-1 random effect, u_{0j} and u_{ij} are the level-2 random effects. It should be noted that the final model for each analysis has more than one level-1 and level-2 predictor variables, however. For each level-1 predictor variable, an equation is added to the level-2 model and the level-1 slopes are either fixed or random, depending on the results of the univariate chi-square and multivariate deviance tests for the model's variance components.

In addition to the general form of the final models and the principles to build the final model, the following particular steps were taken to reach the final models in the current study. That is, after I examined all candidates of level-1 predictors via "random-slope regression model", the level-1 predictors that exhibited the statistical significance at .05 level for either fixed effects or random effects parameters were all included in the level-1 model by letting all the slopes random simultaneously. This was done without including any predictors at level-2. Then, the saturated model was simplified by eliminating non-significant random and fixed effects parameters via deviance tests. After several cycles of this process, I finalized the level-1 model with information on each level-1 coefficient be either fixed or random. After finalizing the level-1 model, then I included the level-2 predictors, that were identified as statistically significant at .05 level via the "Means-as-Outcomes model", into the model for the level-1 intercept (β_{0j}) only and I did not attempt to model the level-1 slopes. This decision of model building principles was made mainly because of the focus of the current study, which is to identify the school and national level factors that predict school violence. That is, at the national level, the national average of school violence (β_{0j}) was the key dependent variable of interest that

is relevant to the research questions, and the level-1 slopes ((β_{qj}, q=1,2,…) were not of the focal dependent variables to be studied in depth. It should be noted, though, that leaving the significantly varying slopes in the model though they were not further modeled by the level-2 predictors, the modeling practice that was used in the current study to reach the final model, has an advantage over other more common ad hoc practices such as fixing either all or most of the slopes or eliminating the level-1 predictors whose fixed effects are non-significant but the random effects are significant, because it reduces the bias from the estimates, which are known to more likely occur with larger magnitudes in the common ad hoc practices mentioned above.

Analysis 1: What Predicts Principals' Reports of School Violence Cross-Nationally?

To build a final hierarchical linear model for "Analysis 1: Principals' Reports of School Violence," using the outcome variable "School Violence Scale," I first ran an unconditional one-way random ANOVA model. Then, I tested the hypotheses presented in Chapter 3 for each predictor variable. In the unconditional one-way random ANOVA model, the intra-class correlation for the outcome variable, "School Violence Scale," is .31; the σ^2 (variance of r_{ij}) is 5.16 and τ_{00} estimate of u_{0j} variance is 2.37[21]. This value of ICC=.31 is considered to be quite large. According to Snijders and Bosker 1999, intra-class correlations ranging from .05 to .20 are common in educational research (p. 46), and in a recent comprehensive study conducted by Hedges and Hedberg (2007), none of the intra-class correlations examined reached above .30. This intra-class correlation indicates that 31 percent of the variance in principals' reports of school violence lies across nations and is considered very high in multi-level analyses (Snijders and Bosker 1999).

[21] Intra-Class Correlation (ICC) = τ_{00}/ (τ_{00}+ σ^2) = 2.37/(2.37+5.16) = 2.37/7.53 = .31

Level-1 Predictor Variables

Table 6 presents the significance tests of level-1 predictors and their variability across nations. Each level-1 predictor in Analysis 1, "Principals' Reports of School Violence," has a statistically significant deviance test p-value <.05.

Hypotheses H1a through H1e test the effects of school-level measures of social disorganization and absolute deprivation (i.e. poverty) on the level of school violence. In Analysis 1, testing principals' reports of violence, hypotheses H1a and H1b were supported. Hypothesis H1a, that larger sized schools have higher levels of violence is supported; the natural log (base e) of the school size variable (Log_e School Size) has a statistically significant fixed effect γ_{10} and the slope varies significantly from nation to nation ($p<.01$). The school size variable (Log_e School Size) explains approximately 5 percent of the level-1 variance in principals' reports of school violence. Hypothesis H1b, that schools with larger eighth grade sizes will exhibit higher levels of violence is also supported (using the natural log, base e, of eighth grade size). The slope for this variable (Log_e Eighth Grade Size) also varies significantly from nation to nation ($p<.01$). Log_e Eighth Grade Size explains approximately 9 percent of the level-1 variance in principals' reports of school violence. The effect sizes of these two predictors, school size and eighth grade size are fairly small, however (.201 and .228, respectively).

Hypothesis H1c, that schools with a larger percent of low SES students will have higher levels of violence is not supported. The fixed effects of the percent low SES variable (Percent Low SES) are not statistically significant at the .05 level; however, the slope does vary significantly across nations ($p<.01$), and this variable accounts for approximately 4 percent of the level-1 variance in principals' reports of school violence. Hypothesis H1d, that schools with a

larger percent of students who do not speak the native language will have higher levels of violence is not supported; the fixed effects of the variable, Language Heterogeneity, are not statistically significant and the effect size is very small. The slope does vary significantly across nations ($p<.01$). Hypothesis H1e, that schools located in larger sized cities will have higher levels of violence is somewhat supported. The fixed effects of the "City Size" variable are close to statistically significant ($p=.065$), but the effect size is very small. The slope, however, does vary significantly across nations ($p<.01$).

Hypotheses H3a through H3c test the effects of school-level measures of institutional anomie, social support and relative deprivation. Hypothesis H3a, that schools that track students by math ability will have higher levels of violence, is not supported. The fixed effects of the variable, "Tracking," on principals' reports of school violence are not statistically significant and the effect size is very small. In addition, the direction of the relationship is negative. The slope of the "Tracking" variable, however, does vary significantly across nations ($p<.05$). Hypothesis H3b, that schools with lower mean math achievement scores will have higher levels of violence, is somewhat supported. The fixed effects of "Mean Math Achievement" are not statistically significant, but the effect size is notable (.140), and the slope varies across nations ($p<.01$). Further, this variable accounts for 4 percent of the level-1 variance. Hypothesis H3c, that schools with higher math achievement standard deviations (Math Achievement SD) will have higher levels of violence is not supported. The fixed effects are not statistically significant and the effect size is very small; the slope, however, does vary significantly across nations ($p<.01$).

Finally, hypotheses H5a and H5b test the effects of the covariates gender and the age composition of schools on the level of school violence. Hypothesis H5a is supported; schools with a larger percent of female students (Percent Female) have lower levels of violence. The

fixed effect is statistically significant (p=.013), although the effect size is considered very small (.087). The slope does not significantly vary across nations (p=.150) by the univariate chi-square test, but the multivariate deviance test indicates that it cannot be removed from the model (p=.019). This discrepancy illustrates the importance of examining both the univariate chi-square test and the multivariate deviance test. Hypothesis H5b, that schools with a lower mean age of eighth grade students will have higher levels of violence is not supported. The fixed effects of "Mean Age" are not statistically significant, the effect size is .100, and although the slope varies significantly across nations (p<.01), the direction of the relationship is positive, rather than negative as hypothesized.

[TABLE 6 ABOUT HERE]

Level-2 Predictor Variables

Table 7 presents the results of the means-as-outcomes regression models. Hypotheses H_{2a} through H_{2i}, presented in Chapter 3 test the relationship between national-level measures of social disorganization, poverty and school violence. Hypothesis H_{2a}, which asserts that nations with larger mean school sizes will have higher levels of violence, is somewhat supported. The fixed effect of the covariate, Mean Log_e School Size, is almost statistically significant (p=.06), and the effect size (.409) is almost moderate. Further, the level-2 school size variable explains approximately 21 percent of the level-2 variance, and the deviance test is statistically significant (p<.05). Hypothesis H2b, that schools in nations with larger mean eighth grade sizes will have higher levels of violence is somewhat supported. The fixed effects of the covariate, Mean Log_e Eighth Grade Size, are not statistically significant, but the effect size is moderate (.446). The log of the eighth grade size variable accounts for 14 percent of the level-2 variance by itself and the deviance test is statistically significant (p<.05).

Hypothesis H2c, that schools in nations with larger mean percentages of low SES students will have higher levels of violence is not supported. The fixed effect of the covariate Mean Percent Low SES is not statistically significant, and the direction of the relationship is negative, rather than positive, as hypothesized. The effect size (.327) is notable, the "Mean Percent Low SES" covariate explains 11 percent of the level-2 variance in principals' reports of school violence, and the deviance test is statistically significant ($p<.05$). Hypothesis H2d, that schools in nations with larger mean percentages of students who do not speak the native language will have higher levels of violence is not supported. The fixed effect of "Mean Language Heterogeneity" is not statistically significant, and again, the direction of the relationship is negative rather than positive as hypothesized. The effect size is moderate (.360) and the deviance test is statistically significant ($p<.05$). The "Mean Language Heterogeneity" variable accounts for approximately 12 percent of the cross-national variation in principals' reports of school violence, but, like "Mean Percent Low SES" the relationship is negative, not positive. Lower mean percent low SES students and lower levels of language heterogeneity account for higher levels of violence in this model, although the fixed effects are not statistically significant.

Hypothesis H2e, that schools in nations in which schools are, on average, located in larger sized cities will have higher levels of violence is not supported. The fixed effects of "Mean City Size" are not statistically significant, the effect size is fairly small and the deviance test is not statistically significant. Hypothesis H2f, that schools in nations with a higher percent of international migrants will have higher levels of violence is supported. The fixed effects of "Percent International Migrants" are statistically significant ($p=.014$), and the effect size is quite

large (.886). The nation-level percent international migrants accounts for approximately 25 percent of the level-2 variance.

Interestingly, Hypothesis H2g is not supported, although the GDP variable is a statistically significant predictor of principals' reports of school violence ($p<.01$) with a very large effect size (.930). Rather than lower GDP predicting higher levels of violence, higher GDP does. This variable accounts for 78.5 percent of the level-2 variance in principals' reports of school violence and the deviance test is statistically significant ($p<.01$). This is an important finding because poverty is a major predictor of adult violence cross-nationally (see Pridemore and Trent 2010). Principals' reports of school violence are higher in wealthier nations, perhaps because the problem of school violence is discussed more openly, or, principals' may consider the types of behaviors described in the 5-item scale differently due to cultural variations in the interpretation of "school violence" between nations with higher or lower GDP's.

Hypothesis H2h, that schools in nations with lower adult literacy rates will have higher levels of violence, is not supported. The fixed effects are not statistically significant, the effect size and level-2 pseudo-R^2 are small, and the deviance test is not statistically significant. In addition, the between Adult Literacy and principals' reports of school violence is positive, rather than negative as hypothesized. Hypothesis H2i, that schools in nations with higher GDP growth rates will have higher levels of violence is not supported; the fixed effects of the covariate "GDP Growth Rate" and deviance test are not statistically significant.

Hypotheses H4a through H4f test the effects of national-level measures of institutional anomie, social support, and relative deprivation on the level of school violence. Hypothesis H4a, that schools in nations that contain a higher mean of schools that track students by math ability

will have higher levels of violence, is not supported. The fixed effects and deviance test of the "Mean Tracking" variable are not statistically significant, although the effect size is small and noteworthy (.273) and the relationship is positive, as hypothesized. Hypothesis H4b, that schools in nations with lower mean math achievement scores will have higher levels of violence, is not supported; the fixed effect of the covariate "Mean of Mean Math Achievement" is almost statistically significant (p=.061), has a moderate effect size (.493) and accounts for approximately 22 percent of the level-2 variance in principals' reports of school violence. The deviance test is statistically significant as well (p<.01). However, the direction of the relationship is positive; that is, nations with higher mean math achievement scores have higher levels of principals' reports of school violence. Like the significant effect of GDP, this is an unexpected finding.

Hypothesis H4c, that schools in nations with higher math achievement standard deviations will have higher levels of violence is not supported. Although the fixed effects of the covariate, "Mean Math Achievement Standard Deviation" is almost statistically significant (p=.056), has a medium effect size (.440) and accounts for 15 percent of the level-2 variance in principals' reports of school violence, the γ_{01} coefficient is negative. That is, the lower the standard deviation in math achievement the higher the level of violence. This is interesting since past research on school violence using students' reports of victimization in the TIMSS 1995 found math achievement standard deviation (or, "Achievement Score Variation") to be a positive predictor (Akiba et al. 2002). Rather than wider variation in achievement scores predicting higher levels of principals' reports of violence, school-level homogeneity in achievement scores does. Both the present study and Akiba et al. (2002) found principals' reports of school violence do not correlate with students' reports, however.

Hypothesis H4d, that schools in nations with a higher Gini coefficient will have higher levels of violence is not supported. The fixed effects and deviance test for the covariate, "Gini Coefficient," are not statistically significant, and the effect size is small (.117). Hypothesis H4e, that schools in nations with higher divorce rates will have higher levels of violence is not supported. The fixed effects and deviance test for the covariate, "Divorce Rate," are not statistically significant. Hypothesis H4f, that schools in nations with lower educational expenditures as a percent of the national GDP will have higher levels of violence is not supported, but the "Educational Expenditures" variable is a statistically significant level-2 predictor ($p<.05$) with a large effect size (.769) that explains approximately 33 percent of the level-2 variance. That is, the higher the educational expenditures, the higher the amount of violence reported by principals; this refutes the theoretical argument of institutional anomie theory that weak non-economic institutions increase rates of violence. On the contrary, higher levels of educational spending predict higher levels of principals' reports of school violence. This could be due to greater awareness or salience of the concept of "school violence" among principals in nations where education is given a higher priority in terms of the percent of the nations' GDP spent on education.

Hypothesis H7a tests the assertion that schools in nations with lower mean math achievement scores and higher GDP per capita will have higher levels of violence is not supported in this analysis. When GDP (measured in thousand dollar units), Mean of Mean Math Achievement and the GDPxMath Achievement Interaction are included in a means-as-outcomes model, the effects of GDP are statistically significant ($p<.01$), Mean Math Achievement is almost statistically significant ($p=.063$) but the interaction effect is not ($p=.512$). Further, the interaction effect has a small effect size and the interaction effect means-as-outcomes model accounts for

less than 1 percent of the cross-national variance. The interaction effect GDP/Math Achievement will not be included in the final model.

Finally, hypotheses H6a through H6c test the effects of the national-level covariates homicide rates, gender and age on school violence. Hypothesis H6a, that schools in nations with higher homicide rates will have higher levels of violence is not supported. The fixed effect of the covariate, "Homicide Rate," is not statistically significant, nor is the deviance test, and the effect size of "Homicide Rate" on principals' reports of school violence is very small. Hypothesis H6b, that schools in nations with a larger percent of female students will have lower levels of violence is not supported. The fixed effects and deviance test are not statistically significant for the covariate "Mean Percent Female", although the effect size is small (.200), and it explains approximately 6 percent of the cross-national variance in principals' reports of school violence. The direction of the relationship is positive rather than negative, as hypothesized. That is, schools with a larger percent female composition have higher levels of principals' reports of school violence, although the effects are not statistically significant. Hypothesis H6c, that schools in nations with a lower mean age of students will have higher levels of violence is not supported. The fixed effects and deviance test for "Mean of Mean Age" are not statistically significant and the effect size and level-2 pseudo-R^2 are relatively small.

[TABLE 7 ABOUT HERE]

Final Model for Analysis 1, "Principals' Reports of School Violence"

I built the final model for this dependent variable based on the significance of the fixed effects of individual covariates at Level-1 and Level-2, their effect sizes, the amount of variance explained and the statistical significance of the univariate chi-square and multivariate deviance tests. Because this analysis is exploratory, and there is a lack of theoretical justification for

making a more precise model specification, I only model the level-1 intercept β_{0j} at level-2. Because the random effects for all the level-1 covariates were statistically significant in the random slope predictor models, each level-1 variable was added to the full level-1 model. When all variables are included, I removed the random effect, *u*, for the level-1 predictor "Percent Female" based on its chi-square p-value and deviance test. Although the random effect *u* is not statistically significant according to the chi-square p-value for the level-1 covariate Language Heterogeneity, the deviance test indicates that it must stay in the model.

In the Level-1 equation I include the following covariates: Log_e School Size, Log_e Eighth Grade Size, Percent Low SES, Language Heterogeneity, Tracking, City Size, Mean Math Achievement, Math Achievement Standard Deviation, Age, and Percent Female. In the Level-2 equation I include: Mean Log_e School Size, Mean of Mean Math Achievement, GDP Per Capita, and Educational Expenditures (as percent of the GDP). Using the likelihood ratio (deviance) test in addition to the univariate chi-square tests, I determine what fixed effects (γ) terms should be included, or dropped, from the final model, controlling for the other covariates.

The final model for Analysis 1, "Principals' Reports of School Violence," includes the following level-1 predictor variables' fixed effects (γ): Log_e Eighth Grade Size, Percent Low SES, Mean Math Achievement, and Percent Female. The following level-2 predictor variables are included: Log_e School Size, Mean of Mean Math Achievement, GDP Per Capita, and Educational Expenditures. This parsimonious model explains 18.4 percent of the level-1 variance in principals' reports of school violence, and 84.4 percent of the level-2 (cross-national) variance. The final model for Analysis 1, "Principals' Reports of School Violence," is represented by the following equations in hierarchical form:

School-Level Model (Level-1):

(5-16)

$$Y_{ij} = \beta_{0j} + \beta_{1j}(Log_e SchoolSize)_{ij} + \beta_{2j}(Log_e EighthGradeSize)_{ij} + \beta_{3j}(PercentLowSES)_{ij} + \beta_{4j}(LanguageHeterogeneity)_{ij} + \beta_{5j}(CitySize)_{ij} + \beta_{6j}(Tracking)_{ij} + \beta_{7j}(MeanMathAchievement)_{ij} + \beta_{8j}(MathAchievementSD)_{ij} + \beta_{9j}(PercentFemale)_{ij} + \beta_{10j}(Age)_{ij} + r_{ij}$$

Nation-Level Model (Level-2):

(5-17)

$$\beta_{0j} = \gamma_{00} + \gamma_{01}(Log_e SchoolSize)_j + \gamma_{02}(MeanofMeanMathAchievement)_j + \gamma_{03}(GDP)_j + \gamma_{04}(EducationalExpenditures)_j + u_{0j}$$
$$\beta_{1j} = u_{1j}$$
$$\beta_{2j} = \gamma_{20} + u_{2j}$$
$$\beta_{3j} = \gamma_{30} + u_{3j}$$
$$\beta_{4j} = u_{4j}$$
$$\beta_{5j} = u_{5j}$$
$$\beta_{6j} = u_{6j}$$
$$\beta_{7j} = \gamma_{70} + u_{7j}$$
$$\beta_{8j} = u_{8j}$$
$$\beta_{9j} = \gamma_{90}$$
$$\beta_{10j} = u_{10j}$$

[TABLE 8 ABOUT HERE]

To summarize, the following covariates have statistically significant level-1 fixed effects controlling for the other covariates in the model: Log_e Eighth Grade Size, Percent Low SES, Mean Math Achievement, and Percent Female. The level-1 fixed effects are all in the hypothesized directions for this model. The following level-1 covariates have statistically

significant random effects (i.e. randomly vary across nations): Log_e School Size, Log_e Eighth Grade Size, Percent Low SES, Language Heterogeneity, Tracking, City Size, Mean Math Achievement, Math Achievement Standard Deviation, and Age.

The following covariates are statistically significant level-2 predictors in the final model for Analysis 1: Mean Log_e School Size, Mean of Mean Math Achievement, GDP Per Capita and Educational Expenditures. Log_e School Size and Mean of Mean Math Achievement predict principals' reports of school violence in the hypothesized directions. Larger schools and schools with lower mean math achievement scores exhibit higher levels of violence reported by school principals.

