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CHARACTERISTICS OF SCHOOLS IN WHICH FATAL SHOOTINGS OCCUR[1]

ROBERTO FLORES DE APODACA, LAUREN M. BRIGHTON, ASHLEY N. PERKINS, KIANA N. JACKSON, AND JESSICA R. STEEGE

Concordia University–Irvine

Summary.—School-based violence, and fatal school shootings in particular, have gained increased attention in the media and psychological literature. Most reports have focused on the characteristics of perpetrators, but there is a growing awareness that school-related factors may also influence the occurrence of fatal school shootings. The current study examined several key characteristics of all schools where random (38) and targeted (96) fatal shootings occurred in the United States between 1966 and 2009. These were compared with a group (138) of schools randomly selected to represent the population of all schools in the United States. The size of a school's enrollment, urban or suburban locale, public funding, and predominantly non-white enrollment were positively associated with fatal shootings. Universities and colleges were disproportionately associated with random shootings and high schools with targeted ones. It was proposed that characteristics of schools that allow feelings of anonymity or alienation among students may help create environmental conditions associated with fatal school shootings. Implications for future research and interventions are considered.

School-based violence is a complex phenomenon that has garnered increased attention in the media and psychological literature (Culley, Conkling, Emshoff, Blakely, & Gorman, 2006). Fatal school shootings, in particular, have occurred throughout the world perhaps as long as schools and guns have co-existed (Benbenishty, Astor, & Zeira, 2003). Despite an occasional, massive amount of attention following such an incident, such as the classic 1966 shooting rampage of Charles Whitman at the University of Texas or Seung-Hui Cho's similar attack at Virginia Tech in 2007, the comprehensive cataloguing and clinical analysis of such events by the Federal Government and others date primarily to the mid-1990s (Furlong, Morrison, Cornell, & Skiba, 2004; Virginia Governor's Task Force, 2007). Although a number of scholars have sought to broaden the focus of research (Culley, *et al*., 2006), most empirical work has focused on individual characteristics of the perpetrators of school shootings (Wetterneck, Sass, & Davies, 2005). The current study was undertaken to move beyond an individual focus to identify those environmental characteristics that distinguish schools where fatal shootings have occurred.

The first systematic, nationwide cataloguing of all school-associat-

[1]Address correspondence to Roberto Flores de Apodaca, Ph.D., Psychology Department, Concordia University–Irvine, 1530 Concordia West, Irvine, CA 92632-3203 or e-mail (roberto.flores@cui.edu).

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ed, violent fatalities in the USA for a given period was published in 1996 through the combined efforts of the Centers for Disease Control and Prevention (CDC), and the U.S. Departments of Justice and Education (Kachur, Stennies, & Powell, 1996). Covering the academic years of 1992–1994, and including a rash of highly publicized fatal shootings, the researchers noted 220 violent incidents (mostly shootings) resulting in 253 deaths in the USA. While the number of these incidents was alarming and their frequency increasing, Kachur, *et al*. (1996) pointed out that violent, school-associated deaths were nonetheless rare and accounted for an annual incidence rate of .07 students per 100,000 attending school. Since then, federal agencies have monitored the incidence rate of these types of events nationally and prepared an annual School-Associated Violent Death Study (SAVD).

These annual studies have shown that the homicide rates in schools decreased significantly between 1992 and 2006, but still averaged 16.5 student homicide victims each year, 0.03 students per 100,000. Anderson, Kaufman, Simon, Barrios, Paulozzi, Ryan, *et al.* (2001) provided a qualification to this decline in the total number of victims in an epidemiological study covering the 1992 through 1999 academic years. They found that while the rate and total number of single-victim student homicides in the USA decreased during that period, the rates for students killed in multiple-victim incidents had increased significantly. These were the types of events Newman, Fox, Harding, Mehta, and Roth (2004) labeled "rampage" shootings, in their comprehensive examination of nine such fatal shootings. Rampage shootings were ones in which multiple victims were seemingly shot at random for their symbolic value. Correspondingly, the motives, methods, and psychology of the rampage shooters were noted as different from those of the more frequent, "targeted" shootings in which the perpetrator had a discernible grievance with the object of their lethal rage.