GDP Per Capita and Educational Expenditures predict principals' reports of school violence in unexpected ways. Nations with higher GDP's and higher Educational Expenditures (as a percent of the nation's GDP) exhibit higher levels of violence. This could be because principals in nations with higher GDP's and nations that spend more money on education are more likely to report the behaviors in the outcome variable "School Violence Scale," (classroom disturbances, and intimidation and injury to students and teachers) occur more frequently because they are more likely to scrutinize the level of violence in their schools. In addition, principals' in higher GDP nations that spend more on education may be more likely to define the types of violence in the scale as problematic. This finding may also reflect cultural variations in the definition and reporting of forms of school violence.

Table 9 depicts the correlations among national effects for Analysis 1, Principals' Reports of School Violence. Table 10 summarizes the direction of the covariates' relationships to the dependent variable; whether the variable was included in the final model (/), with

significant fixed effects (F) and, for level-1 variables, with significant random effects (R), whether the hypothesized relationships were supported (Y), somewhat supported (S) or not supported (N), the results of univariate and multivariate significance tests in random slopes and means-as-outcomes models.

[TABLE 9 ABOUT HERE]

[TABLE 10 ABOUT HERE]

Analysis 2: What Predicts Students' Reports of Physical Victimization?

To build a final hierarchical linear model for "Analysis 2: Students' Reports of Physical Victimization," using the outcome variable "Students' Reports of Physical Victimization," I first ran an unconditional one-way random ANOVA model. Then, I tested the hypotheses presented in Chapter 3 for each predictor variable. In the unconditional one-way random ANOVA model, the intra-class correlation for the outcome variable, "Students Reports of Physical Victimization," is .40; the σ^2 (variance of r_{ij}) is .01577 and τ_{00} estimate of u_{0j} variance is .01049[22]. That is, 40 percent of the variance in students' reports of physical victimization lies across nations. Since most intra-class correlations in education research are between .05 and .20 this intra-class correlation is considered extremely high in multi-level analysis (see Snijders and Bosker 1999).

Level-1 Predictor Variables

Table 11 presents the significance tests of level-1 predictors and their variability across nations. Each level-1 predictor in Analysis 2, "Students' Reports of Physical Victimization," has a statistically significant deviance test p-value <.01 except for the "Language Heterogeneity"

[22] Intra-Class Correlation = $\tau_{00}/ (\tau_{00}+ \sigma^2)$ = .01049/(.01049+.01577)=.39946=.40

variable for which the slope does not significantly vary cross-nationally according to both multivariate deviance and univariate chi-square tests.

Hypotheses H1a through H1e test the effects of school-level measures of social disorganization and poverty on the level of school violence. In Analysis 2, testing students' reports of physical victimization, hypotheses H1a and H1b were not supported. Hypothesis H1a, that larger sized schools have higher levels of violence is not supported; the log of the school size variable (Log_e School Size) does not have a statistically significant fixed effect γ_{10}. The slope does vary significantly from nation to nation ($p<.01$). The effect size is very small and the school size variable explains only about 1.6 percent of the level-1 variance in students' reports of physical victimization. Hypothesis H1b, that schools with larger eighth grade sizes will exhibit higher levels of violence is also not supported; the fixed effect of the covariate Log_e Eighth Grade Size is not statistically significant and the effect size is very small. In addition, the direction of the relationship is negative rather than positive. The slope for this variable also varies significantly from nation to nation ($p<.01$). Log_e Eighth Grade Size explains approximately 1.6 percent of the level-1 variance in students' reports of physical victimization.

Hypothesis H1c, that schools with a larger percent of low SES students will have higher levels of violence is somewhat supported. The fixed effects of the "Percent Low SES" variable are close to statistical significance ($p=.076$); the slope does vary significantly across nations ($p<.01$). However, the "Percent Low SES" variable has a small effect size (.070) and only explains approximately 1 percent of the level-1 variance in students' reports of physical victimization. Hypothesis H1d, that schools with a larger percent of students who do not speak the native language will have higher levels of violence is not supported, although Language Heterogeneity is a significant predictor of students' reports of physical victimization. The fixed

effects of the covariate Language Heterogeneity are statistically significant ($p<.05$), although the effect size and pseudo-R^2 are very small. However, the fixed effects are in the opposite direction than hypothesized; the lower the language heterogeneity the higher the level of students' reports of physical victimization. The slope does not vary significantly across nations ($p>.500$). This is interesting because measures of heterogeneity are significant predictors of adult violence in the positive direction in cross-national studies of homicide (Avison and Loring 1986; Pratt and Godsey 2002; 2003). Hypothesis H1e, that schools located in larger sized cities will have higher levels of violence is not supported. The fixed effects of the "City Size" variable are not statistically significant and the effect size is very small. In addition, the direction of the relationship is negative, not positive as hypothesized, although the effects are not statistically significant. The slope, however, does vary significantly across nations ($p<.01$).

Hypotheses H3a through H3c test the effects of school-level measures of institutional anomie, social support, and relative deprivation. Hypothesis H3a, that schools that track students by math ability will have higher levels of violence, is not supported. The fixed effects of "Tracking" on students' reports of physical victimization are not statistically significant and the effect size is very small. The slope of the "tracking" variable does vary significantly across nations ($p<.01$), and it accounts for approximately 2.5 percent of the level-1 variance. However, the direction of the relationship is negative, rather than positive, as hypothesized. However, again, the fixed effects are not statistically significant. Hypothesis H3b, that schools with lower mean math achievement scores will have higher levels of violence, is somewhat supported. The fixed effects of "Mean Math Achievement" are close to being statistically significant ($p=.089$), the effect size is notable (.115), and the slope varies across nations ($p<.01$). Further, this variable accounts for about 2.5 percent of the level-1 variance. Hypothesis H3c, that schools with higher

math achievement standard deviations will have higher levels of violence is supported. The fixed effects of the covariate "Math Achievement Standard Deviation" are statistically significant ($p<.05$) and although the effect size is small (.096), the slope does vary significantly across nations ($p<.01$).

Finally, hypotheses H5a and H5b test the effects of the covariates of gender and the age composition of schools on the level of school violence. Hypothesis H5a, that schools with a larger percent of female students have lower levels of violence is somewhat supported. The fixed effect of "Percent Female" is not statistically significant and the effect size is considered very small (.071). However, the "Percent Female" variable accounts for approximately 5.6 percent of the level-1 variance, the largest level-1 pseudo-R^2 in Analysis 2, "Students' Reports of Physical Victimization." The slope significantly varies across nations ($p<.01$). Hypothesis H5b, that schools with a lower mean age of eighth grade students will have higher levels of violence is not supported. The fixed effects of the covariate "Mean Age" are not statistically significant; the effect size is very small (.096) but the slope varies significantly across nations ($p<.01$).

[TABLE 11 ABOUT HERE]

Level-2 Predictor Variables

Table 12 presents the results of the means-as-outcomes regression models. Hypotheses H_{2a} through H_{2i}, presented in Chapter 3 test the relationship between national-level measures of social disorganization, poverty and school violence. Hypothesis H_{2a}, which asserts that nations with larger mean school sizes will have higher levels of violence, is not supported. The fixed effect of the covariate, Mean Log_e School Size, is not statistically significant, and the effect size (.127) is small. Further, the relationship between school size and students' reports of

victimization is negative, rather than positive as hypothesized. Mean Log_e School Size only explains approximately 2 percent of the level-2 variance, and the deviance test is not statistically significant. Hypothesis H2b, that schools in nations with larger mean eighth grade sizes will have higher levels of violence is somewhat supported. The fixed effects are not statistically significant, but the effect size is between small and moderate (.367). The variable, Mean Log_e Eighth Grade Size, accounts for 9 percent of the level-2 variance by itself and the deviance test is almost statistically significant (p=.066).

Hypothesis H2c, that schools in nations with larger mean percentages of low SES students will have higher levels of violence is supported. The fixed effect of the covariate "Mean Percent Low SES" is statistically significant (p<.01), and the effect size (.657) is moderate. The level-2 "Mean Percent Low SES" variable explains approximately 46 percent of the level-2 variance in students' reports of physical victimization, and the deviance test is statistically significant (p<.01). Hypothesis H2d, that schools in nations with larger mean percentages of students who do not speak the native language will have higher levels of violence is supported. The fixed effect of the covariate "Mean Language Heterogeneity" is statistically significant (p<.05), the effect size is moderate (.608) and the deviance test is statistically significant (p<.01). The "Mean Language Heterogeneity" variable accounts for approximately 32 percent of the cross-national variation in students' reports of physical victimization.

Hypothesis H2e, that schools in nations in which schools are, on average, located in larger sized cities will have higher levels of violence is not supported. The fixed effects of "Mean City Size" are not statistically significant, although the effect size is notable (.378); the deviance test is not statistically significant, however. The level-2 Mean City Size variable accounts for only 7.5 percent of the level-2 variance. Hypothesis H2f, that schools in nations

with a higher percent of international migrants will have higher levels of violence is not supported. The fixed effects of the covariate, "Percent International Migrants" are close to statistically significant (p=.059), and the effect size is moderate (.676), but the direction of the relationship is negative, not positive as hypothesized. That is, the lower the national percent of international migrants, the greater the students' reports of physical victimization. The nation-level "Percent International Migrants," accounts for approximately 13 percent of the level-2 variance.

Hypothesis H2g, that schools in nations with lower GDP's will have higher levels of violence is supported. GDP is a statistically significant predictor of students' reports of physical victimization ($p<.05$) with a moderate effect size (.625). Unlike in analysis 1 examining principals' reports of school violence, low GDP predicts higher levels of school violence measured as students' reports of physical victimization, as hypothesized. The GDP variable accounts for 15 percent of the level-2 variance and the deviance test is statistically significant ($p<.05$). Hypothesis H2h, that schools in nations with lower adult literacy rates will have higher levels of violence, is not supported. The fixed effects are not statistically significant, the effect size is fairly small (.300), the level-2 pseudo-R^2 is small (.075), and the deviance test is not statistically significant. Hypothesis H2i, that schools in nations with higher GDP growth rates will have higher levels of violence is somewhat supported. The fixed effects are not statistically significant, although the deviance test approaches significance (p=.069). The effect size of the "GDP growth" variable is moderate, however, (.518), and explains approximately 9 percent of the level-2 variance.

Hypotheses H4a through H4f test the effects of national-level measures of institutional anomie, social support, and relative deprivation on students' reports of physical victimization.

Hypothesis H4a, that schools in nations that contain a higher mean of schools that track students by math ability will have higher levels of violence, is not supported. The fixed effects and deviance test of the "Mean Tracking" variable are not statistically significant, although the effect size is between small and moderate (.334). The direction of the relationship between the "Mean Tracking" variable and students' reports of physical victimization is negative, however. That is, nations with a lower mean of schools that track students by math ability exhibit higher levels of violence, although the relationship is not statistically significant. Hypothesis H4b, that schools in nations with lower mean math achievement scores will have higher levels of violence, is supported; the fixed effect of the covariate "Mean of Mean Math Achievement" is statistically significant ($p<.05$), has a moderate effect size (.664) and accounts for approximately 35 percent of the level-2 variance in students' reports of physical victimization. The deviance test is statistically significant as well ($p<.01$). Hypothesis H4c, that schools in nations with higher math achievement standard deviations will have higher levels of violence is not supported. The fixed effects of the covariate, "Mean Math Achievement Standard Deviation" are not statistically significant, it has a small effect size (.341) and accounts for only 8 percent of the level-2 variance in students' reports of physical victimization. Furthermore, the γ_{01} coefficient is negative.

Hypothesis H4d, that schools in nations with a higher Gini coefficient will have higher levels of violence is not supported. The fixed effects and deviance test are not statistically significant, and the effect size is small (.164). Hypothesis H4e, that schools in nations with higher divorce rates will have higher levels of violence is not supported. The fixed effects of the "Divorce Rate" variable are almost statistically significant ($p=.076$), and the effect size is small but notable (.384), and the deviance test is statistically significant ($p<.01$). However, the

direction of the fixed effect is negative; that is, schools in nations with lower divorce rates have higher levels of students' reports of physical victimization. The divorce rate accounts for 29 percent of the level-2 variance in this analysis. Hypothesis H4f, schools in nations with lower educational expenditures as a percent of the national GDP will have higher levels of violence, is not supported. The fixed effects and deviance test are not statistically significant, although the relationship is in the hypothesized direction. The effect size of the covariate, "Educational Expenditures" is small but notable (.342). Educational expenditures account for approximately 6 percent of the level-2 variance in students' reports of physical victimization.

Hypothesis H7a tests the assertion that schools in nations with lower mean math achievement scores and higher GDP per capita will have higher levels of violence is not supported in this analysis. When GDP (measured in thousand dollar units), Mean of Mean Math Achievement and the GDP/Math Achievement Interaction are included in a means-as-outcomes model, the effects of GDP are almost statistically significant ($p=.086$), Mean Math Achievement is not statistically significant ($p=.886$) but the interaction effect is ($p<.05$). The interaction effect is positive, however. The gamma coefficients for the independent effects of GDP and Math Achievement are both negative, indicating that the effect of low math achievement scores in nations with low GDP on students' reports of physical victimization are magnified. Rather than schools in nations with low achievement scores and high GDP's exhibiting higher levels of violence, the effects of poverty and low achievement interact at the national level significantly affecting the level of students' reports of physical victimization. In the interaction effect means-as-outcomes model, the GDP x Math Achievement interaction has a moderate effect size, accounting for an approximately 42 percent reduction of the cross-national variance in student reports of physical victimization.

Finally, hypotheses H6a through H6c test the effects of the national-level covariates Homicide Rate, Mean Percent Female and Mean Age on school violence. Hypothesis H6a, that schools in nations with higher homicide rates will have higher levels of violence is not supported. The fixed effect is not statistically significant, but the deviance test is ($p<.05$), and the effect size of "Homicide Rate" on students' reports of physical victimization is notable (.341). The direction of the relationship between nations' homicide rate and students' reports of physical victimization is negative, however. That is, the lower the homicide rate, the greater the students' reports of physical victimization. One would expect levels of school violence to be higher in nations with higher levels of adult violence (i.e. homicide), but this is not the case in this analysis.

Hypothesis H6b, that schools in nations with a larger mean percent of female students will have lower levels of violence is supported. The fixed effects of "Mean Percent Female" are close to statistical significance ($p=.063$), and the deviance test is statistically significant ($p<.01$); the effect size is moderate (.537), and it explains approximately 19 percent of the cross-national variance in students' reports of physical victimization. Hypothesis H6c, that schools in nations with a lower mean age of students will have higher levels of violence is not supported. The fixed effects and deviance test of the covariate, "Mean of Mean Age" are not statistically significant and the effect size and level-2 pseudo-R^2 are relatively small. In addition, the direction of the relationship is positive, meaning that rather than a younger mean age of students, an older mean age predicts higher levels of violence. This could be because older eighth grade students may be more likely to exhibit problem behaviors, for instance, behaviors that led the students to have to repeat the eighth grade, including violent behaviors.

[TABLE 12 ABOUT HERE]

Final Model for Analysis 2, "Students' Reports of Physical Victimization"

I built the final model for this dependent variable based on the significance of the fixed effects of individual covariates at Level-1 and Level-2, their effect sizes, the amount of variance explained and the statistical significance of the univariate chi-square and multivariate deviance tests. Because this analysis is exploratory, and there is a lack of theoretical justification for making a more precise model specification, I only model the level-1 intercept β_{0j} at level-2.

Because the random effects for all the level-1 covariates were statistically significant in the random slope predictor models, with the exception of the Language Heterogeneity covariate, each level-1 variable was added to the full level-1 model. When all variables are included, I removed the random effect, *u*, for the level-1 predictors "Log_e Eighth Grade Size" "Math Achievement Standard Deviation," and "Language Heterogeneity," based on the results of the chi-square p-value and deviance test. The following level-1 covariates' random effects are included in the final model: Log_e School Size, Percent Low SES, City Size, Tracking, Mean Math Achievement, Percent Female and Mean Age.

When all variables are included in the model, the fixed effects of the following level-1 variables are significant and must be included in the model based on the results of not only the univariate chi-square test, but the multivariate deviance test: Log_e Eighth Grade Size, Percent Low SES, Language Heterogeneity, Tracking, Mean Math Achievement, Math Achievement Standard Deviation, Percent Female and Mean Age. In the Level-2 equation I include Mean Language Heterogeneity, Mean of Mean Math Achievement, Homicide Rate, and Mean Percent Female.

The final model for Analysis 2, "Students' Reports of Physical Victimization," explains approximately 19 percent of the level-1 variance in students' reports of physical victimization,

and 52 percent of the level-2 (cross-national) variance. As in the final model for Analysis 1, more variance is explained at the cross-national than at the school level. The final model for Analysis 2, "Students' Reports of Physical Victimization," is represented by the following equations in hierarchical form:

School-Level Model (Level-1):

(5-18)

$$Y_{ij} = \beta_{0j} + \beta_{1j}(Log_e SchoolSize)_{ij} + \beta_{2j}(Log_e EighthGradeSize)_{ij} + \beta_{3j}(PercentLowSES)_{ij} + \beta_{4j}(LanguageHeterogeneity)_{ij} + \beta_{5j}(CitySize)_{ij} + \beta_{6j}(Tracking)_{ij} + \beta_{7j}(MeanMathAchievement)_{ij} + \beta_{8j}(MathAchievementSD)_{ij} + \beta_{9j}(PercentFemale)_{ij} + \beta_{10j}(Age)_{ij} + r_{ij}$$

Nation-Level Model (Level-2):

(5-19)

$$\beta_{0j} = \gamma_{00} + \gamma_{01}(MeanLanguageHeterogeneity)_j + \gamma_{02}(MeanofMeanMathAchievement)_j + \gamma_{03}(HomicideRate)_j + \gamma_{04}(MeanPercentFemale)_j + u_{0j}$$
$$\beta_{1j} = u_{1j}$$
$$\beta_{2j} = \gamma_{20}$$
$$\beta_{3j} = \gamma_{30} + u_{3j}$$
$$\beta_{4j} = \gamma_{40}$$
$$\beta_{5j} = u_{5j}$$
$$\beta_{6j} = \gamma_{60} + u_{6j}$$
$$\beta_{7j} = \gamma_{70} + u_{7j}$$
$$\beta_{8j} = \gamma_{80}$$
$$\beta_{9j} = \gamma_{90} + u_{9j}$$
$$\beta_{10j} = \gamma_{100} + u_{10j}$$

[TABLE 13 ABOUT HERE]

The final model for Analysis 2, "Students' Reports of Physical Victimization," exhibits some expected as well as some surprising results. As hypothesized, Math Achievement Standard Deviation significantly predicts students' reports of physical victimization at the school level. That is, higher gaps between high and low scoring students within schools leads to higher levels of violence. Math Achievement, Percent Female, Mean Age, and Percent Low SES are all significant predictors in the hypothesized directions.

However, some level-1 covariates included in the final model are not significant predictors in the hypothesized direction. Language Heterogeneity, has a negative, rather than a positive relationship, contradictory to the hypothesized relationship, and the tenets of social disorganization theory. That is, schools with lower levels of heterogeneity (measured as the estimated percent of the student body of the school that does not speak the native language) exhibit higher levels of violence. Lower levels of "tracking" at the school level also predict higher levels of violence, which is also surprising. Finally, smaller eighth grade class sizes predict higher levels of students' reports of victimization. Table 14 displays the correlations among national effects for level-1 covariates.

[TABLE 14 ABOUT HERE]

The level-2 predictors, Mean of Mean Math Achievement and Mean Percent Female, in the final model for the analysis of students' reports of physical victimization, predict the level of violence as hypothesized. Schools in nations that contain schools with lower mean math achievement scores and lower percent females exhibit higher levels of violence. Interestingly, Homicide Rate and Language Heterogeneity are significant predictors in the negative direction. That is, nations with lower homicide rates and with schools with lower levels of language

heterogeneity exhibit higher levels of physical victimization reported by students. That low homicide rates at the national level and lower levels of language heterogeneity at the school and national levels significantly predict higher levels of students' reports of physical victimization is extremely interesting. However, the Homicide Rate covariate has a much smaller effect on students' reports of victimizations controlling for other covariates than in the means-as-outcomes model.

Since math achievement standard deviation, which can be conceptualized as educational inequality, at the school level, and low mean math achievement and higher mean percent low SES students at the national level predict higher levels of violence in this model as well, this indicates there may be a need to extend disorganization and institutional anomie theories to account for school violence. That is, rather than poverty or inequality predicting school violence alone, it seems that in this analysis there may be an effect of what I will call "poverty and inequality in the context of homogeneity," at least with regard to the composition of the school that speaks the native language, and with lower levels of tracking students by math ability. I will discuss this concept further in Chapter 6.

Table 15 summarizes the direction of the covariates' relationships to the dependent variable; whether the variable was included in the final model (/), with significant fixed effects (F) and, for level-1 variables, with significant random effects (R), whether the hypothesized relationships were supported (Y), somewhat supported (S) or not supported (N), the results of univariate and multivariate significance tests.

[TABLE 15 ABOUT HERE]

Analysis 3: What Predicts Students' Reports of Emotional Victimization?

To build a final hierarchical linear model for "Analysis 3: Students' Reports of Emotional Victimization," using the outcome variable "Emotional Victimization," I first ran an unconditional one-way random ANOVA model. Then, I tested the hypotheses presented in Chapter 3 for each predictor variable. The intra-class correlation for the outcome variable, "Students Reports of Emotional Victimization," is .41; the σ^2 (variance of r_{ij}) is .02003 and τ_{00} estimate of u_{0j} variance is .01365[23]. This indicates that 41 percent of the variance in students' reports of emotional victimization lies across nations, and again, this intra-class correlation is considered extremely high in multi-level analysis (i.e. see Snijders and Bosker 1999).

Level-1 Predictor Variables

Table 16 presents the significance tests of level-1 predictors and their variability across nations. Each level-1 predictor in Analysis 3, "Students' Reports of Emotional Victimization," has a statistically significant deviance test p-value <.05 except for "Percent Low SES," and "City Size."

Hypotheses H1a through H1e test the effects of school-level measures of social disorganization and poverty on the level of school violence. In Analysis 3, testing students' reports of emotional victimization, hypotheses H1a and H1b were not supported. Hypothesis H1a, that larger sized schools have higher levels of violence is not supported; the Log_e School Size variable does not have a statistically significant fixed effect γ_{10}. The univariate chi-square test is almost significant (p=.062), but the multivariate deviance test is statistically significant (p<.01), indicating that the random slope for this variable should be kept in the model. The effect size is very small, however, and the Log_e School Size variable explains less than one

[23] Intra-Class Correlation = $\tau_{00}/ (\tau_{00}+ \sigma^2)$ = .01365/(.01365+.02003)=.40528=.41

percent of the level-1 variance in students' reports of emotional victimization. Hypothesis H1b, that schools with larger eighth grade sizes will exhibit higher levels of violence is also not supported; the fixed effect of the covariate, Log_e Eighth Grade Size is not statistically significant, is negative rather than positive in direction, and the effect size is very small. The slope for this variable varies significantly from nation to nation ($p<.05$). Log_e Eighth Grade Size only explains less than one percent of the level-1 variance in students' reports of emotional victimization.

Hypothesis H1c, that schools with a larger percent of low SES students will have higher levels of violence is not supported. The fixed effects of the "Percent Low SES" variable are not statistically significant. The slope does not vary significantly across nations ($p>.500$). Not only does this variable have a very small effect size, it accounts for almost no level-1 variance, and the deviance test was not statistically significant. Hypothesis H1d, that schools with a larger percent of students who do not speak the native language will have higher levels of violence is not supported; the fixed effects of the covariate "Language Heterogeneity" are not statistically significant, and the effect size and pseudo-R^2 are very small. Further, the direction of the relationship is negative, not positive, as hypothesized. That is, similar to the findings in Analysis 2, "Students' Reports of Physical Victimization," the lower the language heterogeneity the higher the level of students' reports of emotional victimization. The slope does vary significantly across nations ($p<.01$). Hypothesis H1e, that schools located in larger sized cities will have higher levels of violence is not supported. The fixed effects of the "City Size" variable are not statistically significant, the effect size and pseudo-R^2 are very small and the deviance test is not statistically significant. Like Language Heterogeneity, the direction is negative. Smaller sized cities exhibit higher levels of violence, although the fixed effects are not statistically significant. In addition, the slope does not vary significantly across nations ($p=.178$).

Hypotheses H3a through H3c test the effects of school-level measures of institutional anomie, social support and relative deprivation. Hypothesis H3a, that schools that track students by math ability will have higher levels of violence, is not supported. The fixed effects of "Tracking" on students' reports of emotional victimization are not statistically significant and the effect size is very small. The slope of the "Tracking" variable does vary significantly across nations ($p<.01$), and it accounts for approximately 3.6 percent of the level-1 variance. However, the direction of the relationship between "Tracking" and students' reports of emotional victimization is negative, rather than positive as hypothesized. Hypothesis H3b, that schools with lower mean math achievement scores will have higher levels of violence, is not supported. The fixed effects of "Mean Math Achievement" are not statistically significant, and the effect size is very small. In addition, the fixed effects are positive, meaning that schools with higher math achievement scores exhibit higher levels of students' reports of emotional victimization. However, the effects are not statistically significant. The slope for "mean math achievement" varies significantly across nations ($p<.01$); this variable accounts for approximately 4 percent of the level-1 variance. Hypothesis H3c, that schools with higher math achievement standard deviations will have higher levels of violence is not supported. The fixed effects of "Math Achievement Standard Deviation" are not statistically significant and the effect size and pseudo-R^2 are very small. The slope does vary significantly across nations ($p<.01$).

Finally, hypotheses H5a and H5b test the effects of the covariates of gender and the age composition of schools on the level of school violence. Hypothesis H5a, that schools with a larger percent of female students have lower levels of violence is supported. The fixed effect of the covariate "Percent Female" is statistically significant ($p<.05$) and the effect size is considered small (.153), but is the largest effect size of all level-1 variables in this analysis. Furthermore,

the "Percent Female" variable accounts for approximately 7.4 percent of the level-1 variance, the largest level-1 pseudo-R^2 in Analysis 3, "Students' Reports of Emotional Victimization." The slope significantly varies across nations ($p<.01$). Hypothesis H5b, that schools with a lower mean age of eighth grade students will have higher levels of violence is not supported. The fixed effects of the covariate "Mean Age" are not statistically significant, the effect size is very small; however, the slope varies significantly across nations ($p<.01$).

[TABLE 16 ABOUT HERE]

Level-2 Predictor Variables

Table 17 presents the results of the means-as-outcomes regression models. Hypotheses H_{2a} through H_{2i}, presented in Chapter 3 test the relationship between national-level measures of social disorganization, poverty and school violence. Hypothesis H_{2a}, which asserts that nations with larger mean school sizes will have higher levels of violence, is not supported. The fixed effect of the covariate, Mean Log_e School Size, is not statistically significant, and the effect size (.029) is extremely small. Further, the deviance test is not statistically significant ($p>.500$), and the direction of the relationship is negative. Hypothesis H2b, that schools in nations with larger mean eighth grade sizes will have higher levels of violence is somewhat supported. The fixed effects are not statistically significant, but the effect size is between small and moderate (.465). The covariate, Mean Log_e Eighth Grade Size accounts for approximately 15.8 percent of the level-2 variance by itself and the deviance test is statistically significant ($p<.05$).

Hypothesis H2c, that schools in nations with larger mean percentages of low SES students will have higher levels of violence is supported. The fixed effect is statistically significant ($p<.01$), and the effect size (.646) is moderate. The level-2 "Mean Percent Low SES"

variable explains 49 percent of the level-2 variance in students' reports of emotional victimization, and the deviance test is statistically significant ($p<.01$). Hypothesis H2d, that schools in nations with larger mean percentages of students who do not speak the native language will have higher levels of violence is supported. The fixed effect of the covariate, "Mean Language Heterogeneity" is statistically significant ($p<.01$), the effect size is moderate (.685) and the deviance test is statistically significant ($p<.01$). As hypothesized, the higher the language heterogeneity, the higher the level of violence. The "Mean Language Heterogeneity" variable accounts for 44 percent of the cross-national variation in students' reports of physical victimization, and the deviance test is statistically significant ($p<.01$).

Hypothesis H2e, that schools in nations in which schools are, on average, located in larger sized cities will have higher levels of violence is supported. The fixed effects of the covariate, "Mean City Size," are statistically significant ($p<.05$), the effect size is moderate-to-large (.704), and the deviance test is statistically significant ($p<.01$). The level-2 "Mean City Size" variable accounts for approximately 29 percent of the level-2 variance. Hypothesis H2f, that schools in nations with a higher percent of international migrants will have higher levels of violence is not supported. The fixed effects of "Percent International Migrants" are statistically significant ($p<.05$), and the effect size is moderate (.672), but the direction of the relationship is negative. That is, the lower percent international migrants at the national level, the higher the students' reports of emotional victimization. That is surprising considering heterogeneity is often a significant predictor of adult violence (i.e. see Pridemore and Trent 2010). The "Percent International Migrants" covariate accounts for approximately 14.5 percent of the level-2 variance, and the deviance test is statistically significant ($p<.05$).

Hypothesis H2g, that schools in nations with lower GDP's will have higher levels of violence is not supported. GDP is a not statistically significant predictor of students' reports of physical victimization, and has a small effect size (.261). The deviance test for the GDP variable is not statistically significant, and GDP Per Capita accounts for only 4.6 percent of the level-2 variance. Hypothesis H2h, that schools in nations with lower adult literacy rates will have higher levels of violence, is somewhat supported. The fixed effects of the covariate, "Percent Adult Literacy," are not statistically significant, the effect size is small, but notable (.367), the level-2 pseudo-R^2 is small but substantial (.124), and the deviance test is statistically significant ($p<.05$). Hypothesis H2i, that schools in nations with higher GDP growth rates will have higher levels of violence is somewhat supported. The fixed effects are not statistically significant, although the deviance test approaches significance ($p=.097$). The effect size of the "GDP Growth" variable is moderate, however, (.452), and explains approximately 7 percent of the level-2 variance.

Hypotheses H4a through H4f test the effects of national-level measures of institutional anomie, social support, and relative deprivation on students' reports of emotional victimization. Hypothesis H4a, that schools in nations that contain a higher mean of schools that track students by math ability will have higher levels of violence, is not supported. The fixed effects of the "Mean Tracking" variable are not statistically significant, although the effect size is small-to-moderate (.389), and the deviance test is statistically significant ($p<.05$). However, rather than "Mean Tracking predicting students' reports of emotional victimization in the hypothesized direction, the relationship between "Mean Tracking" and this form of school violence is negative. That is, nations with a lower mean of schools that track students by math ability have higher levels of violence.

Hypothesis H4b, that schools in nations with lower mean math achievement scores will have higher levels of violence, is supported; the fixed effect of the covariate "Mean of Mean Math Achievement" is statistically significant ($p<.01$), has a moderate-to-large effect size (.725) and accounts for approximately 46 percent of the level-2 variance in students' reports of emotional victimization. The deviance test is statistically significant as well ($p<.01$). Hypothesis H4c, that schools in nations with higher math achievement standard deviations will have higher levels of violence is not supported. The fixed effects of the covariate, "Mean Math Achievement Standard Deviation" are statistically significant ($p<.05$). This variable has a moderate effect size (.582) and accounts for approximately 27 percent of the level-2 variance in students' reports of emotional victimization. In addition, the deviance test is statistically significant ($p<.01$). However, the γ_{01} coefficient is negative. That is, the lower the standard deviation in math achievement the higher the level of violence. Unlike the findings of Akiba et al. (2002) that used the 1995 TIMSS to examine students' reports of victimization, rather than educational inequality predicting higher levels of violence, homogeneity in test scores does.

Hypothesis H4d, that schools in nations with a higher Gini Coefficient will have higher levels of violence is supported. The fixed effects are statistically significant ($p<.05$), and the effect size almost moderate (.458). Further, the deviance test is statistically significant ($p<.01$), and the Gini Coefficient variable accounts for approximately 20 percent of the level-2 variance. It is interesting to note that while the Gini Coefficient is a common, robust and significant predictor of homicide cross-nationally, it only predicts school violence in Analysis 3, "Students' Reports of Emotional Victimization." Hypothesis H4e, that schools in nations with higher divorce rates will have higher levels of violence is not supported. The fixed effects of the "Divorce Rate" variable are statistically significant ($p<.05$), the effect size is notable (.446), and

the deviance test is statistically significant (p<.01). However, the direction of the fixed effect is negative; that is, schools in nations with lower divorce rates have higher levels of students' reports of emotional victimization. This finding is interesting because it indicates that lower levels of institutional anomie (conceptualized in terms of the strength of non-economic institutions), and lower levels of social support at the national level, are conducive to school violence. The Divorce Rate covariate accounts for 42 percent of the level-2 variance in this analysis. Hypothesis H4f, schools in nations with lower educational expenditures as a percent of the national GDP will have higher levels of violence, is not supported. The fixed effects and deviance test are not statistically significant; the effect size (.207) is small, and the Educational Expenditures covariate account for only 2 percent of the level-2 variance in students' reports of emotional victimization.

Hypothesis H7a tests the assertion that schools in nations with lower mean math achievement scores and higher GDP per capita will have higher levels of violence is not supported in this analysis. When GDP, Mean of Mean Math Achievement and the GDP x Math Achievement Interaction are included in a means-as-outcomes model, the effects of GDP and Mean Math Achievement are not statistically significant, but the interaction effect is (p<.01). The interaction effect is positive, however. The gamma coefficients for the independent effects of GDP and Math Achievement are both negative, indicating that the effect of low math achievement scores in nations with low GDP on students' reports of physical victimization are magnified. That is, nations with low mean math achievement scores and low GDP's have higher levels of reported student emotional victimization. By itself the GDP x Math Achievement interaction has a large effect size (.800) and accounts for an approximately 55 percent reduction

of the cross-national variance. The interaction effect GDP x Math Achievement was tested for inclusion in the final model but did not achieve statistical significance.

Finally, hypotheses H6a through H6c test the effects of the national-level covariates Homicide Rate, Percent Female and Mean Age on school violence. Hypothesis H6a, that schools in nations with higher homicide rates will have higher levels of violence is not supported. As in Analysis 2, the direction of the relationship between Homicide Rate and school violence is negative, but the fixed effect is not statistically significant, nor is the deviance test ($p>.500$), and the effect size is very small (.095). Hypothesis H6b, that schools in nations with a larger percent of female students will have lower levels of violence is somewhat supported. The fixed effects of the covariate "Percent Female" are not statistically significant, but the deviance test is almost statistically significant ($p=.075$); the effect size is small to moderate (.335), and it explains approximately 8 percent of the cross-national variance in students' reports of emotional victimization. Hypothesis H6c, that schools in nations with a lower mean age of students will have higher levels of violence is not supported. The fixed effects of the covariate, Mean Age, are close to statistically significant ($p=.064$), and the deviance test is statistically significant ($p<.05$). The effect size (.401) is notable, but the direction of the relationship is positive. Schools in nations with higher mean age of eighth grade students exhibit higher levels of violence. The level-2 Mean Age variable accounts for approximately 13 percent of the level-2 variance.

[TABLE 17 ABOUT HERE]

Final Model for Analysis 3, "Students' Reports of Emotional Victimization"

I built the final model for this dependent variable based on the significance of the fixed effects of individual covariates at Level-1 and Level-2, their effect sizes, the amount of variance explained and the statistical significance of the univariate chi-square and multivariate deviance

tests. Because this analysis is exploratory, and there is a lack of theoretical justification for making a more precise model specification, I only model the level-1 intercept β_{0j} at level-2.

Because the random effects for all the level-1 covariates were statistically significant in the random slope predictor models, with the exception of the Percent Low SES and City Size covariates, each level-1 variable was added to the full level-1 model. When all variables are included, I removed the random effect, *u*, for the level-1 predictor Mean Age, based on the results of the chi-square p-value and deviance test. The following level-1 covariates' random effects are included in the final model: Log_e School Size, Log_e Eighth Grade Size, Language Heterogeneity, Tracking, Mean Math Achievement, Math Achievement Standard Deviation and Percent Female.

When all variables are included in the model, the fixed effects of the following level-1 variables are significant and must be included in the model based on the results of not only the univariate chi-square test, but the multivariate deviance test: Log_e School Size, Log_e Eighth Grade Size, Percent Female and Mean Age. In the Level-2 equation I include Mean Percent Low SES, Mean Language Heterogeneity, and Mean City Size.

The final model for Analysis 3, "Students' Reports of Emotional Victimization," includes Percent Female as a level-1 predictor variable, and contains Mean Language Heterogeneity, Mean Percent Low SES, Mean City Size and Mean Tracking as level-2 predictors. This model explains approximately 18.8 percent of the level-1 variance in students' reports of emotional victimization, and 77.1 percent of the level-2 (cross-national) variance. The final model for Analysis 3, "Students' Reports of Emotional Victimization," is represented by the following equations in hierarchical form:

School-Level Model (Level-1):

(5-20)

$$Y_{ij} = \beta_{0j} + \beta_{1j}(Log_e SchoolSize)_{ij} + \beta_{2j}(Log_e EighthGradeSize)_{ij} + \beta_{3j}(LanguageHeterogeneity)_{ij}$$
$$+ \beta_{4j}(Tracking)_{ij} + \beta_{5j}(MeanMathAchievement)_{ij} + \beta_{6j}(MathAchievementSD)_{ij}$$
$$+ \beta_{7j}(PercentFemale)_{ij} + \beta_{8j}(MeanAge)_{ij} + r_{ij}$$

Nation-Level Model (Level-2):

(5-21)

$$\beta_{0j} = \gamma_{00} + \gamma_{01}(MeanPercentLowSES)_j + \gamma_{02}(MeanLanguageHeterogeneity)_j$$
$$+ \gamma_{03}(MeanCitySize)_j + u_{0j}$$
$$\beta_{1j} = \gamma_{10} + u_{1j}$$
$$\beta_{2j} = \gamma_{20} + u_{2j}$$
$$\beta_{3j} = u_{3j}$$
$$\beta_{4j} = u_{4j}$$
$$\beta_{5j} = u_{5j}$$
$$\beta_{6j} = u_{6j}$$
$$\beta_{7j} = \gamma_{70} + u_{7j}$$
$$\beta_{8j} = \gamma_{80}$$

[TABLE 18 ABOUT HERE]

To summarize the final model for this analysis, the level-1 covariates Log_e School Size, Percent Female and Mean Age predict levels of students' reports of being teased at school in the hypothesized directions. The log of Eighth Grade Size is negative in direction, however. That is, schools with smaller eighth grade sizes exhibit higher levels of violence. The level-2 covariates Mean Percent Low SES, Mean Language Heterogeneity and Mean City Size all predict the level

of students' reports of emotional victimization in the hypothesized directions. Table 19 displays the correlations among national effects for level-1 covariates.

[TABLE 19 ABOUT HERE]

The final model for Analysis 3, "Students' Reports of Emotional Victimization," further illustrates the concept of "poverty and inequality in the context of homogeneity," but more specifically this model exhibits support for social disorganization theory at the macro-level. Larger schools with smaller eighth grade sizes, with lower percent female students and lower students' mean age, in nations with schools that have, on average, higher percentages of low SES students, greater language heterogeneity and that are located, on average, in larger sized cities have a significant effect on the level of school violence. The analysis of students' reports of emotional victimization strongly supports social disorganization theory at the national level. I discuss the implications of these findings further in Chapter 6.