The data from the annual SAVDs showed that rates for both types of fatal school shootings have stabilized since 1999. However, incidents like the Virginia Tech University massacre, in April of 2007, and other high-profile mass shootings in schools show that American society is not yet free of such sudden, typically unpredictable, and immeasurably tragic events.

The scope and disturbing nature of these fatal shootings have prompted a number of efforts by the Federal Government to develop and implement prevention programs in middle and high schools. Some school-wide programs of this type have been the Safe Schools/Healthy Students Initiative, and Threat Assessment in Schools: A Guide to Managing Threatening Situations and to Creating Safe Schools (Culley, *et al*., 2006). These programs have two primary aims: first, helping students become less prone to

resorting to violence through training in various techniques of conflict resolution, impulse control training and social-skills enhancement, and second, changing the physical and social environment of the school such as the classroom climate, and school policies and their enforcement. Based on the social urgency of the problem and before empirical research had established the causes or correlates of school violence, these programs aimed at what their developers had concluded to be the underlying sources of school violence: a number of the characteristics of perpetrators and, less directly, environmentally based factors. Each of these classes of correlates is discussed here.

Individual Characteristics of Those Who Commit Such Acts

What are the characteristics of those who shoot others in schools? What kinds of interpersonal factors are associated with such incidents? Such questions about perpetrators have traditionally guided research to understand what precipitates these events, and how their occurrence may be prevented (Moore, Petrie, Braga, & McLaughlin, 2003).

Of all the *fatal* forms of school-based violence, shootings are the most frequent, dramatic instances, and account for the highest number of deaths (Verlinden, Hersen, & Thomas, 2000). The majority of the empirical studies have examined the motives and the psychological and demographic characteristics of perpetrators (Verlinden, *et al*., 2000). The typical characteristics of shooters has been a male with a mean age of 16 years, who abused drugs and alcohol, was involved in an interpersonal dispute, and frequently, belonged to a street gang. More recently, Zagar, Busch, Grove, and Hughes (2009) noted the important role of deficiencies in executive functioning, social maturity, and number of court contacts as important predictors of later homicide by adolescents who had come into contact with Juvenile Court. The CDC (2008a) analyzed written media accounts of 358 school-associated violent deaths occurring between July 1992 and June 1999. Of the 358 deaths, the perpetrators were nearly all males, whose median age was 16 years.

Empirical studies have found consistently that males are far more likely to be the perpetrators of school violence than females (CDC, 2008b). This fact is consistent with the general finding that male juveniles are arrested six times more often than females for all acts of violence (Verlinden, *et al*., 2000). The U.S. Department of Education (2006) conducted a nationwide investigation, relying on published media accounts, to better understand the motives of those who committed fatal acts of school-based violence. The most common motive involved interpersonal disputes, which accounted for 33% of the acts. Gang-related activities motivated 31.4% of the fatalities, whereas suicides accounted for the next 18.1% of the victims.

Romantic disputes accounted for an additional 11.4% of the fatalities, and the remainder were due to miscellaneous motives.

The FBI (O'Toole, 2000), although cautioning against the idea of a singular "profile," reported a number of personality and family characteristics commonly found in the backgrounds of school shooters. These included personality traits such as poor anger management and coping skills, which have also been noted by other researchers (Verlinden, *et al*., 2000; Wetterneck, *et al*., 2005; Zagar, *et al*., 2009). The FBI (O'Toole, 2000) and Verlinden, *et al*. (2000) also found that strained family relationships and insufficient parental monitoring were frequent in the families of these youths.

The Office of Juvenile Justice and Delinquency (2007) reported the two most commonly cited reasons for carrying weapons to school were to instill a sense of protection and respect. Of those who admitted to carrying guns to school, 18% claimed it was permissible to shoot someone merely if they showed disrespect. Although these attitudes and behaviors may be precursors to impulsive and deliberate acts of violence in the schools, some data indicate that those adolescents who carry weapons to school are not immediately distinguishable from those who commit nonweapons-related offenses in terms of their demographics, prior offenses, mental health characteristics, low intelligence, and substance abuse histories (Finkenbine & Dwyer, 2006).