Table 20 summarizes the direction of the covariates' relationships to the dependent variable; whether the variable was included in the final model (/), with significant fixed effects (F) and, for level-1 variables, with significant random effects (R), whether the hypothesized relationships were supported (Y), somewhat supported (S) or not supported (N), the results of univariate and multivariate significance tests. Table 21 below summarizes the results of all three analyses, indicating which hypotheses were supported or not, the direction of the relationship between the covariates and dependent variables, and whether the covariates were included in the final model for each analysis.

[TABLE 20 ABOUT HERE]

Table 21 presents a summary of the results of the level 1 random slopes and level 2 means-as-outcomes models for all three analyses of school violence, in addition to indicating the covariates that were included in the final models for each analysis.

[TABLE 21 ABOUT HERE]

CHAPTER 6: Discussion

This study is unique in that it uses multi-level analysis to parse out the school and nation-level effects on the level of school violence cross-nationally. Further, I test major theories that have found support in explaining violence, including homicide, in the U.S. and cross-nationally for their applicability to the school context. Bullying, as measured by the students' reports of physical and emotional victimization in the TIMSS 2007 data, is a particular type of violence that takes place in schools, and therefore requires a nuanced theoretical understanding. Furthermore, differentiating the predictors of different types of school violence (i.e. students' reported physical vs. emotional victimization) is an important contribution to the study of this type of violence. Using hierarchical linear modeling allows for a nuanced understanding of how poverty, inequality, heterogeneity, mobility, institutional anomie and the lack of adequate non-economic social support are related to school violence, to differentiate between school and national contexts that affect the level of violence, to identify what school-level effects vary randomly across nations, and to extend social disorganization and institutional anomie theories to apply more adequately to violence in the school context.

What predicts the level of school violence cross-nationally? How do school and national contexts affect the amount of violence in schools?

The answer to the research questions, what predicts the level of school violence cross-nationally, and how do school and national contexts affect the amount of violence in schools depends on the way that "school violence" is measured. In this study I tested three measures of school violence: principals' reports of the frequency of classroom disturbances, injury and intimidation of students and teachers, students' reports of physical victimization (being hit or

hurt in the past month) and students' reports of emotional victimization (being teased or made fun of in the past month). The use of hierarchical linear modeling enables me to discuss what school-level effects vary randomly across nations for each type of violence measured as well. I will discuss the analysis of each type of violence in turn, examining the final hierarchical models in particular- the covariates that predict the level of violence controlling for the other covariates in the models.

Principals' Reports of School Violence

The interpretation of the analysis of principals' reports of school violence requires some caution. Social desirability bias (see Fisher 1993) can certainly apply to school principals, particularly since this cross-national study uses data collected in many different cultures. Principals may try to hide, or inflate, the true amount of violence that goes on in their school. Cultural differences in social desirability and definitions and perceptions of school violence may be particularly relevant in this cross-national study. In addition, the effects of the independent variables measuring school and eighth grade sizes cannot necessarily be interpreted as measures of social disorganization, since it is reasonable to assume that the more students in a school or grade, the more likely school principals are to become aware of any number of behaviors not limited just to violence. Furthermore, since principals are not necessarily aware of students' behaviors, and principals' reports of violence do not correlate significantly with students' reports of violence, this is clearly a problematic measure. However, the interpretation of the analysis of the final hierarchical linear model for principals' reports of school violence is still interesting and theoretically relevant- what it means for the principal of a school to report higher levels of violence in the TIMSS 2007 study just needs to be interpreted with care.

In the final hierarchical linear model with principals' reports of violence as the dependent

variable, the school-level fixed effect of eighth grade size is significant and positive. Both school size and eighth grade size vary randomly across nations- meaning the effects of these variables significantly vary across nations. The percent female composition of the school is negatively related to principals' reports of violence as expected. The school-level predictor, percent female, does not significantly vary across nations.

The estimated percent of low SES students has a statistically significant school-level fixed effect, and varies randomly across nations. This indirect measure of poverty predicts school principals reporting higher frequencies of violence. This can indicate that lower SES students are perceived as more violent by school principals, that schools with greater numbers of low SES students are socially disorganized and more conducive to violence, and/or that schools with greater numbers of low SES students have fewer resources to be able to enact effective social control. Future research will need to investigate the precise relationship between SES and school violence in further depth.

Math achievement is a significant school-level predictor of principals' reports of violence, and the effect of math achievement on this measure of violence varies randomly across nations. Schools with lower mean math achievement scores may exhibit higher levels of violence due to strain, since the normative goal of education is being undermined. Furthermore, principals in schools that have students who score low in math achievement may lack the resources both to be able to teach students math more effectively and to enact effective social control to prevent violence. Low math achievement scores predict principals' reports of higher frequencies of violence not only at the school level, but at the national level as well. This can indicate that nations that on average perform poorly in international standardized tests may need to invest more resources, or social support, into low-scoring schools nation-wide in order to not

only raise scores but reduce violence.

In Analysis 1, of principals' reports of school violence, the school-level variables language heterogeneity, city size, tracking, math achievement standard deviation (i.e. educational inequality) and age all vary randomly across nations but do not have statistically significant fixed effects. This finding is interesting and indicative of the importance of utilizing multilevel analysis for nested data. Ordinary regression analyses using nested data cannot distinguish which level-1 effects significantly apply in the context of level-1, or whether they vary randomly across the level-2 units. Further, when level-1 effects did not achieve a statistically significant γ term, removing the γ coefficient and keeping the level-2 random u coefficients in the final models in each analysis in the present study enabled me to further prevent model misspecification.

At the national level, not surprisingly, mean school size significantly predicts principals' reports of school violence. What is somewhat surprising is that, at the national level, higher GDP's and the higher the percent of the GDP spent on education, the more likely principals are to report higher levels of violence in their schools. Taking all the other covariates in the final model for this analysis into consideration, these relationships can be interpreted in several ways. Schools in wealthier nations that have students who perform poorly on math achievement tests may have higher levels of violence due to strain and anomie. However, the interaction effect was not included in the final model because it was not statistically significant according to univariate and multivariate significance tests. The effect of math achievement has the unique effect on the level of reported violence, even after controlling for nations' GDP in the final HLM for principals' reports of school violence. School principals in wealthier nations may be more likely to perceive school violence as a potential problem or they may be more aware of violent

incidents in their schools.

Schools in nations that spend more money on the institution of education have higher levels of social support for a non-economic institution that can be a locus of social control. Why, then, do the principals of schools in nations that invest more of their GDP into education report higher levels of violence? This could be because nations that spend more on education may spend more on anti-bullying programs, and thus recognizing and examining the frequency of violence could be a normal practice in these types of nations. Taken together with the fact that schools with low math achievement scores at both the school and, on average, at the national level predict principals' reporting higher frequencies of violence could support this assertion. Future qualitative research is needed to further elucidate the relationship between nations' wealth, investment in the institution of education, cultural differences in definitions of school violence as well as perceptions of violence as a problem.

Students' Reports of Victimization

In the final hierarchical linear model with students' reports of physical victimization as the dependent variable, the school-level fixed effect of eighth grade size is significant and negative. School size, but not eighth grade size, varies randomly across nations- meaning the effect of school size does depend on the national context, but the effect of eighth grade size does not. Eighth grade size is negatively related to physical bullying in this model, but is not statistically significant. The percent female composition of the school is negatively related to students' reports of physical victimization as expected. The school-level predictor, percent female, varies randomly across nations. Mean age is also a significant predictor in the final model of students' reports of physical victimization; schools composed of younger students report higher levels of this type of violence. The effect of age also varies randomly across

nations.

The percent of low SES students has a statistically significant school-level fixed effect, and varies randomly across nations. The indirect measure of poverty here predicts students' reporting higher levels of physical victimization. This supports the assertion of social disorganization theory that poverty at the aggregate level can undermine communities' ability to maintain effective social control. This can also indicate that schools with greater numbers of low SES students have fewer resources to be able to enact effective social control. Future research will need to investigate the precise relationship between SES and school violence in further depth.

Math achievement is a significant school-level predictor of students' reports of physical victimization, and the effect of math achievement on this measure of violence varies randomly across nations. Schools with lower mean math achievement scores may exhibit higher levels of violence due to strain, since the normative goal of education is being undermined in low-achieving schools. Low math achievement scores predict students' reports of physical victimization not only at the school level, but at the national level as well. This can indicate that schools in nations that on average perform poorly in international standardized math achievement tests may lack the resources to both teach math effectively and to effectively prevent students from hitting each other. Furthermore, subcultural theory may add to an understanding of students' physical victimization. As Cohen (1955) pointed out in his study of delinquent boys, when young working class boys cannot achieve academic success according to middle class educational standards, they act out, often violently. A subculture of violence develops in opposition to the normative middle class institution of education. This can add to an understanding of how strain can lead to the development of a subculture of violence in schools

and nations where academic achievement is valued, but not attainable for all students. Valuing other kinds of education besides performance on standardized tests could allow working class and low-achieving students the opportunity to attain a legitimate identity of success, thus reducing the likelihood that the formation of a subculture of violence will develop.

Math achievement standard deviation, a measure of relative deprivation within schools, or educational inequalities, is a significant predictor of students' reports of physical victimization. The greater the educational inequality, the greater the level of physical victimization reported in the schools in this study. This school-level covariate does not vary randomly across nations and applies to schools within nations, which has important policy implications which will be discussed in Chapter 7.

Interestingly, the two school-level variables that measure language heterogeneity and whether or not schools track their students by math ability predict students' reports of physical victimization in unexpected ways. The relationship to this measure of violence with language heterogeneity and tracking is negative for both variables; however the fixed effect of the school-level tracking variable is not statistically significant. Further, the effect of tracking varies randomly across nations but language heterogeneity does not. That language homogeneity, rather than heterogeneity, predicts higher levels of students' reports of being physically "bullied" are an interesting finding. Instead of heterogeneity predicting violence as would be expected in a test of social disorganization theory, homogeneity does. This finding needs to be examined further in future research on bullying. It could be that in homogenous settings, bullying emerges as a form of social control wherein any perceived difference is met with violence. Qualitative research can especially shed light on this possibility in future research, but is beyond the scope of the present study.

In Analysis 2, of students' reports of physical victimization, the school-level variables school size and city size vary randomly across nations but do not have statistically significant fixed effects. Again, keeping the level-2 random *u* coefficients in the final models in each analysis in the present study when the level-1 fixed effects are not statistically significant reduces the likelihood of model misspecification and reduces the size of the biases in the parameter estimates. Again, this indicates the importance of utilizing multilevel analysis for nested data to be able to ascertain what effects vary randomly across nations.

At the national level, not surprisingly, the mean percent female composition of schools significantly predicts students' reports of victimization in the negative direction. Like at the school-level, language heterogeneity at the national level is a negative predictor of students' reports of physical victimization. Again homogeneity, not heterogeneity, predicts this form of school violence, indicating an extension of social disorganization theory is required to better account for violence in the school context. Homicide rate is an unexpected predictor of students' reports of physical victimization in the negative direction; nations with lower homicide rates have higher students' reports of being bullied physically, however, the effect is very small in the final model, particularly compared to the effects of homicide rate in the means-as-outcome model.

In the final hierarchical linear model with students' reports of emotional victimization as the dependent variable, the school-level fixed effects of both school and eighth grade size are statistically significant. Interestingly, the larger the school size and the smaller the eighth grade size, the greater the students' reported emotional victimization. This indicates the type of schools where emotional bullying, students teasing and making fun of one another may be large overall but with multiple grades in one building, thus, smaller eighth grade sizes. It could be that

these types of schools are more disorganized, have less resources to effectively control students' behavior, or that age or grade level may be a salient social distinction about which students tease one another. The effects of both school size and eighth grade size vary randomly across nations in the final model for students' reports of emotional victimization.

The percent female composition of the school is negatively related to students' reports of emotional victimization as expected, and the school-level predictor, percent female, varies randomly across nations. Mean age is also a significant predictor in the final model of students' reports of emotional victimization; schools composed of younger students report higher levels of this type of violence. The effect of age does not vary randomly across nations in this model, unlike for students' reports of physical victimization.

In Analysis 3, of students' reports of emotional victimization, the school-level variables language heterogeneity, tracking, mean math achievement and math achievement standard deviation vary randomly across nations but do not have statistically significant fixed effects. Again, this indicates the importance of utilizing multilevel analysis for nested data to be able to ascertain what effects vary randomly across nations.

At the national level, supporting the utility of social disorganization for explaining emotional victimization, mean percent low SES composition of schools, on average within nations, significantly predicts students' reports of victimization in the positive direction, along with mean language heterogeneity and mean city size. Nations where schools are located in larger sized cities, with greater linguistic heterogeneity, along with greater numbers of low SES students, on average, have higher levels of students teasing and making fun of each other.

Do major criminological theories of adult violence apply to the school context? Toward an Integrated Theory of School Violence

Based on the results of this study, there is some support for the applicability of social disorganization, institutional anomie, and social support theories. However, these theories need to be extended to better apply to the school context cross-nationally. The analysis of principals' reports of school violence reveals the need to better understand cross-cultural definitions of school violence, and to further examine the potential role of national funding for education in raising awareness of school violence as a social problem. For principals' reports of violence and students' reports of physical victimization, math achievement scores had a significant impact on the level of violence. This relationship must be examined further to determine how a lack of school resources may be related to both low math achievement and higher levels of violence. In addition, future research should examine the effects of using curriculum that stress standardized tests over other forms of achievement on the development of subcultures of violence within schools.

The analysis of students' reports of emotional victimization lends support to social disorganization theory as the national-level variables percent low SES students, language heterogeneity and city size all predicted higher levels of violence. However, in the analysis of students' reports of physical victimization I find that language heterogeneity and tracking are negatively related to the level of violence (although the fixed effect of tracking is not statistically significant). This indicates that in the case of teasing, heterogeneity may lead to violence by undermining the schools' ability to enact social control, or, perhaps when students do not speak the native language, this is something they are teased about. In the case of hitting/physical bullying, homogeneity rather than heterogeneity underlies the relationship between language differences, tracking by math ability and violence.

The role of educational inequality is also important to note in the present study. While the Gini coefficient is a strong predictor of homicide cross-nationally, income inequality does not significantly predict school violence cross-nationally in the 2007 TIMSS data. Instead, math achievement standard deviation- the school-level variation in achievement-- predicts the level of physical bullying. Future research needs to examine whether or not intelligence and academic achievement is something that leads to violence at the micro-level, the mechanisms by which this type of bullying occurs in the context of poverty, inequality and homogeneity. In addition, whereas the Gini coefficient is a significant predictor of homicide cross-nationally (i.e. Cole and Gramjo 2009; Stamatel 2009; Bjerregaard and Cochran 2008a, 2008b; Jacobs and Richardson 2008; Lin 2007; Chamlin and Cochran 2006, etc.), it is apparent that the type of inequality that affects the level of school violence cross-nationally is not income inequality but educational. In other words, the Gini coefficient measures income inequality which is understandably important to adults, but what is important to eighth grade students is inequality in math achievement- underscoring the importance of equality of opportunities for students to learn. Table 22 summarizes the theoretical support by analysis for each group of covariates listed in the correspondence table in Appendix C.

[TABLE 22 ABOUT HERE]

CHAPTER 7: Conclusion

In this study, I have empirically tested the relationships between numerous factors and school violence. I have shown that there are important differences in the significant predictors of school violence depending on how the concept is measured. I show that what predicts principals' reports of school violence differ from what predicts students' reports of victimization, and that the predictors of students' reports of physical victimization differ from the predictors of their reports of emotional victimization. Further, I differentiate between school and national level effects, illustrating the importance of using hierarchical linear modeling for nested data.

I tested and extended theories of adult violence, and determined the importance of math achievement for predicting students' reports of victimization. In doing so, I conclude that a reduced emphasis on standardized testing and renewed investment in valuing other kinds of learning and achievement may go a long way toward reducing school violence cross-nationally. Finally, a great deal of variance in school violence is explained at the national level in each analysis. For that reason, I will focus on nation-level policy implications and the potential danger of creating national cultures that stress standardized forms of achievement. In this chapter I will first discuss the limitations of the data used, policy implications and directions for future research.

Limitations of the Data

Because the TIMSS is a large cross-national dataset administered to children and teenagers, the school-level measures of SES and heterogeneity that I use to test social disorganization and absolute deprivation theories are indirect. That is, I do not have data on parents' income or the precise racial/ethnic makeup of schools, but rather principals' estimates of

this. Likewise, a nation's percent of international migrants is an indirect nation-level measure of heterogeneity. More precise data on racial and ethnic heterogeneity at the national level could potentially be compiled, but would be complicated in a large cross-national study because the way in which racial and ethnic groups are defined varies a great deal from nation to nation.

Furthermore, GDP per capita and the adult literacy rate are indirect measures of poverty. Cross-national homicide studies have tested poverty in numerous indirect ways, but have been critiqued for largely ignoring poverty in favor of measures of relative deprivation (Pridemore 2010). Poverty is an important variable to consider in studies of criminality, and the effects of poverty on youth violence in the United States are well-established (Dahlberg 1998; Polakow 2000) and though understudied cross-nationally, there is also support for the effect of absolute deprivation on adult homicide rates (Paré and Felson 2010; Pridemore 2010; 2008). How poverty affects violence in the school context cross-nationally is under-studied and under-theorized, and future research should test the effects of poverty operationalized in numerous ways in quantitative analyses. The social mechanisms by which poverty affects bullying should be studied qualitatively as well.

Because this is a macro-level study looking only at schools within nations, not individual students, I cannot adequately theorize the links between micro- and macro-level processes. Furthermore, while I utilize students' reports of physical and emotional victimization, the reported victimization of being hit or hurt, and teased/made fun of in the past month, the TIMSS does not ask students to report on their perception of the seriousness/severity of the behavior, or if they define these behaviors as problematic. In a cross-national study it is important to recognize that cultural differences in perceptions of what constitutes behavior that is perceived as problematic, or deviant, can vary a great deal. It may be that students who reported being hit or

hurt by another student or who were made fun of in the past month did not consider themselves to be victims of bullying. The TIMSS does ask principals about the perceived severity of the measures used in the "school violence scale" in the present study. In the future, an analysis including those items could add further nuance to an understanding of school violence.

Policy implications

Three main policy implications arise based on the results of the present study. First, it is clear that investment in students' excellence in achievement can reduce violence. Investing resources that would raise students' level of achievement would at the same time be an investment in bullying reduction. However, the type of achievement that students need to be able to attain does not need to be in the form of performance on standardized testing alone, if at all. In fact, standardized testing can reduce the quality and quantity of learning and increase the gaps between economically disadvantaged and privileged students (see McNeil 2000). National education policy that emphasizes the value of other types of learning besides the ability to perform well on standardized testing would enable economically disadvantaged and educationally marginalized students the opportunity to succeed through legitimate means, reducing the students' levels of strain and frustration, thus reducing the level of violence.

Second, equal opportunities to learn and school equity should be at the forefront of school violence reduction policies since educational inequality is linked to students' reports of physical victimization and poverty is related to students' reports of emotional victimization. Finally, investing in multicultural education at the national level can reduce the effects that language heterogeneity, poverty, educational inequality and the context of homogeneity have on bullying. Promoting pedagogy and curricula that engage students in critical dialogue about

diversity and multiculturalism may go a long way toward reducing violence by promoting tolerance.

Directions for future research

Future quantitative and qualitative research can further explicate the relationships between measures of social disorganization, homogeneity, poverty, inequality, social support, and school violence to come up with generalizable theories that apply cross-nationally to the social problem of bullying in schools. Future time-series analysis with previous iterations of the TIMSS data can further determine if bullying is a problem that has been growing over the past 15 years. Since achievement on standardized tests is significant in this study of violence, future research should examine the effects of violence on achievement. This is particularly important since standardized testing is becoming increasingly utilized and considered important world-wide.

Three-level hierarchical linear modeling examining student, school and nation level data could add theoretical nuance to the processes by which macro-level characteristics lead to the micro-level outcome of victimization in schools. In-depth qualitative and comparative research could illustrate the important cross-cultural differences that affect levels of violence, and even the perception of violence in schools as problematic. The degree to which school violence is a form of social control in itself, and examining what norms students are expected to adhere to in order to avoid being victimized by other students both physically and emotionally in different cross-cultural contexts are additional important qualitative research questions for future research.

Conclusion

In the present study, I tested the relationships between school and national level inequalities, social disorganization, institutional anomie, social support, resource deprivation theories and school violence. I analyzed the effects of factors on school violence measured three different ways: as principals' reports, students' reports of physical victimization and student's reports of emotional victimization. Students' reports of victimization are more accurate than principals' reports, although the findings in the analysis of principals' reports are theoretically relevant. School principals in nations with higher GDP's that spend more on education are more likely to report higher levels of violence, as are schools with lower math achievement scores.

In the analyses of students' reports of school violence, I find that measures of social disorganization, poverty, city size, and language heterogeneity significantly predict students' reports of emotional victimization. Physical bullying is predicted by educational inequality and poverty, but surprisingly the context of homogeneity (as measured by tracking and language heterogeneity) was also important in this analysis. While I find a great deal of support for the effects of poverty and math achievement on the level of school violence, the concept of heterogeneity needs to be examined further to see how homogeneity rather than heterogeneity can lead to school violence. In addition, future research will have to determine what behaviors students define as problematic bullying cross-culturally, and the specific interventions that could reduce the problem.

This research is important because it is the first study to use multi-level linear analysis to discern the school and national level predictors of school violence. Future research on school violence using nested data should utilize multilevel analysis to reduce the likelihood of model

misspecification and to better target educational policies. That is, multilevel analysis can differentiate the effects of covariates at individual, school and national levels and therefore can greatly improve the targeting, implementation and evaluation of future anti-bullying initiatives.

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TABLES

Table 1: Dependent Variables' Descriptive Statistics

	N	Minimum	Maximum	Mean	SD	ICC
Analysis 1: Principals' Reports of Violence	5150 J=39	0	20	3.30	2.74	.31
Analysis 2: Students' Reports of Physical Victimization	4885 J=36	0	.90	.21	.16	.40
Analysis 3: Students' Reports of Emotional Victimization	4885 J=36	0	.90	.26	.18	.41

Table 2: Analysis 1 Principals' Reports of School Violence

School-Level Independent Variables' Descriptive Statistics (N=5150)

	Minimum	Maximum	Mean	SD
School Size	9	5184	438.73	445.05
8^{th} Grade Size	1	1034	84.50	96.67
Log_e School Size	2.20	8.55	5.67	.95
Log_e 8^{th} Grade Size	0	6.94	3.93	.99
Percent Low SES	0	3	1.90	1.13
Language Heterogeneity	0	3	.80	1.21
City Size	-2	3	-.05	1.78
Tracking	0	1	.44	.50
Mean Math Achievement	197.60	730.78	439.09	81.35
Math Achievement SD	18.91	134.39	64.95	16.77
Percent Female	0	1	.49	.23
Mean Age	10.10	18.01	14.45	.50

Table 3: Analysis 1 Principals' Reports of School Violence

National-Level Independent Variables' Descriptive Statistics (J=39)

	Minimum	**Maximum**	**Mean**	**SD**
Mean School Size	140.64	1333.49	595.86	269.60
Mean 8th Grade Size	29.55	314.74	114.81	71.92
Mean Log_e School Size	4.95	7.20	6.29	.47
Mean Log_e 8th Grade Size	3.39	5.75	4.54	.66
Mean Percent Low SES	.62	2.81	1.74	.60
Mean Language Heterogeneity	0	2.97	.67	.76
Mean City Size	-.93	3	.14	.85
International Migrants (%)	0	.42	.10	.12
GDP Per Capita ($)	646	49662	17879.69	17054.15
Adult Literacy (%)	.56	1	.93	.11
GDP Growth (%)	-.01	.11	.03	.02
Mean Tracking	.03	.99	.35	.23
Mean of Mean Math Achievement	298.68	584.65	457.98	68.35
Mean Math Achievement SD	42.83	86.93	64.33	11.29
GINI Coefficient	.25	.61	.38	.07
Divorce Rate (per 1,000)	.40	4.50	1.75	1.11
Educational Expenditures (% GDP)	2.64	7.96	4.76	1.15
GDP x Math Achievement (thousand dollar units)	-523.04	2745.40	810.45	768.91
Homicide rate per 100,000	.39	57.26	5.67	10.90
Mean Percent Female	.45	.54	.50	.02
Mean of Mean Age	13.76	15.88	14.45	.43

Table 4: Analyses 2 and 3 Students' Reports of Physical and Emotional Victimization

School-Level Independent Variables' Descriptive Statistics (N=4885)

	Minimum	**Maximum**	**Mean**	**SD**
School Size	9	5184	430.63	460.81
8^{th} Grade Size	1	1034	79.38	88.99
Log_e School Size	2.20	8.55	5.61	.98
Log_e 8^{th} Grade Size	0	6.94	3.89	.97
Percent Low SES	0	3	1.93	1.13
Language Heterogeneity	0	3	.88	1.25
City Size	-2	3	-.04	1.81
Tracking	0	1	.41	.49
Math Achievement Mean	197.60	730.78	427.45	80.14
Math Achievement SD	18.91	134.39	66.02	17.09
Percent Female	0	1	.49	.25
Mean Age	10.10	18.01	14.47	.53

Table 5: Analyses 2 and 3 Students' Reports of Physical and Emotional Victimization National-Level Independent Variables' Descriptive Statistics (J=36)

	Minimum	Maximum	Mean	SD
Mean School Size	140.64	1333.49	600.17	280.15
Mean 8th Grade Size	29.55	314.74	113.75	74.57
Mean Log$_e$ School Size	4.95	7.20	6.29	.49
Mean Log$_e$ 8th Grade Size	3.39	5.75	4.52	.68
Mean Percent Low SES	.62	2.81	1.74	.62
Mean Language Heterogeneity	0	2.97	.69	.79
Mean City Size	-.93	3	.16	.88
International Migrants (%)	0	.42	.10	.12
GDP Per Capita ($)	646	49662	15570.33	15635.28
Adult Literacy (%)	.56	1	.92	.11
GDP Growth (%)	-.01	.11	.03	.02
Mean Tracking	.03	.99	.32	.23
Mean of Mean Math Achievement	298.68	584.65	452.54	68.28
Mean Math Achievement SD	42.83	86.93	64.75	11.63
GINI Coefficient	.25	.61	.37	.07
Divorce Rate (per 1,000)	.40	4.50	1.59	1.01
Educational Expenditures (% GDP)	2.64	7.96	4.70	1.18
GDP x Math Achievement (thousand dollar units)	-509.67	2588.33	714.50	732.92
Homicide rate per 100,000	.39	57.26	5.69	11.36
Mean Percent Female	.45	.54	.50	.03
Mean of Mean Age	13.76	15.88	14.46	.45

Table 6: Results of Random Slope Level-1 (School-Level) Predictor Models for Analysis 1, Principals' Reports of School Violence as the Dependent Variable

Level-1 Predictor	Fixed Effects				Random Effects							
	γ_{00} (s.e.)	γ_{10} (s.e.)	E.S.	p-value (H_0: γ_{10}=0)	σ^2 (s.e.)	R^2_{L-1}	τ_{00} (s.e.)	τ_{11} (s.e.)	τ_{01} (s.e.)	Corr (u_{oj}, u_{1j})	χ^2 test p-value (H_0: τ_{11}=0)	Deviance test p-value(H_0: τ_{11}=0 & τ_{01}=0)
(Unconditional)	3.32 (.44)	--	--		5.16 (.10)	--	2.37 (.55)	--	--	--	<.001	--
Log_e School Size§	3.59 (.46)	.58** (.15)	.201	.001	4.92 (.10)	.047	2.62 (.61)	.15 (.06)	.51 (.16)	.813	<.001	<.001
Log_e Eighth Grade Size§	3.72 (.51)	.63** (.14)	.228	<.001	4.69 (.09)	.091	3.26 (.75)	.14 (.05)	.62 (.17)	.917	<.001	<.001
Percent Low SES	3.34 (.44)	.17 (.13)	.070	.187	4.97 (.10)	.037	2.39 (.55)	.14 (.04)	.52 (.14)	.887	<.001	<.001
Language Heterogeneity	3.34 (.45)	.01 (.12)	.004	.934	5.10 (.10)	.012	2.43 (.56)	.09 (.04)	.28 (.11)	.619	<.001	<.001
City Size	3.39 (.43)	.10† (.05)	.065	.079	5.11 (.10)	.010	2.28 (.53)	.01 (.01)	-.05 (.04)	-.327	.010	.042
Tracking	3.33 (.44)	-.03 (.20)	.005	.875	5.14 (.10)	.004	2.37 (.55)	.10 (.08)	.27 (.16)	.551	.101	.020
Mean Math Achievement	3.34 (.45)	-4.71×10^{-3} (2.92×10^{-3})	.140	.115	4.94 (.10)	.043	2.40 (.55)	$.8\times10^{-5}$ ($.2\times10^{-5}$)	-.01 (3.1×10^{-3})	-.858	<.001	<.001
Math Achievement SD	3.33 (.44)	-3.48×10^{-3} (.01)	.021	.652	5.12 (.10)	.008	2.37 (.55)	2.4×10^{-4} (1.1×10^{-4})	2.8×10^{-3} (.01)	.118	<.001	.003
Percent Female	3.32 (.44)	-1.04* (.40)	.087	.013	5.11 (.10)	.010	2.39 (.55)	.39 (.27)	-.87 (.34)	-.908	.150	.019
Mean Age	3.32 (.44)	.55 (.44)	.100	.218	5.10 (.10)	.012	2.30 (.53)	1.40 (.49)	1.41 (.43)	.783	<.001	<.001

†p<.10 *p<.05 **p<.01

§Log with base e (2.71828)

Table 7: Results of Level-2 (Nation-Level) Means-as-Outcomes Models for Analysis 1, Principals' Reports of School Violence as the Dependent Variable

Level-2 Predictor	Fixed Effects				Random Effects			
	γ_{00} (s.e.)	γ_{01} (s.e.)	Effect Size	p-value (H_0: $\gamma_{10}=0$)	σ^2 (s.e.)	τ_{00} (s.e.)	R^2_{L-2}	Deviance test p-value
(Unconditional)	3.32 (.44)	--	--		5.16[24] (.10)	2.37 (.55)	--	--
Mean Log_e School Size[§]	3.73 (.38)	1.34† (.69)	.409	.060		1.87 (.44)	.211	.003
Mean Log_e Eighth Grade Size[§]	3.56 (.42)	1.04 (.67)	.446	.127		2.03 (.47)	.143	.015
Mean Percent Low SES	3.48 (.42)	-.84 (.66)	.327	.213		2.10 (.49)	.114	.030
Mean Language Heterogeneity	3.44 (.41)	-.73 (.56)	.360	.199		2.09 (.48)	.118	.026
Mean City Size	3.36 (.46)	.23 (.68)	.127	.733		2.35 (.54)	.008	>.500
International Migrants (%)	3.80 (.40)	11.37* (4.40)	.886	.014		1.78 (.42)	.249	.001
GDP	3.71 (.22)	$8.4\text{x}10^{-5}$** ($1.3\text{x}10^{-5}$)	.930	<.001		.51 (.13)	.785	<.001
Adult Literacy (%)	3.34 (.44)	2.77 (3.37)	.198	.416		2.29 (.53)	.034	.261
GDP Growth (%)	3.39 (.46)	10.77 (29.74)	.140	.719		2.36 (.54)	.004	>.500
Mean Tracking	3.18 (.42)	1.83 (1.80)	.273	.316		2.23 (.52)	.059	.115
Mean of Mean Math	3.57	$1.11\text{x}10^{-2}$†	.493	.061		1.84	.224	.002

[24] The value of σ^2 remains constant in the level-2 means-as-outcome models

Achievement	(.41)	(.01)			(.43)		
Mean Math Achievement SD	3.34 (.41)	-.06† (.03)	.440	.056	2.01 (.47)	.152	.011
Gini Coefficient	3.30 (.44)	2.57 (5.18)	.117	.622	2.34 (.54)	.013	>.500
Divorce Rate (per 1,000)	3.25 (.43)	.24 (.33)	.173	.474	2.25 (.52)	.051	.152
Educational Expenditures (% GPD)	3.57 (.36)	1.03* (.42)	.769	.019	1.58 (.37)	.333	<.001
GDP x Math Achievement Interaction	3.81 (.31)	-2.17×10^{-4} (3.28×10^{-7})	.108	.512	.41 (.10)	.010	>.500
Homicide Rate	3.32 (.45)	1.95×10^{-3} (.03)	.014	.926	2.37 (.55)	<.001	>.500
Mean Percent Female	3.37 (.43)	15.42 (14.78)	.200	.304	2.23 (.52)	.059	.122
Mean of Mean Age	3.33 (.44)	-.49 (.79)	.137	.536	2.34 (.54)	.013	>.500

†p<.10 *p<.05 **p<.01 (2-tailed tests)
[§]Log base e

Note: The estimate of γ_{01} and τ_{00} are based on the model that includes two main effects. $R^2_{L\text{-}2}$ and the deviance test p-value are computed relative to the unconditional (no interaction) model.

Table 8: Final Model for Analysis 1, Principals' Reports of School Violence as the Dependent Variable

Fixed Effects

	Coefficient	*S.E.*	*t-ratio*	*p-value*	*E.S.*
National Mean Principals' Reports of School Violence, β_{0j}					
Base, γ_{00}	4.22**	.16	26.38	<.001	
Mean Log_e School Size γ_{01}	.87**	.20	4.25	<.001	.266
Mean of Mean Math Achievement γ_{02}	$-7.19x10^{-3}$**	$2.4x10^{-3}$	-2.942	.006	.319
GDP γ_{03}	$7.4x10^{-5}$**	$1.1x10^{-5}$	6.793	<.001	.819
Educational Expenditures γ_{04}	.47**	.15	3.169	.004	.351
Log_e Eighth Grade Size γ_{20}	.64**	.11	5.630	<.001	.231
Percent Low SES γ_{30}	.09	.09	1.011	.319	.037
Mean Math Achievement γ_{70}	$-3.81x10^{-3}$†	$2.09x10^{-3}$	-1.822	.076	.113
Percent Female γ_{90}	-.83**	.30	-2.783	.006	.070

Random Effects

	Variance Component	*S.D.*	*df*	*Chi-Square*	*p-value*
National Mean Principals' Reports of School Violence u_{0j}	.370**	.61	28	297.50	<.001
Log_e School Size u_{1j}	.218**	.46	33	72.20	<.001
Log_e Eighth grade size u_{2j}	.201**	.45	32	93.84	<.001
Percent Low SES u_{3j}	.051**	.23	32	65.44	.001
Language Heterogeneity u_{4j}	.037†	.19	33	45.74	.069
City Size u_{5j}	.028**	.17	33	88.93	<.001
Tracking u_{6j}	.184**	.43	33	56.64	.007
Mean Math Achievement u_{7j}	$3x10^{-5}$**	.01	32	77.70	<.001
Math Achievement Standard Deviation u_{8j}	$2.5x10^{-4}$**	.02	33	59.92	.003
Age u_{10j}	.591**	.77	33	63.80	.001
Level-1 error, r_{ij}	4.214	2.053			

†p<.10 * p<.05 **p<.01

Table 9: Correlations among National Effects in Analysis 1: Principals' Reports of Violence

	National Mean Principals Reports of School Violence u_{0j}	Log_e School Size u_{1j}	Log_e Eighth Grade Size u_{2j}	Percent Low SES u_{3j}	L.H. u_{4j}	City Size u_{5j}	Tracking u_{6j}	Mean M.A. u_{7j}	M.A. SD u_{8j}	Age u_{10j}
National Mean Principals' Reports of School Violence u_{0j}	1									
Log_e School Size u_{1j}	-.234	1								
Log_e Eighth Grade Size u_{2j}	.829	-.641	1							
Percent Low SES u_{3j}	.847	-.486	.777	1						
Language Heterogeneity u_{4j}	-.289	-.160	-.100	-.227	1					
City Size u_{5j}	-.303	-.567	-.154	.110	.363	1				
Tracking u_{5j}	.421	-.145	.451	.609	-.559	-.262	1			
Mean Math Achievement u_{7j}	-.720	.223	-.685	-.460	.665	.466	-.367	1		
Math Achievement SD u_{8j}	$1x10^{-4}$	.132	-.049	-.174	-.842	-.344	.177	-.641	1	
Age u_{10j}	.670	-.316	.520	.925	-.290	.197	.693	-.253	-.180	1

Table 10: Summary of Covariates' Relationships, Hypotheses and Significance Tests, Analysis 1 Principals' Reports of School Violence

Level-1 Covariate	Direction	Final Model (/) Fixed (F) Random (R)	Hypotheses	Hypothesis Supported	*p-value <.05(H_0: γ_{10}=0)*	Deviance Test p-value <.05
Log_e School Size	+	/R	Larger schools will have higher levels of violence	Y	Y	Y
Log_e Eighth Grade Size	+	/FR	Schools with larger eighth grade sizes will have higher levels of violence.	Y	Y	Y
Percent Low SES	+	/FR	Schools with a larger percent of low SES students will have higher levels of violence.	N	N	Y
Language Heterogeneity	+	/R	Schools with a larger percent of students who do not speak the native language will have higher levels of violence.	N	N	Y
City Size	+	/R	Schools located in larger sized cities will have higher levels of violence.	S	N	Y
Tracking	-	/R	Schools that track students by math ability will have higher levels of violence.	N	N	Y
Mean Math Achievement	-	/FR	Schools with lower mean math achievement scores will have higher levels of violence.	S	N	Y
Math Achievement SD	-	/R	Schools with higher math achievement standard deviations will have higher levels of violence.	N	N	Y
Percent Female	-	/F	Schools with a larger percent of female students will have lower levels of violence.	Y	Y	Y
Mean Age	+	/R	Schools with a lower mean age of eighth grade students will have higher levels of violence.	N	N	Y
Level-2 Covariates	**Direction**	**Final Model (/)**	**Hypotheses**	**Hypothesis Supported**	***p-value <.05(H_0: γ_{10}=0)***	**Deviance Test p-value <.05**
Mean Log_e School Size	+	/	Schools in nations with larger mean school sizes will have higher levels of violence.	S	N	Y
Mean Log_e Eighth Grade Size	+		Schools in nations with larger mean eighth grade sizes will have higher levels of violence.	S	N	Y
Mean Percent Low SES	-		Schools in nations with larger mean percentages of low SES	N	N	Y

			students will have higher levels of violence.			
Mean Language Heterogeneity	-		Schools in nations with larger mean percentages of students who do not speak the native language will have higher levels of violence.	N	N	Y
Mean City Size	+		Schools in nations in which schools are, on average, located in larger sized cities will have higher levels of violence.	N	N	N
Percent International Migrants	+		Schools in nations with a higher percent of international migrants will have higher levels of violence.	Y	Y	Y
GDP Per Capita	+	/	Schools in nations with lower GDP per capita will have higher levels of violence.	N	Y	Y
Adult Literacy Rate	+		Schools in nations with lower adult literacy rates will have higher levels of violence.	N	N	N
GDP Growth Rate	+		Schools in nations with higher GDP growth rates will have higher levels of violence.	N	N	N
Mean Tracking	+		Schools in nations that contain a higher mean of schools that track students by math ability will have higher levels of violence.	N	N	N
Mean of Mean Math Achievement	+	/	Schools in nations with lower mean math achievement scores will have higher levels of violence.	N	N	Y
Mean Math Achievement SD	-		Schools in nations with higher mean math achievement standard deviations will have higher levels of violence.	N	N	Y
Gini Coefficient	+		Schools in nations with a higher ratio of income inequality, measured by the Gini coefficient, will have higher levels of violence.	N	N	N
Divorce Rate	+		Schools in nations with higher divorce rates will have higher levels of violence.	N	N	N
Educational Expenditures	+	/	Schools in nations with lower education expenditures as a percent of GDP will have higher levels of violence.	N	Y	Y
GDPxMath Interaction	-		Schools in nations with lower mean math achievement scores and higher GDP per	N	N	N

		capita will have higher levels of violence.			
Homicide Rate	+	Schools in nations with higher homicide rates will have higher levels of violence.	N	N	N
Mean Percent Female	+	Schools in nations with a larger percent of female students will have lower levels of violence.	N	N	N
Mean of Mean Age	-	Schools in nations with a lower mean age of eighth grade students will have higher levels of violence.	N	N	N