As mentioned, substance abuse has been an important correlate of violence among youthful perpetrators. Kingery, Mirzaee, Pruitt, and Hurley (1991) stated that high school students who abused drugs were much more likely to carry weapons on campus, engage in more fights, and take more risks. Among a sample of 4,147 adolescents in high school, that best post-event correlates of having engaged in school violence were a history of binge drinking and other forms of substance abuse (Reid, Peterson, Hughey, & Garcia-Reid, 2006). All of these variables have been reported as correlates but not as predictors of school violence.

Environmental Factors Associated With Fatal School Shootings

If Pentz (1999) is correct in his formulation that rare, violent events occur as a result of the intermingling of person, situation, and environmental factors, then the Environmental factor has been proportionally under-investigated empirically in fatal school shootings (Culley, *et al*., 2006). Encouraged by Furlong, *et al*. (2004) and others in a special Issue of the *Journal of School Violence*, the research literature has more recently begun to address the current imbalance in favor of individual factors, with several recent studies examining a variety of contextual and environmental factors hypothesized to be involved in fatal school shootings.

Perhaps the school-related factors receiving the most consistent support in the literature as correlates of school violence are average class size

and total enrollment in the school (DeVoe, Peter, Kaufman, Ruddy, Miller, Planty, *et al*., 2003). Larger and more crowded schools consistently exhibit higher rates of violence than smaller, less crowded schools, by approximately a factor of 8 to 1 (Kaiser, 2005). Kaiser (2005) argued that school shootings may follow, in part, as responses to the social complexity inherent in large schools. In his analysis of 17 multiple-injury school shootings occurring in the decade preceding his study, Kaiser noted that 11 of 13 such shootings occurred in high schools with enrollments over 600, and many with enrollments over 1,000.

A number of other environmental factors have also been associated with the incidence of school violence. Osher, VanAcker, Morrison, Gable, Dwyer, and Quinn (2004) provided a list of these factors that included environment (e.g., vandalism to the school building is obvious, crowded and chaotic hallways during transitions), student behavior (e.g., extramural participation is low, strong social cliques are present), faculty and staff behavior (e.g., students may be scolded in public, student bullying is ignored), and school policy (e.g., PTA is not active, teaching is not observed). Other non-perpetrator social factors have included lack of attachment to the school (Verlinden, *et al*., 2000), exposure to violence and access to lethal weapons (O'Toole, 2000), older students, the presence of gangs (DeVoe, *et al*., 2003), and unreported bullying (Culley, *et al*., 2006). Clearly, the growing understanding of the correlates of school violence, including fatal shootings, shows that social and environmental factors as well as personal characteristics of shooters may well be operative in the occurrence of these types of incidents.

One investigation into the social precipitants and underpinnings of shootings in schools (e.g., the Columbine and Virginia Tech shootings) which was quite comprehensive was conducted by Newman and her students (2004). Relying on a variety of data sources (e.g., direct interviews, CDC archives and various media databases), the authors examined every instance of "rampage" (the title of their book) shootings that occurred in the USA between 1974 and 2002. They defined a "rampage" shooting as one which: (a) takes place on a school-related stage before an audience, (b) involves multiple victims, some of whom are shot simply for their symbolic significance, some at random, and (c) involves one or more shooters who were former students of the school.

The present study was done to contribute to the understanding of these less examined, environmental factors associated with school-based, fatal shootings. There might be different environmental influences at work in random (in which victims were selected seemingly at random or for their symbolic value) and targeted shootings (where specific victims were chosen given specific grievances the shooters had with them). The exam-

ined hypothesis was that the contribution of the environment (using the 1999 Pentz model) is likely to be different for random than it is for targeted shootings and might, therefore, involve different epidemiology in terms of the characteristics of school settings where they have occurred. In particular, a number of characteristics of those schools where different types of fatal shootings (targeted vs random) have occurred were examined to assess whether schools differed from each other and from the general population of schools in systematic ways. The current study had the following aims: (1) to examine the correlates of fatal school shootings in hopes of furthering the understanding of the understudied environmental factors associated with these shootings; (2) to explore whether certain environmental characteristics predict whether a shooting is random or targeted.