Notes: 1. ± indicates the sign of the coefficient in the random slopes and means-as-outcomes models 2. Y=Yes, hypothesis is supported; S=Somewhat supported; N=No, Not supported

Table 11: Results of Random Slope Level-1 (School-Level) Predictor Models for Analysis 2, Students' Reports of Physical Victimization as the Dependent Variable

	Fixed Effects				Random Effects							
Level-1 Predictor	γ_{00} *(s.e.)*	γ_{10} *(s.e.)*	*E.S.*	*p-value (H_0: $\gamma_{10}=0$)*	σ^2 *(s.e.)*	R^2_{L-1}	τ_{00} *(s.e.)*	τ_{11} *(s.e.)*	τ_{01} *(s.e.)*	*Corr(u_{0j}, u_{1j})*	*χ^2 test p-value (H_0: $\tau_{11}=0$)*	*Deviance test p-value(H_0: $\tau_{11}=0$ & $\tau_{01}=0$)*
(Unconditional)	.217 (.03)	--	--	<.001	.016 (3.2×10^{-4})	--	.010 (2.5×10^{-3})	--	--	--	<.001	--
Log_e School Size[§]	.216 (.03)	1.42×10^{-4} (.01)	.001	.988	.016 (3.2×10^{-4})	.016	.010 (2.3×10^{-3})	4.9×10^{-4} (1.9×10^{-4})	-.001 (4.8×10^{-4})	-.261	<.001	<.001
Log_e Eighth Grade Size[§]	.214 (.03)	-.004 (.01)	.024	.678	.016 (3.2×10^{-4})	.016	.009 (2.2×10^{-3})	4.3×10^{-4} (1.6×10^{-4})	-.001 (4.4×10^{-4})	-.308	<.001	<.001
Percent Low SES	.215 (.03)	.010† (.01)	.070	.076	.016 (3.2×10^{-4})	.008	.011 (2.4×10^{-3})	1.3×10^{-4} (6×10^{-5})	.001 (3.3×10^{-4})	.998	.005	<.001
Language Heterogeneity	.218 (.03)	-.011* (4.7×10^{-3})	.086	.027	.016 (3.2×10^{-4})	.008	.011 (2.5×10^{-3})	1×10^{-6} (3×10^{-5})	1×10^{-4} (2.3×10^{-4})	.998	>.500	>.500
City Size	.218 (.03)	-.002 (4.3×10^{-3})	.023	.628	.015 (3.1×10^{-4})	.020	.010 (2.5×10^{-3})	1.3×10^{-4} (4×10^{-5})	-3.5×10^{-4} (2.4×10^{-4})	-.295	<.001	<.001
Tracking	.219 (.03)	-.013 (.02)	.041	.432	.015 (3.1×10^{-4})	.025	.011 (2.6×10^{-3})	.002 (6.4×10^{-4})	-.001 (9.3×10^{-4})	-.143	<.001	<.001
Mean Math Achievement	.214 (.03)	-2.30×10^{-4}† (1.3×10^{-4})	.115	.089	.015 (3.1×10^{-4})	.025	.010 (2.4×10^{-3})	1×10^{-6} (1×10^{-6})	-1×10^{-6} (1×10^{-5})	-.129	<.001	<.001
Math Achievement SD	.215 (.03)	8.96×10^{-4}* (4.3×10^{-4})	.096	.042	.016 (3.2×10^{-4})	.017	.011 (2.5×10^{-3})	1×10^{-6} (1×10^{-6})	1×10^{-6} (2×10^{-5})	.039	<.001	<.001
Percent Female	.217 (.03)	-.046 (.05)	.071	.333	.015 (3×10^{-4})	.056	.010 (2.5×10^{-3})	.014 (4.7×10^{-3})	-.002 (2.5×10^{-3})	-.198	<.001	<.001
Mean Age	.220 (.03)	-.029 (.02)	.096	.138	.015 (3.1×10^{-4})	.020	.011 (2.7×10^{-3})	.002 (7.8×10^{-4})	-.002 (1.2×10^{-3})	-.607	<.001	<.001

†p<.10 *p<.05 **p<.01

[§]Log with base e

Table 12: Results of Level-2 (Nation-Level) Means-as-Outcomes Models for Analysis 2, Students' Reports of Physical Victimization as the Dependent Variable

Level-2 Predictor	Fixed Effects				Random Effects			
	γ_{00} *(s.e.)*	γ_{01} *(s.e.)*	*Effect Size*	*p-value (H_0: γ_{10}=0)*	σ^2 *(s.e.)*	τ_{00}	R^2_{L-2}	*Deviance test p-value*
(Unconditional)	.217 (.03)				.016[25] ($3.2x10^{-4}$)	.010 ($2.5x10^{-3}$)		
Mean Log_e School Size[§]	.208 (.03)	-.026 (.05)	.127	.600		.010 ($2.5x10^{-3}$)	.021	>.500
Mean Log_e Eighth Grade Size[§]	.232 (.03)	.054 (.05)	.367	.250		.010 ($2.3x10^{-3}$)	.089	.066
Mean Percent Low SES	.195 (.02)	.106** (.03)	.657	.005		.006 ($1.4x10^{-3}$)	.457	<.001
Mean Language Heterogeneity	.201 (.03)	.077* (.03)	.608	.022		.007 ($1.7x10^{-3}$)	.321	<.001
Mean City Size	.224 (.03)	.043 (.04)	.378	.337		.010 ($2.3x10^{-3}$)	.075	.091
International Migrants (%)	.189 (.03)	-.563† (.29)	.676	.059		.009 ($2.2x10^{-3}$)	.133	.023
GDP	.191 (.03)	$-4x10^{-6}$* ($2x10^{-6}$)	.625	.026		.009 ($2.1x10^{-3}$)	.154	.014
Adult Literacy (%)	.214 (.03)	-.273 (.22)	.300	.226		.010 ($2.3x10^{-3}$)	.075	.091
GDP Growth (%)	.236 (.03)	2.59 (1.89)	.518	.180		.010 ($2.3x10^{-3}$)	.087	.069
Mean Tracking	.227 (.03)	-.145 (.13)	.334	.262		.010 ($2.3x10^{-3}$)	.081	.080
Mean of Mean Math Achievement	.190 (.03)	$-9.72x10^{-4}$* ($3.8x10^{-4}$)	.664	.014		.007 ($1.6x10^{-3}$)	.351	<.001
Mean Math Achievement SD	.220 (.03)	$-2.93x10^{-3}$ ($2.2x10^{-3}$)	.341	.199		.010 ($2.3x10^{-3}$)	.080	.080

[25] The value of σ^2 remains constant in the level-2 means-as-outcome models

Gini Coefficient	.215 (.03)	.234 (.34)	.164	.500	.010 ($2.5x10^{-3}$)	.024	>.500
Divorce Rate (per 1,000)	.226 (.03)	-.038† (.02)	.384	.076	.007 ($1.8x10^{-3}$)	.292	.001
Educational Expenditures (% GPD)	.208 (.03)	-.029 (.03)	.342	.387	.010 ($2.4x10^{-3}$)	.059	.137
GDP x Math Achievement Interaction	.135 (.03)	$8.7x10^{-5}$ ($4.1x10^{-5}$)	.638	.043	.006 ($1.4x10^{-3}$)	.428	.002
Homicide Rate	.223 (.03)	-.003 ($2.1x10^{-3}$)	.341	.120	.009 ($2.2x10^{-3}$)	.134	.022
Mean Percent Female	.210 (.03)	-1.79† (.93)	.537	.063	.008 ($2x10^{-3}$)	.194	.006
Mean of Mean Age	.216 (.03)	.040 (.05)	.180	.441	.010 ($2.4x10^{-3}$)	.024	>.500

[§]Log base e
†p<.10 *p<.05 **p<.01 (2-tailed tests)

Note: The estimate of γ_{01} and τ_{00} are based on the model that includes two main effects. R^2_{L-2} and the deviance test p-value are computed relative to the unconditional (no interaction) model.

Table 13: Final Model for Analysis 2, Students' Reports of Physical Victimization as the Dependent Variable

Fixed Effects					
	Coefficient	*s.e.*	*t-ratio*	*p-value*	*Effect size*
National Mean Students' Reports of Physical Victimization, B_{0j}					
Base, γ_{00}	.203**	.02	10.007	<.001	
Mean Language Heterogeneity γ_{01}	-.032†	.02	-1.829	.077	.253
Mean of Mean Math Achievement γ_{02}	$-7.59x10^{-4}$**	$2.7x10^{-4}$	-2.808	.009	.518
Homicide Rate γ_{03}	$-2.27\ x10^{-3}$†	$1.3x10^{-3}$	-1.788	.083	.258
Mean Percent Female γ_{04}	-.841	.57	-1.484	.148	.252
Log_e Eighth Grade Size γ_{20}	$-9.42x10^{-3}$	$7.2x10^{-3}$	-1.309	.191	.057
Percent Low SES γ_{30}	$6.4x10^{-3}$	$4.9x10^{-3}$	1.320	.196	.045
Language Heterogeneity γ_{40}	-.008†	$4.3x10^{-3}$	-1.821	.068	.063
Tracking γ_{60}	-.019	.01	-1.427	.162	.058
Mean Math Achievement γ_{70}	$-2.92x10^{-4}$*	$1.2x10^{-4}$	-2.371	.023	.146
Math Achievement Standard Deviation γ_{80}	$7.02x10^{-4}$*	$3.2x10^{-4}$	2.194	.028	.075
Percent Female γ_{90}	-.079†	.05	-1.723	.093	.123
Mean Age γ_{100}	-.056**	.02	-3.289	.003	.186

Random Effects					
	Variance Component	*S.D.*	*df*	*Chi-Square*	*p-value*
National Mean Students' Reports of Physical Victimization u_{0j}	$5.04x10^{-3}$**	.07	29	1248.10	<.001
Log_e School Size u_{1j}	$9.3x10^{-4}$**	.03	34	160.81	<.001
Percent Low SES u_{3j}	$1.2x10^{-4}$*	.01	33	49.56	.032
City Size u_{5j}	$8x10^{-5}$**	.01	34	76.35	<.001
Tracking u_{6j}	$1.2x10^{-3}$**	.03	33	109.30	<.001
Mean Math Achievement u_{7j}	$1x10^{-6}$**	$3.6x10^{-4}$	33	112.68	<.001
Percent Female u_{9j}	.017**	.13	33	169.72	<.001
Mean Age u_{10j}	$3.1x10^{-3}$**	.06	33	93.50	<.001
Level-1 error, r_{ij}	.013	.11			

†p<.10 * p<.05 **p<.01

Table 14: Correlations among National Effects in Analysis 2: Students' Reports of Physical Victimization

	National Mean Students' Reports of Physical Victimization, u_{0j}	Log_e School Size u_{1j}	Percent Low SES u_{3j}	City Size u_{5j}	Tracking u_{6j}	Mean M.A. u_{7j}	Percent Female u_{9j}	M. Age u_{10j}
National Mean Students' Reports of Physical Victimization u_{0j}	1							
Log_e School Size u_{1j}	-.440	1						
Percent Low SES u_{3j}	.551	-.917	1					
City Size u_{5j}	-.398	.924	-.721	1				
Tracking u_{6j}	-.212	.624	-.801	.287	1			
Mean Math Achievement u_{7j}	-.421	-.625	.469	-.558	.504	1		
Percent Female u_{9j}	-.424	.485	-.761	.215	.678	-.148	1	
Mean Age u_{10j}	-.848	.803	-.752	.801	.352	-.067	.330	1

Table 15: Summary of Covariates' Relationships, Hypotheses and Significance Tests, Analysis 2 Students' Reports of Physical Victimization

Level-1 Covariate	Direction	Final Model (/) Fixed (F) Random (R)[26]	Hypotheses	Hypothesis Supported	*p-value <.05(H_0: γ_{10}=0)*	Deviance Test p-value <.05
Log_e School Size	+	/R	Larger schools will have higher levels of violence	N	N	Y
Log_e Eighth Grade Size	-	/F	Schools with larger eighth grade sizes will have higher levels of violence.	N	N	Y
Percent Low SES	+	/FR	Schools with a larger percent of low SES students will have higher levels of violence.	S	N	Y
Language Heterogeneity	-	/F	Schools with a larger percent of students who do not speak the native language will have higher levels of violence.	N	Y	N
City Size	-	/R	Schools located in larger sized cities will have higher levels of violence.	N	N	Y
Tracking	-	/FR	Schools that track students by math ability will have higher levels of violence.	N	N	Y
Mean Math Achievement	-	/FR	Schools with lower mean math achievement scores will have higher levels of violence.	S	N	Y
Math Achievement SD	+	/F	Schools with higher math achievement standard deviations will have higher levels of violence.	Y	Y	Y
Percent Female	-	/FR	Schools with a larger percent of female students will have lower levels of violence.	S	N	Y
Mean Age	-	/FR	Schools with a lower mean age of eighth grade students will have higher levels of violence.	N	N	Y
Level-2 Covariates	**Direction**	**Final Model (/)**	**Hypotheses**	**Hypothesis Supported**	***p-value <.05(H_0: γ_{10}=0)***	**Deviance Test p-value <.05**
Mean Log_e School Size	+		Schools in nations with larger mean school sizes will have higher levels of violence.	N	N	N
Mean Log_e	+		Schools in nations with larger	S	N	N

[26] Random effects apply to level-1 covariates, referring to whether the random effect *u* was included in the final model.

Eighth Grade Size			mean eighth grade sizes will have higher levels of violence.			
Mean Percent Low SES	+		Schools in nations with larger mean percentages of low SES students will have higher levels of violence.	Y	Y	Y
Mean Language Heterogeneity	+	/	Schools in nations with larger mean percentages of students who do not speak the native language will have higher levels of violence.	Y	Y	Y
Mean City Size	+		Schools in nations in which schools are, on average, located in larger sized cities will have higher levels of violence.	N	N	N
Percent International Migrants	-		Schools in nations with a higher percent of international migrants will have higher levels of violence.	N	N	Y
GDP Per Capita	-		Schools in nations with lower GDP per capita will have higher levels of violence.	Y	Y	Y
Adult Literacy Rate	-		Schools in nations with lower adult literacy rates will have higher levels of violence.	N	N	N
GDP Growth Rate	+		Schools in nations with higher GDP growth rates will have higher levels of violence.	S	N	N
Mean Tracking	-		Schools in nations that contain a higher mean of schools that track students by math ability will have higher levels of violence.	N	N	N
Mean of Mean Math Achievement	-	/	Schools in nations with lower mean math achievement scores will have higher levels of violence.	Y	Y	Y
Mean Math Achievement SD	-		Schools in nations with higher mean math achievement standard deviations will have higher levels of violence.	N	N	N
Gini Coefficient	+		Schools in nations with a higher ratio of income inequality, measured by the Gini coefficient, will have higher levels of violence.	N	N	N
Divorce Rate	-		Schools in nations with higher divorce rates will have higher levels of violence.	N	N	Y
Educational Expenditures	-		Schools in nations with lower education expenditures as a	N	N	N

			percent of GDP will have higher levels of violence.			
GDPxMath Interaction	+		Schools in nations with lower mean math achievement scores and higher GDP per capita will have higher levels of violence.	N	Y	Y
Homicide Rate	-	/	Schools in nations with higher homicide rates will have higher levels of violence.	N	N	Y
Mean Percent Female	-	/	Schools in nations with a larger percent of female students will have lower levels of violence.	Y	N	Y
Mean of Mean Age	+		Schools in nations with a lower mean age of eighth grade students will have higher levels of violence.	N	N	N

Notes: 1. ± indicates the sign of the coefficient in the random slopes and means-as-outcomes models 2. Y=Yes, hypothesis is supported; S=Somewhat supported; N=No, Not supported

Table 16: Results of Random Slope Level-1 (School-Level) Predictor Models for Analysis 3, Students' Reports of Emotional Victimization as the Dependent Variable

Level-1 Predictor	Fixed Effects				Random Effects							
	γ_{00} (s.e.)	γ_{10} (s.e.)	E.S.	p-value(H_0: $\gamma_{10}=0$)	σ^2 (s.e.)	R^2_{L-1}	τ_{00} (s.e.)	τ_{11} (s.e.)	τ_{01} (s.e.)	Corr (u_{oj}, u_{1j})	X^2 test p-value (H_0: $\tau_{11}=0$)	Deviance test p-value(H_0: $\tau_{11}=0$ & $\tau_{01}=0$)
(Unconditional)	.271 (.04)	--	--	<.001	.020 ($4.1x10^{-4}$)	--	.014 ($3.3x10^{-3}$)	--	--	--	<.001	--
Log_e School Size§	.272 (.03)	.002 (.01)	.011	.779	.020 ($4.1x10^{-4}$)	.004	.013 ($3.1x10^{-3}$)	$1.6x10^{-4}$ ($1.2x10^{-4}$)	-.001 ($4.5x10^{-4}$)	-.496	.062	.008
Log_e Eighth Grade Size§	.268 (.03)	-.004 (.01)	.022	.592	.020 ($4.1x10^{-4}$)	.006	.013 ($3x10^{-3}$)	$1.9x10^{-4}$ ($1.1x10^{-4}$)	-.001 ($4.4x10^{-4}$)	-.548	.019	.001
Percent Low SES	.271 (.04)	$3.46x10^{-4}$ ($5x10^{-3}$)	.002	.945	.020 ($4.1x10^{-4}$)	<.001	.014 ($3.2x10^{-3}$)	$2x10^{-5}$ ($4x10^{-5}$)	$4.8x10^{-4}$ ($2.8x10^{-4}$)	.958	>.500	.233
Language Heterogeneity	.271 (.04)	-.002 (.01)	.014	.828	.020 ($4x10^{-4}$)	.016	.014 ($3.2x10^{-3}$)	$3.3x10^{-4}$ ($1.4x10^{-4}$)	.001 ($5.5x10^{-4}$)	.666	<.001	<.001
City Size	.271 (.04)	$-1.31x10^{-4}$ ($3.2x10^{-3}$)	.001	.968	.020 ($4.1x10^{-4}$)	.002	.014 ($3.3x10^{-3}$)	$2x10^{-5}$ ($2x10^{-5}$)	$3x10^{-5}$ ($1.9x10^{-4}$)	.049	.178	.248
Tracking	.273 (.04)	-.024 (.02)	.065	.251	.019 ($3.9x10^{-4}$)	.036	.014 ($3.3x10^{-3}$)	.003 ($1x10^{-3}$)	$-6x10^{-5}$ ($1.3x10^{-3}$)	-.009	<.001	<.001
Mean Math Achievement	.275 (.04)	$1.46x10^{-4}$ ($1.8x10^{-4}$)	.065	.423	.019 ($3.9x10^{-4}$)	.039	.015 ($3.6x10^{-3}$)	$1x10^{-6}$ ($1x10^{-6}$)	$4x10^{-5}$ ($1x10^{-5}$)	.558	<.001	<.001
Math Ach. SD	.270 (.04)	$5.56x10^{-4}$ ($4.7x10^{-4}$)	.053	.241	.020 ($4.1x10^{-4}$)	.007	.014 ($3.2x10^{-3}$)	$1x10^{-6}$ ($1x10^{-6}$)	$4x10^{-5}$ ($3x10^{-5}$)	.381	.002	.002
Percent Female	.271 (.03)	-.110* (.04)	.153	.018	.019 ($3.8x10^{-4}$)	.074	.013 ($3.2x10^{-3}$)	.011 ($4x10^{-3}$)	-.003 ($2.6x10^{-3}$)	-.287	<.001	<.001
Mean Age	.274 (.04)	-.021 (.02)	.062	.310	.020 ($4x10^{-4}$)	.012	.014 ($3.4x10^{-3}$)	$1.4x10^{-3}$ ($8x10^{-4}$)	-.002 ($1.3x10^{-3}$)	-.509	.001	<.001

†p<.10 *p<.05 **p<.01

§Log with base e

Table 17: Results of Level-2 (Nation-Level) Means-as-Outcomes Models for Analysis 3, Students' Reports of Emotional Victimization as the Dependent Variable

	Fixed Effects				Random Effects			
Level-2 Predictor	γ_{00} *(s.e.)*	γ_{01} *(s.e.)*	*Effect Size*	*p-value(H_0: γ_{10}=0)*	σ^2 *(s.e.)*	τ_{00}	R^2_{L-2}	*Deviance test p-value*
(Unconditional)	.271 (.04)	--	--	--	.020[27] (4.1×10^{-4})	.014 (3.3×10^{-3})	--	--
Mean Log_e School Size[§]	.269 (.03)	-.007 (.06)	.029	.904		.014 (3.3×10^{-3})	<.001	>.500
Mean Log_e Eighth Grade Size[§]	.293 (.03)	.082 (.05)	.465	.113		.012 (2.8×10^{-3})	.158	.013
Mean Percent Low SES	.245 (.03)	.125** (.04)	.646	.003		.007 (1.7×10^{-3})	.490	<.001
Mean Language Heterogeneity	.249 (.03)	.104** (.03)	.685	.004		.008 (1.8×10^{-3})	.443	<.001
Mean City Size	.285 (.03)	.096* (.04)	.704	.036		.010 (2.3×10^{-3})	.291	.001
International Migrants (%)	.238 (.03)	-.672* (.33)	.672	.047		.012 (2.8×10^{-3})	.145	.017
GDP	.255 (.03)	-2×10^{-6} (2×10^{-6})	.261	.236		.013 (3.1×10^{-3})	.046	.190
Adult Literacy (%)	.267 (.03)	-.400 (.25)	.367	.113		.012 (2.9×10^{-3})	.124	.028
GDP Growth (%)	.291 (.04)	2.71 (2.17)	.452	.221		.013 (3×10^{-3})	.073	.097
Mean Tracking	.284 (.03)	-.203 (.14)	.389	.159		.012 (2.9×10^{-3})	.122	.029
Mean of Mean Math Achievement	.235 (.03)	-1.28×10^{-3}** (3.9×10^{-4})	.725	.003		.007 (1.8×10^{-3})	.464	<.001
Mean Math Achievement SD	.276 (.03)	-.006* (2.3×10^{-3})	.582	.012		.010 (2.4×10^{-3})	.267	.001
Gini Coefficient	.264 (.03)	.785* (.35)	.458	.033		.011 (2.6×10^{-3})	.201	.005
Divorce Rate (per 1,000)	.283 (.03)	-.053* (.02)	.446	.020		.008 (1.9×10^{-3})	.424	<.001

[27] The value of σ^2 remains constant in the level-2 means-as-outcome models

Educational Expenditures (% GPD)	.264 (.03)	-.021 (.04)	.207	.586	.013 ($3.2x10^{-3}$)	.023	>.500
GDP x Math Achievement Interaction	.183 (.03)	$1.1x10^{-4}$** ($3.8x10^{-5}$)	.672	.009	$5.12x10^{-3}$ ($1.3x10^{-3}$)	.625	<.001
Homicide Rate	.274 (.04)	-.001 ($2.5x10^{-3}$)	.095	.551	.013 ($3.2x10^{-3}$)	.021	>.500
Mean Percent Female	.265 (.03)	-1.34 (1.13)	.335	.246	.013 ($3x10^{-3}$)	.083	.075
Mean of Mean Age	.268 (.03)	.107† (.06)	.401	.064	.012 ($2.9x10^{-3}$)	.127	.025

†p<.10; *p<.05; **p<.01

Note: The estimate of γ_{01} and τ_{00} are based on the model that includes two main effects. R^2_{L-2} and the deviance test p-value are computed relative to the unconditional (no interaction) model.

Table 18: Final Model for Analysis 3, Students' Reports of Emotional Victimization as the Dependent Variable

Fixed Effects					
	Coefficient	*s.e.*	*t-ratio*	*p-value*	*Effect size*
National Mean Students' Reports of Emotional Victimization, B_{0j}					
Base, γ_{00}	.242**	.02	15.846	<.001	
Mean Percent Low SES γ_{01}	.061**	.02	3.193	.004	.315
Mean Language Heterogeneity γ_{02}	.079**	.02	4.589	<.001	.520
Mean City Size γ_{03}	.035†	.02	1.796	.081	.257
Log_e School Size γ_{10}	.030*	.01	2.142	.039	.163
Log_e Eighth Grade Size γ_{20}	-.039*	.01	-2.680	.012	.210
Percent Female γ_{70}	-.110**	.04	-2.869	.007	.153
Mean Age γ_{80}	-.025†	.01	-1.749	.080	.074
Random Effects					
	Variance Component	*S.D.*	*df*	*Chi-Square*	*p-value*
National Mean Students' Reports of Emotional Victimization u_{0j}	$3.12x10^{-3}$**	.06	27	609.74	<.001
Log_e School Size u_{1j}	$8x10^{-4}$*	.03	30	46.07	.030
Log_e Eighth Grade Size u_{2j}	.002**	.05	30	82.37	<.001
Language Heterogeneity u_{3j}	$2.2x10^{-4}$**	.01	31	81.15	<.001
Tracking u_{4j}	$4.04x10^{-3}$**	.06	31	219.38	<.001
Mean Math Achievement u_{5j}	$1x10^{-6}$**	$5.8x10^{-4}$	31	243.62	<.001
Math Achievement S.D. u_{6j}	$1x10^{-6}$**	$9.9x10^{-4}$	31	56.84	.003
Percent Female u_{7j}	.012**	.11	30	109.76	<.001
Level-1 error, r_{ij}	.016	.13			

†p<.10 * p<.05 **p<.01

Table 19: Correlations among National Effects in Analysis 3: Students' Reports of Emotional Victimization

	National Mean Students' Reports of Emotional Victimization, u_{0j}	Log_e School Size u_{1j}	Log_e Eighth Grade Size u_{2j}	L.H. u_{3j}	Tracking u_{4j}	Mean M.A. u_{5j}	M.A. S.D. u_{6j}	Percent Female u_{7j}
National Mean Students' Reports of Emotional Victimization u_{0j}	1							
Log_e School Size u_{1j}	-.250	1						
Log_e Eighth Grade Size u_{2j}	-.031	-.927	1					
Language Heterogeneity u_{3j}	.556	.335	-.606	1				
Tracking u_{4j}	-.105	-.630	.542	.072	1			
Mean Math Achievement u_{5j}	.385	.642	-.791	.427	-.709	1		
Math Achievement S.D. u_{6j}	.503	.542	-.612	.297	-.840	.851	1	
Percent Female u_{7j}	-.405	-.231	.412	-.262	.554	-.660	-.840	1

Table 20: Summary of Covariates' Relationships, Hypotheses, and Significance Tests, Analysis 3 Students' Reports of Emotional Victimization

Level-1 Covariate	Direction	Final Model (/) Fixed (F) Random (R)	Hypothesis	Hypothesis Supported	*p-value* $<.05(H_0: \gamma_{10}=0)$	Deviance Test p-value <.05
Log_e School Size	+	/FR	Larger schools will have higher levels of violence	N	N	Y
Log_e Eighth Grade Size	-	/FR	Schools with larger eighth grade sizes will have higher levels of violence.	N	N	Y
Percent Low SES	+		Schools with a larger percent of low SES students will have higher levels of violence.	N	N	N
Language Heterogeneity	-	/R	Schools with a larger percent of students who do not speak the native language will have higher levels of violence.	N	N	Y
City Size	-		Schools located in larger sized cities will have higher levels of violence.	N	N	N
Tracking	-	/R	Schools that track students by math ability will have higher levels of violence.	N	N	Y
Mean Math Achievement	+	/R	Schools with lower mean math achievement scores will have higher levels of violence.	N	N	Y
Math Achievement SD	+	/R	Schools with higher math achievement standard deviations will have higher levels of violence.	N	N	Y
Percent Female	-	/FR	Schools with a larger percent of female students will have lower levels of violence.	Y	Y	Y
Mean Age	-	/F	Schools with a lower mean age of eighth grade students will have higher levels of violence.	N	N	Y
Level-2 Covariates	**Direction**	**Final Model (/)**	**Hypothesis**	**Hypothesis Supported**	***p-value* $<.05(H_0: \gamma_{10}=0)$**	**Deviance Test p-value <.05**
Mean Log_e School Size	-		Schools in nations with larger mean school sizes will have higher levels of violence.	N	N	N
Mean Log_e Eighth Grade Size	+		Schools in nations with larger mean eighth grade sizes will have higher levels of violence.	S	N	Y

Mean Percent Low SES	+	/	Schools in nations with larger mean percentages of low SES students will have higher levels of violence.	Y	Y	Y
Mean Language Heterogeneity	+	/	Schools in nations with larger mean percentages of students who do not speak the native language will have higher levels of violence.	Y	Y	Y
Mean City Size	+	/	Schools in nations in which schools are, on average, located in larger sized cities will have higher levels of violence.	Y	Y	Y
Percent International Migrants	-		Schools in nations with a higher percent of international migrants will have higher levels of violence.	N	Y	Y
GDP Per Capita	-		Schools in nations with lower GDP per capita will have higher levels of violence.	N	N	N
Adult Literacy Rate	-		Schools in nations with lower adult literacy rates will have higher levels of violence.	S	N	Y
GDP Growth Rate	+		Schools in nations with higher GDP growth rates will have higher levels of violence.	S	N	N
Mean Tracking	-		Schools in nations that contain a higher mean of schools that track students by math ability will have higher levels of violence.	N	N	Y
Mean of Mean Math Achievement	-		Schools in nations with lower mean math achievement scores will have higher levels of violence.	Y	Y	Y
Mean Math Achievement SD	-		Schools in nations with higher mean math achievement standard deviations will have higher levels of violence.	N	Y	Y
Gini Coefficient	+		Schools in nations with a higher ratio of income inequality, measured by the Gini coefficient, will have higher levels of violence.	Y	Y	Y
Divorce Rate	-		Schools in nations with higher divorce rates will have higher levels of violence.	N	Y	Y
Educational Expenditures	-		Schools in nations with lower education expenditures as a percent of GDP will have higher levels of violence.	N	N	N
GDPxMath	+		Schools in nations with lower	N	Y	Y

Interaction		mean math achievement scores and higher GDP per capita will have higher levels of violence.			
Homicide Rate	-	Schools in nations with higher homicide rates will have higher levels of violence.	N	N	N
Mean Percent Female	-	Schools in nations with a larger percent of female students will have lower levels of violence.	S	N	N
Mean of Mean Age	+	Schools in nations with a lower mean age of eighth grade students will have higher levels of violence.	N	N	Y

Notes: 1. ± indicates the sign of the coefficient in the random slopes and means-as-outcomes models 2. Y=Yes, hypothesis is supported; S=Somewhat supported; N=No, Not supported

Table 21: Summary of Results by Hypothesis; All 3 Analyses of School Violence

Hypotheses		*Covariate*	Principals' Reports	Students' Physical Victimization	Students' Emotional Victimization
School-level measures of social disorganization					
H1a	Larger schools will have higher levels of violence	Log_e School Size	○ +**	● +	● +
H1b	Schools with larger eighth grade sizes will have higher levels of violence.	Log_e Eighth Grade Size	○ +** /	● -	● -
H1c	Schools with a larger percent of low SES students will have higher levels of violence.	Percent Low SES	● +	◙ +†	● +
H1d	Schools with a larger percent of students who do not speak the native language will have higher levels of violence.	Language Heterogeneity	● +	● -* /	● -
H1e	Schools located in larger sized cities will have higher levels of violence.	City Size	◙ +†	● -	● -
National-level measures of social disorganization					
H2a	Schools in nations with larger mean school sizes will have higher levels of violence.	Mean Log_e School Size	◙ +† /	● -	● -
H2b	Schools in nations with larger mean eighth grade sizes will have higher levels of violence.	Mean Log_e Eighth Grade Size	◙ +	◙ +	◙ +
H2c	Schools in nations with larger mean percentages of low SES students will have higher levels of violence.	Mean Percent Low SES	● -	○ +** /	○ +** /
H2d	Schools in nations with larger mean percentages of students who do not speak the native language will have higher levels of violence.	Mean Language Heterogeneity	● -	○ +*	○ +** /

H2e	Schools in nations in which schools are, on average, located in larger sized cities will have higher levels of violence.	Mean City Size	● +	● +	○ +* /
H2f	Schools in nations with a higher percent of international migrants will have higher levels of violence.	Percent International Migrants	○ +*	● -*	● -*
H2g	Schools in nations with lower GDP per capita will have higher levels of violence.	GDP Per Capita	● +** /	○ -*	● -
H2h	Schools in nations with lower adult literacy rates will have higher levels of violence.	Adult Literacy Rate	● +	● -	◙ -
H2i	Schools in nations with higher GDP growth rates will have higher levels of violence.	GDP Growth Rate	● +	◙ +	◙ +
School-level measures of IAT					
H3a	Schools that track students by math ability will have higher levels of violence.	Tracking	● -	● -	● -
H3b	Schools with lower mean math achievement scores will have higher levels of violence.	Mean Math Achievement	◙ - /	◙ -†	● +
H3c	Schools with higher math achievement standard deviations will have higher levels of violence.	Math Achievement SD	● -	○ +* /	● +
Nation-level measures of IAT					
H4a	Schools in nations that contain a higher mean of schools that track students by math ability will have higher levels of violence.	Mean Tracking	● +	● -	● - /
H4b	Schools in nations with lower mean math achievement scores will have higher levels of violence.	Mean of Mean Math Achievement	● +† /	○ -* /	○ -**

H4c	Schools in nations with higher mean math achievement standard deviations will have higher levels of violence.	Mean Math Achievement SD	● -†	● -	● -*
H4d	Schools in nations with a higher ratio of income inequality, measured by the Gini coefficient, will have higher levels of violence.	Gini Coefficient	● +	● +	○ +*
H4e	Schools in nations with higher divorce rates will have higher levels of violence.	Divorce Rate	● +	● -†	● -*
H4f	Schools in nations with lower education expenditures as a percent of GDP will have higher levels of violence.	Educational Expenditures	● +* /	● -	● -
School-level Covariates					
H5a	Schools with a larger percent of female students will have lower levels of violence.	Percent Female	○ -* /	◙ -	○ -* /
H5b	Schools with a lower mean age of eighth grade students will have higher levels of violence.	Mean Age	● +	● -	● -
Nation-level Covariates					
H6a	Schools in nations with higher homicide rates will have higher levels of violence.	Homicide Rate	● +	● - /	● -
H6b	Schools in nations with a larger percent of female students will have lower levels of violence.	Mean Percent Female	● +	○ -†	◙ -
H6c	Schools in nations with a lower mean age of eighth grade students will have higher levels of violence.	Mean of Mean Age	● -	● +	● +†
Interaction Effect					

H7a	Schools in nations with lower mean math achievement scores and higher GDP per capita will have higher levels of violence.	GDPxMath Achievement Interaction	● +	● +†	● +**

†p<.10, *p<.05, **p<.01

Legend:

○ Hypothesis is supported

◙ Hypothesis is somewhat supported

● Hypothesis is not supported

+ Or – indicates the direction of the relationship

/ indicates covariate is included in the final combined model

Table 22: Theory Correspondence Table Summary of Analysis Results

Theory		Construct	Variables		A1	A2	A3
			School-Level	Nation-Level			
Social Disorganization Theory					S	S	Y
	Absolute Deprivation	Poverty	Percent Low SES Students	Mean Percent Low SES Students GDP per capita Adult literacy rate GDP growth rate	Y	Y	Y
		Heterogeneity	Language Heterogeneity	Mean Percent Language heterogeneity Percent international migrants	N	N	Y
		Mobility	School Size Eighth Grade Size City Size	Mean School size Mean Eighth Grade Size Mean City size	Y	N	N
Strain/anomie theories					S	S	N
		Opportunity	Mean Math Achievement Tracking	Mean Math Achievement Mean Tracking	Y	S	N
	Relative Deprivation	Strain	Math Achievement Score Standard Deviation	Mean Math Achievement Score Standard Deviation Gini Coefficient	N	Y	N
		Institutional Anomie/Social Support		Divorce Rate Educational Expenditures	N	N	N
Covariates			Mean Age Percent Female	Mean Age Mean Percent Female Homicide Rate	Y	S	Y

Y=Yes supported, S=Somewhat supported, N=Not supported

APPENDIX A: List of Nations Included in Analysis

Nations

Algeria
Armenia
Australia
Bosnia and Herzegovina
Botswana
Bulgaria
Canada (BC)
Canada (Ontario)
Canada (Quebec)
Colombia
Egypt
El Salvador
England
Georgia
Ghana
Hong Kong
Hungary
Indonesia
Iran
Israel
Italy
Jordan
Korea
Lithuania
Malaysia
Mongolia
Morocco
Russian Federation
Romania
Singapore
Slovenia
Spain
Sweden
Thailand
Tunisia
Ukraine
USA*
USA (Mass.)*
USA (Minn.)*

*The United States is excluded from the analysis of Models 2 and 3 because these nation units did not ask students to report on physical or emotional victimization at school. Other nations are listwise deleted for missing national-level data.