METHOD

Data Sources

First, all incidents of fatal school shootings that had occurred in the USA between 1966 and mid-2008 were identified. The inquiry into fatal school shootings was limited to those which have occurred since 1966, which seems a reasonably "current" era. This marks the post-American Civil Rights era, when the culture of U.S. schools underwent marked changes, which have remained in effect. An exhaustive listing of such incidents was collected from two authoritative compendia because there is no single, agreed-upon roster of fatal school shootings.

The two sources on school shootings considered most valid and comprehensive include Appendix L from the report, *Fatal School Shootings in the United States: 1966–2007*, compiled by the Virginia Governor's Task Force (2007) following the Virginia Tech University shooting, and the National School Safety Center, a federally funded database compiled annually from newspaper articles and other mass-media sources.[2] In combination, these sources provided brief accounts of every fatal school shooting recorded in the USA between 1966 and mid-2008, when this study was prepared. Information included names and locations of the schools in which shootings had occurred.

For current purposes, a number of characteristics were collected for all those schools. Fatal shootings were defined as a deliberate act of homicide committed by gunshot(s), by a perpetrator who had a formal, legitimate, and ongoing membership in the school (e.g., student, faculty, employee). Shootings by someone unaffiliated with the school were not thought to reflect information about that particular school's environment. Each school represented a single incident, as no school had more than one incident of fatal school shooting.

[2]Their ongoing, updated data set can be found at www.nssc1.org.

Random, Targeted, and Comparison Schools

Incidents of fatal shootings (i.e., schools where these occurred) were identified as random shootings when the perpetrator shot and killed people (typically multiple victims) without having a specific conflict, grievance, or relationship with them. The victims were selected seemingly at random or as symbolic targets of the shooter's diffuse rage. These incidents were akin to what Newman, *et al*. (2004) termed a "rampage" shooting. A classic example of a rampage shooting was the previously mentioned Virginia Tech University shooting in which the perpetrator shot and killed over two dozen people with whom he had no previous personal involvement. Through the Virginia Governor's Task Force (2007) and The National School Safety Center, 38 such fatal, random shootings were identified in American schools since 1966. In contrast, targeted shootings were characterized by a perpetrator who had a specific individual victim with whom a personalized grievance was held at the time of the fatal shooting. There were 96 schools in which such targeted fatal shootings had occurred.

For the purpose of analyses, a stratified, randomly selected, comparison group of schools was compiled. This comparison group of schools was roughly representative of the general population of schools in the USA. The dependent variables are noted below. Constructing a comparison group representative of the more than 100,000 schools found in the USA would be an enormous undertaking. Hundreds, if not thousands, of schools would be required to represent and control for differences in school grades, enrollment, location, ratio of ethnic groups, and many other important environmental characteristics. The admittedly modest (138) comparison group was constructed using a stratified, random sampling approach in which we picked universities, high schools, and middle schools in the proportion found in the general population of schools. The data employed were based on information listed in the National Center of Education Statistics (NCES),[3] a federally funded agency which tracks educational data nationwide and makes them available to the general public. The comparison group had the same ratio of location (urban, rural, suburban), funding source (public, private), and school level (college, high school, middle school, combined grades) characteristics as the total number of schools in the USA.

Correlates of School Shootings

Five variables were used for comparisons of schools in which fatal shootings had occurred. Four derived from earlier investigations which indicated some environmental characteristics of schools may influence the

[3]www.nces.edu.

TABLE 1
FREQUENCIES OF SCHOOL SHOOTINGS AND PREDICTOR VARIABLES

	Incident Type				χ^2	*df*	*p*
	Comparison ($n=138$)	Random ($n=38$)	Targeted ($n=96$)	Total ($N=272$)			
Location					22.83	4	.001
Urban	49	18	51	118			
Suburban	31	11	32	74			
Rural	58	9	13	80			
School					13.82	2	.001
Middle/High school	119	31	95	245			
College	19	7	1	27			
Funding					15.61	2	.001
Public	118	38	94	250			
Private	20	0	2	22			
Majority ethnicity					57.20	2	.001
White	111	21	30	162			
Non-white	27	17	66	110			

behavior of students: school level (i.e., middle school, high school, college; Soderstrom & Elrod, 2006), location (i.e., urban vs rural; Renfro, Huebner, Callahan, & Ritchey, 2003), ethnicity ratios (Newman, *et al*., 2004), and enrollment, as a proxy for school size (Kaiser, 2005). Further, the source of funding for the schools, public versus private, was examined.