APPENDIX B: Variable Sources

	Variable	Source and Date
Outcome Variables		
Analysis 1: *Principals' Reports of School Violence*	*School Violence Scale* (5 items)	TIMSS 2007
Model 2: *Students' Reports of Physical Victimization*	% students hit or hurt	TIMSS 2007
Model 3: *Students' Reports of Emotional Victimization*	% students made fun of	TIMSS 2007
Predictor Variables		
Level-1 (School)		
	% Female	TIMSS 2007
	Mean math achievement	TIMSS 2007
	Math achievement score SD	TIMSS 2007
	School size	TIMSS 2007
	8^{th} grade class size	TIMSS 2007
	Tracking - math	TIMSS 2007
	City size	TIMSS 2007
	Mean age	TIMSS 2007
	% Students non-native language	TIMSS 2007
	% Students from low SES	TIMSS 2007
Level-2 (Nation)		
	Mean math achievement	TIMSS 2007
	Math achievement score SD	TIMSS 2007
	Gini Coefficient	U.N. Human Development Report 2009
	National homicide rate per 100,000	W.H.O. Mortality Database 2004-2009
	GDP per capita	U.N. Human Development Report 2009
	% Growth GDP per capita	U.N. Human Development Report 2009
	Percent of total population International Migrants 2005	U.N. Human Development Report 2007/2008
	Adult Literacy Rate (%)	U.N. Human Development Report 2007/2008
	Divorce rate per 1,000 people	UN Demographic Yearbook 2008
	Educational expenditures as % of GDP	CIA World Factbook 2010

APPENDIX C: Correspondence Table

Theory		Construct	Variables	
			School-Level	Nation-Level
Social Disorganization Theory				
	Absolute Deprivation	Poverty	Percent Low SES Students	Mean Percent Low SES Students GDP per capita Adult literacy rate GDP growth rate
		Heterogeneity	Language Heterogeneity	Mean Percent language heterogeneity Percent international migrants
		Mobility	School Size Eighth Grade Size City Size	Mean School size Mean Eighth Grade Size Mean City size
Strain/anomie theories				
		Opportunity	Mean Math Achievement Tracking	Mean Math Achievement Mean Tracking
	Relative Deprivation	Strain	Math Achievement Score Standard Deviation	Mean Math Achievement Score Standard Deviation Gini Coefficient
		Institutional Anomie/Social Support		Divorce Rate Educational Expenditures
Covariates			Mean Age Percent Female	Mean Age Mean Percent Female Homicide Rate

APPENDIX D: Correlations

Correlation Matrix 1: School-level (Total) Correlations, Analysis 1 Principals' Reports of School Violence

	SVS	SS	EGS	PLS	LH	CS	T	MA	MASD	PF	A
SVS	1										
SS	.298**	1									
EGS	.287**	.750**	1								
PLS	-.024	-.178**	-.010	1							
LH	-.120**	-.234**	-.020	.169**	1						
CS	.076**	.407**	.472**	-.120**	-.006	1					
T	.048**	-.123**	-.062**	-.096**	.016	-.041**	1				
MA	.158**	.309**	.097**	-.471**	-.356**	.113**	.114**	1			
MASD	-.131**	-.276**	-.320**	-.016	-.108**	-.263**	.066**	-.037**	1		
PF	-.061**	.051**	.010	-.066**	-.025	-.013	.044**	.073**	.027	1	
A	-.045**	-.192**	-.222**	.178**	.176**	-.135**	-.018	-.339**	.065**	-.065**	1

Listwise N=5150. Two-Tailed Significance Tests: * p≤.05 **p≤.01

School-level (Total) Correlation Matrix Key:

SVS	School Violence Scale (Principals' Reports)
SS	Log_e School Size
EGS	Log_e Eighth Grade Size
PLS	Percent low SES students
LH	Language Heterogeneity
CS	City size
T	Tracking
MA	Mean Math Achievement
MASD	Math Achievement SD
PF	Percent Female
A	Mean Age

Correlation Matrix 2: Between-Nation (Total) Correlations, Analysis 1 Principals' Reports of School Violence

	SVS	MSS	MEGS	MPLS	MLH	MCS	PIM	GDP	AL	GDPG	MT	MMA	MMASD	GC	DR	EE	HR	MPF	MA
SVS	1																		
MSS	.307	1																	
MEGS	.293	.670**	1																
MPLS	-.473**	-.125	-.029	1															
MLH	.057	-.142	.161	.001	1														
MCS	.243	.582**	.674**	-.200	.237	1													
PIM	.299	.246	.240	-.390*	.033	.451**	1												
GDP	.797**	.262	.288	-.692**	-.029	.408**	.440**	1											
AL	.191	.109	-.193	-.587**	-.351*	-.045	.301	.475**	1										
GDPG	-.072	.111	.177	.151	-.033	-.013	-.109	-.132	.053	1									
MT	.244	-.069	.042	-.243	-.144	.071	.149	.380*	.332*	-.107	1								
MMA	.393*	.332*	.292	-.688**	-.254	.400*	.486**	.714**	.705**	.135	.417**	1							
MMASD	-.513**	-.469**	-.469**	.117	-.215	-.388*	-.096	-.412**	.071	.042	-.038	-.060	1						
GC	-.050	.259	.183	.452**	.334*	.103	-.023	-.206	-.310	-.004	-.166	-.409**	-.299	1					
DR	.316	-.015	-.059	-.539**	-.208	.039	.292	.522**	.482**	-.307	.443**	.622**	.067	-.312	1				
EE	.467**	-.070	.119	-.046	.187	-.229	-.069	.147	-.157	.184	.027	-.096	-.133	.054	.078	1			
HR	-.105	.106	-.316*	.245	-.168	-.192	-.246	-.248	-.066	-.179	-.078	-.381*	-.068	.565**	-.133	-.217	1		
MPF	.094	.387*	.116	.033	-.210	-.027	.144	-.017	.051	-.195	.107	-.010	-.125	.317*	.128	.138	.339*	1	
MA	-.271	-.198	-.183	.478**	.307	-.228	-.392*	-.457**	-.398*	.167	-.258	-.475**	.120	.220	-.256	.069	.266	-.148	1

Listwise N=39. Two-Tailed Significance Tests: * p≤.05 **p≤.01

Between-Nation (Total) Correlation Matrix Key:

SVS	Mean School Violence Scale (Principals' Reports)
MSS	Mean Log_e School Size
MEGS	Mean Log_e Eighth Grade Size
MPLS	Mean Percent low SES students
MLH	Mean Language Heterogeneity
MCS	Mean City size
PIM	Percent International Migrants
GDP	Gross Domestic Product (per capita)
AL	Adult Literacy Rate (percent)
GDPG	GDP Growth (percent)
MT	Mean Tracking
MMA	Mean of Mean Math Achievement
MMASD	Mean Math Achievement SD
GC	Gini Coefficient
DR	Divorce Rate (per 1,000)
EE	Educational Expenditures (percent GDP)
HR	Homicide Rate
MPF	Percent Female
MA	Mean of Mean Age

Correlation Matrix 3: School-level (Total) Correlations, Analyses 2 and 3, Students' Reports of Physical and Emotional Victimization

	SVS	PV	EV	SS	EGS	PLS	LH	CS	T	MA	MASD	PF	A
SVS	1												
PV	-.019	1											
EV	.086**	.611**	1										
SS	.271**	-.055**	-.007	1									
EGS	.218**	.082**	.129**	.753**	1								
PLS	-.059**	.277**	.247**	-.193**	-.021	1							
LH	-.093**	.148**	.218**	-.251**	-.036*	.160**	1						
CS	.097**	.062**	.125**	.419**	.501**	-.110**	-.025	1					
T	-.041**	-.109**	-.154**	-.166**	-.122**	-.057**	.031*	-.068**	1				
MA	.068**	-.340**	-.303**	.305**	.085**	-.476**	-.332**	.126**	.037**	1			
MASD	-.084**	-.044**	-.163**	-.270**	-.333**	-.031*	-.160**	-.266**	.084**	.017	1		
PF	-.076**	-.163**	-.205**	.046**	.016	-.065**	-.021	-.013	.044**	.065**	.041**	1	
A	-.014	.004	.103**	-.181**	-.228**	.172**	.175**	-.136**	.015	-.321**	.048**	-.057**	1

Listwise N=4885. Two-Tailed Significance Tests: * p≤.05 **p≤.01

School-level (Total) Correlation Matrix Key:

SVS	School Violence Scale (Principals' Reports)
PV	Students' Reports of Physical Violence
EV	Students' Reports of Emotional Violence
SS	Log_e School Size
EGS	Log_e Eighth Grade Size
PLS	Percent low SES students
LH	Language Heterogeneity
CS	City size
T	Tracking
MA	Mean Math Achievement
MASD	Mean Math Achievement SD
PF	Percent Female
A	Mean Age

Correlation Matrix 4: Between-Nation (Total) Correlations, Analyses 2 and 3 Students' Reports of Physical and Emotional Victimization

	SVS	MPV	MEV	MSS	MEGS	MPLS	MLH	MCS	PIM	GDP	AL	GDPG	MT	MMA	MMASD	GC	DR	EE	HR	MPF	MA
SVS	1																				
MPV	-.068	1																			
MEV	.179	.543**	1																		
MSS	.322	-.215	.089	1																	
MEGS	.267	-.082	.195	.675**	1																
MPLS	-.479**	.385*	.269	-.122	-.015	1															
MLH	.084	.310	.563**	-.145	.169	.001	1														
MCS	.283	-.154	.225	.585**	.692**	-.203	.232	1													
PIM	.294	-.189	-.062	.247	.235	-.389*	.038	.460**	1												
GDP	.774**	-.276	-.015	.295	.261	-.756**	.005	.509**	.464**	1											
AL	.147	-.251	-.268	.110	-.220	-.587**	-.345*	-.032	.294	.456**	1										
GDPG	-.040	-.029	-.087	.112	.194	.146	-.041	-.021	-.102	-.092	.073	1									
MT	.153	.001	-.080	-.074	-.004	-.235	-.128	.102	.135	.264	.297	-.075	1								
MMA	.334*	-.402*	-.264	.343*	.266	-.698**	-.248	.440**	.488**	.688**	.697**	.173	.358*	1							
MMASD	-.504**	.007	-.404*	-.476**	-.467**	.116	-.232	-.408*	-.088	-.401*	.095	.028	.005	-.028	1						
GC	-.096	.164	.471**	.261	.169	.467**	.347*	.114	.114	-.306	-.340*	.010	-.226	-.468**	-.288	1					
DR	.195	-.302	-.230	-.019	-.142	-.585**	-.200	.089	.297	.377*	.465**	-.293	.337*	.580**	.152	-.433**	1				
EE	.440	.098	.158	-.072	.099	-.036	.204	-.219	-.082	.073	-.193	.207	-.036	-.154	-.113	.032	-.010	1			
HR	-.109	-.119	.058	.107	-.319	.246	-.169	-.193	-.246	-.279	-.066	-.180	-.082	-.396*	-.069	.570**	-.150	-.220	1		
MPF	.043	-.179	-.133	.403*	.109	.034	-.199	-.003	.137	-.122	.022	-.183	.061	-.062	-.092	.307	.046	.111	.353*	1	
MA	-.252	.084	.304	-.198	-.170	.474**	.304	-.238	-.388*	-.464**	-.388*	.158	-.237	-.465**	.110	.237	-.235	.090	.267	-.140	1

Listwise N=36. Two-Tailed Significance Tests: * p≤.05 **p≤.01

Between-Nation (Total) Correlation Matrix Key:

SVS	Mean School Violence Scale (Principals' Reports)
MPV	Mean Physical Victimization (Students' Reports)
MEV	Mean Emotional Victimization (Students' Reports)
MSS	Mean Log_e School Size
MEGS	Mean Log_e Eighth Grade Size
MPLS	Mean Percent low SES students
MLH	Mean Language Heterogeneity
MCS	Mean City size
PIM	Percent International Migrants
GDP	Gross Domestic Product (per capita)
AL	Adult Literacy Rate (percent)
GDPG	GDP Growth (percent)
MT	Mean Tracking
MMA	Mean of Mean Math Achievement
MMASD	Mean Math Achievement SD
GC	Gini Coefficient
DR	Divorce Rate (per 1,000)
EE	Educational Expenditures (percent GDP)
HR	Homicide Rate
MPF	Percent Female
MA	Mean of Mean Age

APPENDIX E: IRB Permission Letters

Office of Research Compliance

Institutional Review Board

2000 Kraft Drive, Suite 2000 (0497)
Blacksburg, Virginia 24060
540/231-4606 Fax 540/231-0959
e-mail irb@vt.edu
Website: www.irb.vt.edu

MEMORANDUM

DATE: February 23, 2011

TO: James Hawdon, Laura Agnich, Yasuo Miyazaki, Theodore D. Fuller, John W. Ryan

FROM: Virginia Tech Institutional Review Board (FWA00000572, expires October 26, 2013)

PROTOCOL TITLE: A Cross-National Study of School Violence

IRB NUMBER: 11-114

Effective February 23, 2011, the Virginia Tech IRB PAM, Andrea Nash, approved the new protocol
for the above-mentioned research protocol.

This approval provides permission to begin the human subject activities outlined in the IRB-approved
protocol and supporting documents.

Plans to deviate from the approved protocol and/or supporting documents must be submitted to the
IRB as an amendment request and approved by the IRB prior to the implementation of any changes,
regardless of how minor, except where necessary to eliminate apparent immediate hazards to the
subjects. Report promptly to the IRB any injuries or other unanticipated or adverse events involving
risks or harms to human research subjects or others.

All investigators (listed above) are required to comply with the researcher requirements outlined at
http://www.irb.vt.edu/pages/responsibilities.htm (please review before the commencement of your
research).

PROTOCOL INFORMATION:
Approved as: Exempt, under 45 CFR 46.101(b) category(ies) 4
Protocol Approval Date: 2/23/2011
Protocol Expiration Date: NA

Continuing Review Due Date*: NA

*Date a Continuing Review application is due to the IRB office if human subject activities covered under this protocol, including data analysis, are to continue beyond the Protocol Expiration Date.

FEDERALLY FUNDED RESEARCH REQUIREMENTS:

Per federally regulations, 45 CFR 46.103(f), the IRB is required to compare all federally funded grant proposals / work statements to the IRB protocol(s) which cover the human research activities included in the proposal / work statement before funds are released. Note that this requirement does not apply to Exempt and Interim IRB protocols, or grants for which VT is not the primary awardee.

The table on the following page indicates whether grant proposals are related to this IRB protocol, and which of the listed proposals, if any, have been compared to this IRB protocol, if required.

Invent the Future

V I R G I N I A P O L Y T E C H N I C I N S T I T U T E A N D S T A T E U N I V E R S I T Y

Date* OSP Number Sponsor Grant Comparison Conducted?
*Date this proposal number was compared, assessed as not requiring comparison, or comparison information was revised.

If this IRB protocol is to cover any other grant proposals, please contact the IRB office

(irbadmin@vt.edu) immediately.

cc: File

V I R G I N I A P O L Y T E C H N I C I N S T I T U T E A N D S T A T E U N I V E R S I T Y

Figure 1: Principals' Reports of School Violence (Scale) by Nation

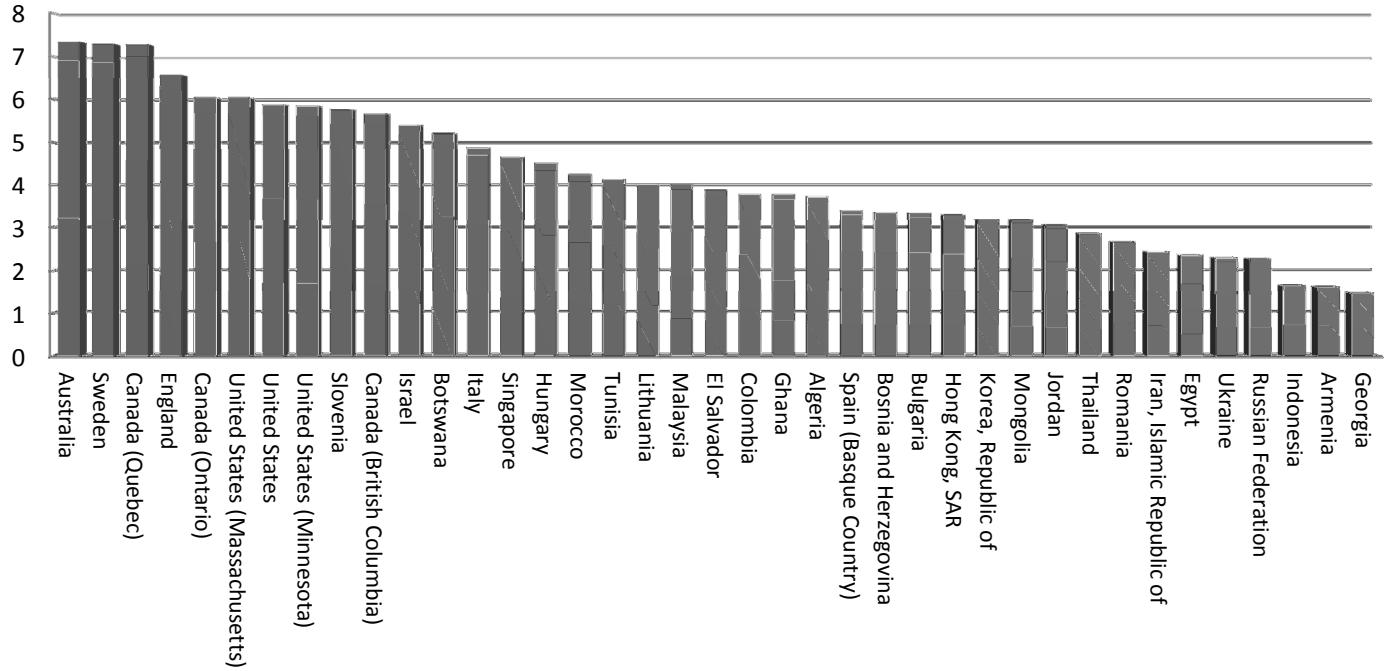

Figure 2: Students' Reports of Physical Victimization by Nation

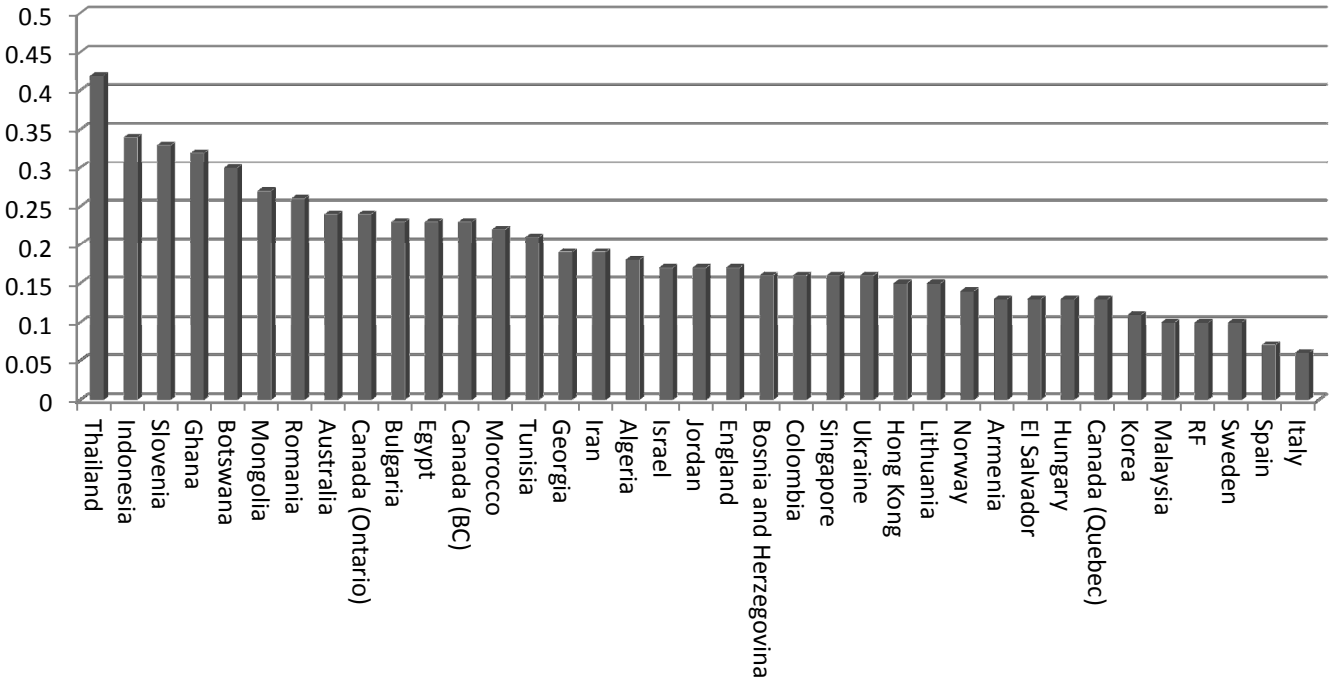

Figure 3: Students' Reports of Emotional Victimization by Nation