Information on these variables for each school was recorded from the National Center for Education Statistics[3] and the schools' current web sites, as data from the moment of the fatal shooting were simply not available in most instances. The principal focus was on the comparisons between the three groups of schools, and there is no compelling reason to believe that they would have differed systematically over time; i.e., targeted, random, and control schools are likely to have changed in similar ways over time on the variables selected. Frequencies of all categorical variables may be found in Table 1. The following characteristics were recorded for each school:

School level.—Each school (comparison groups and control) was categorized as a middle school, high school, or college/university. Middle school, high school, and combined middle/high schools were collapsed into one group to compare with college campuses.

Location.—Each school was categorized as being located in an urban (large city), suburban (outskirt of cities), or rural location (well outside larger urban cities), according to NCES classification.

Enrollment.—The distribution of enrollments at each school was highly skewed ($M=2{,}201.2$, $SD=5{,}571.8$; Min. = 6, Max = 49,697). To aid in-

terpretation and analysis, deciles of enrollment were created with scores ranging from 0 (in the bottom 10th percentile of the sample) to 9 (in the 90th percentile of the sample).

Ethnicity ratios.—These were used to classify each school as predominantly white (>50% white) or predominantly non-white (≤50% white).

Funding source.—Schools were categorized as having public, private, or a combination of funding sources.

Analytic Plan

Logistic regression is an extension of linear regression, ideal for dichotomous outcomes such as whether a fatal school shooting was present (1) or absent (0), or whether a fatal school shooting was a random (0) or targeted (1) incident. Interpretation of logistic regression coefficients is similar to that of linear regression. However, whereas regression coefficients represent the expected change in the dependent variable (y) for a 1-unit change in the independent variable (x), the logistic regression coefficient represents the expected change in the logit of y for a 1-unit change in x. As interpretation of the change in logit is unintuitive for most, results are often presented as odds ratios (OR), obtained by exponentiating the regression coefficient ($OR = e^{\beta 1}$). The OR has a much more straightforward interpretation than the logistic regression coefficient.[4]

Logistic regression is well suited to answer the aims of this study; however, due to the sparsity of data and occurrence of cells with a frequency of 0 (Table 1), assumptions associated with logistic regression, such as large sample size and data distribution, may not be met. Therefore, exact logistic regressions were used for all analyses and run on STATA 11.2. This method is computationally intensive but avoids reliance on statistical assumptions that may not have been met in the data (Hosmer & Lemeshow, 2000). Exact logistic regression provides ORs that can be interpreted in the same manner as those in a typical logistic regression. To test the first aim of the study, five separate exact logistic regressions were run with school shooting present (1) versus absent (0) as the dependent variable with each of the above-specified independent variables. Similarly, to test the second aim, five separate exact logistic regressions were run with random (1) versus targeted (0) shootings as the dependent variable. All tests were run with $\alpha = .05$.

[4]The OR represents how much more (or less) likely it is for the outcome to be present for a 1-unit increase in x. For example, if y represents the presence or absence of depression, and x represents the presence of a family history of depression, an OR = 2.0 estimates that depression is twice as likely to occur among those with a family history of depression as those without a family history of depression. Conversely, if x represented regular exercise, an OR of 0.5 would indicate that depression is one half as likely to occur among those who exercise regularly compared to those who do not.

RESULTS

School Shootings

Logistic regressions showed that fatal school shootings were more than three times more common in urban (OR = 3.71, $p < .001$) and suburban (OR = 3.65, $p < .001$) than rural schools (Table 2). Further, fatal school shootings were more likely at schools that had higher enrollment (OR = 1.32, $p < .001$) and public funding (OR = 11.18, $p < .001$). Fatal school shootings were 2.5 times more likely to occur at a high school or middle school campus compared with a college campus (OR = 2.51, $p = .05$), and more than six times more likely to occur at predominantly non-white compared with predominantly white schools (OR = 6.69, $p < .001$).

Random versus Targeted Shooting

Compared to college campuses, middle or high schools were less likely to have a random rather than targeted shooting (OR = .05, $p < .01$). Schools with a student body consisting of predominantly white students were 2.7 times more likely to have a random rather than targeted shooting (OR = 2.71, $p = .01$). Fatal shootings were equally likely to be random or targeted in urban (OR = 0.51, $p = .19$) and suburban (OR = 0.50, $p = .21$) compared with rural school locations. Further, no association between school shooting type (random or targeted) was found with enrollment size (OR = 0.98, $p = .80$) or funding source (OR = 0.96, $p = 1.00$). This last finding should be interpreted cautiously as only two shootings took place at private schools. Both the chi-squared and the Hosmer-Lemeshow goodness-of-fit tests indicated that the model was a good fit to the data and that the number of observations was greater than the number of covariate patterns in the model.

TABLE 2
ODDS RATIOS OF SCHOOL CHARACTERISTICS AND SHOOTING OCCURRENCE

	School Shootings[a]		Random vs Targeted Shootings[b]	
	Odds Ratio	95%*CI*	Odds Ratio	95%*CI*
School location				
Urban	3.69†	1.93, 7.21	0.51	0.17, 1.61
Suburban	3.62†	1.77, 7.60	0.50	0.15, 1.72
Rural[c]				
Enrollment size	1.32†	1.20, 1.45	0.98	0.83, 1.15
College campus[d]	0.40*	0.15, 0.99	20.9†	2.53, 976.53
Public funding	11.11†	2.61, 100.07	0.96	0.07, +∞
Predominantly White	0.15†	0.08, 0.27	2.70*	1.17, 6.32

Note.—All models run with exact logistic regression. [a]School shooting = 1, comparison school = 0. $N = 272$. [b]Random shooting = 1, targeted shooting = 0. $n = 134$. [c]Rural schools were the comparison group. [d]College campus was dummy coded and compared to the aggregated categories of high/middle schools. *$p < .05$. †$p < .001$.

Because the above variables can all interact and influence the findings, the following interactions were considered. There was a significant interaction between type of school and ethnic makeup of the campus with high/middle schools that were also predominantly non-white being more likely to have fatal shootings occur (OR = 8.50, $p = .03$). There was no significant interaction between ethnic makeup and location of the school or between the location of the school (rural vs suburban vs urban) and the type of school (middle/high vs college).

Multivariate analyses were performed that allowed for the examination of all significant independent variables simultaneously, while controlling for the effects of each of these variables on the others. Only variables that were significant at the univariate level were included in the final model. Results of these analyses are displayed in Table 3. This was done separately for whether or not a school shooting occurred and what type of shooting took place (random vs targeted).

TABLE 3
VARIABLES ASSOCIATED WITH SCHOOL SHOOTINGS ($N = 272$)

	School Shootings		Targeted	
	OR	*SE*	OR	*SE*
Funding	5.15	4.33		
Type of school	4.25*	2.61	16.99†	18.71
Race/ethnicity	3.93†	1.22	2.26*	0.94
Enrollment	1.31†	0.09		
Suburban school	1.65	0.68		
Urban school	1.39	0.53		

Note.—Above variables dummy coded. Publicly funded schools compared to privately funded (coded 0). Middle/high schools compared to colleges (coded 0). Predominantly non-white campus ethnicity compared to predominantly white (coded 0). Suburban and urban schools were compared to rural schools (coded 0). Column labeled "Targeted" dummy coded and compared to "Random" shootings (coded 0). *$p < .05$. †$p < .01$.

DISCUSSION

School-based violence has a long history and literature. Many different types of violent incidents have occurred in schools over the years, and there are indications that although the frequency of fatal school shootings may have decreased in recent years (CDC, 2008), the phenomenon is still far from absent. Overwhelmingly, researchers have paid the most attention to the personal characteristics and motives of perpetrators (Verlinden *et al.*, 2000; Zagar, *et al.*, 2009), with cause, as several of their characteristics have been identified consistently; e.g., feeling alienated, being male, having substance abuse problems, gang affiliation, disengagement from school, having troubled family relationships, or having psychiatric problems have all been linked with school shootings. The current study was

conceptualized out of the relative dearth of research into environmental characteristics of these incidents (Culley, *et al*., 2006). Additionally, the theoretical model of Pentz (1999), which argued for the cumulative contribution of person (P), situation (S) and environmental (E) characteristics in the occurrence of extremely rare, fatal shootings in schools, provided a rationale for this investigation.

Significant relationships were found between several dimensions of school environments and these types of fatal shootings. Logistic regressions showed that fatal school shootings were over three times more common in urban and suburban than in rural schools. It was also found that fatal school shootings were more likely to occur in schools with higher enrollment and, especially, public funding. These shootings were 60% less likely to occur on a college campus, when compared with middle or high schools. The ethnicity ratios of schools was also found to be a regressor as fatal shootings were 85% less likely to occur at a predominantly white when compared with a predominantly non-white school. The results showing greater prevalence of these occurrences in urban schools echoed the earlier findings of Renfro, *et al*. (2003) and others.

Perhaps more surprising was the finding that schools which were privately funded were disproportionately less likely to experience fatal school shootings than those which were publicly funded. In our sample of 134 American schools where fatal shootings had occurred since 1966, only two of them were privately funded schools.

An environmental condition allowing relative anonymity may well be at work in instances of fatal school shootings (Hyman, Cohen, & Mahon, 2003). Ever since the tragic case of Kitty Genovese, in which numerous bystanders passively witnessed her murder without any of them taking action to help or even report the event, the psychological literature has recognized the fact that the more someone is able to obscure his or her presence in a group, the less likely that person is to act responsibly (Latane & Darley, 1970). Feelings of alienation among students have been found to act as the justification for counter-aggression in the form of bullying and hurting others (Reid, Patterson, & Snyder, 2002). Aspects of these phenomena may be at work in school-based shootings where the larger the school, the more likely they are to happen. Consistent with this formulation were the findings that private schools were far less likely to experience either type of shooting. These findings suggest when identification with the character of the school is higher, as it arguably is in the case of private schools where the student body is likely to be more homogeneous, it is relatively less possible to withdraw from social contact and be anonymous.

This condition of anonymity, or lacking a sense of belonging to the larger, more unified identity of the school, may well be a significant factor

in the occurrence of fatal school shootings (Trusty & Dooley-Dickey, 1993). The data suggest that several characteristics of schools may be significant contributors to the E part of Pentz's (1999) P + S + E model for understanding such rare events. Random shootings were proportionately more likely to occur at the college level, where it was found that college campuses were 20 times more likely to have a random rather than targeted shooting. School size might be the most compelling factor associated with school-based, fatal shootings; with larger enrollment being strongly associated with violent incidents, consistent with Kaiser's (2005) findings.

It may also be that other environmentally related characteristics of schools may be at work, as some researchers have suggested (e.g., Culley, *et al*., 2006). Putative predictors include "un-owned" locations on the school grounds, the difficulty of enforcing disciplinary actions, and the general fact that certain behaviors can go unnoticed. These behaviors include policy violations, bullying, small acts of violence, and even planning of larger-scale incidents. These factors all play into student–teacher ratio, and the higher the ratio, the greater the likelihood of anonymity.

The principal strengths of the current study are, first, its comprehensive review of all incidents of fatal school shootings we were able to identify, dating back to 1966, and second, its empirical/quantitative approach to a subject matter that has largely been analyzed qualitatively. Apparently, this is the first study of the environmental correlates of school shootings to use this empirical methodology. In addition, multivariate logistic regression analyses allowed for the control of the influence of each variable on the others.

The limitations to the study's approach were substantial, beginning with the modest size of the comparison group of schools ($n = 138$). To get a control group truly representative of the 100,000-plus schools in the United States, which accurately controls for the relevant variables needed to be considered (i.e., level of school, enrollment, location, funding source), would require hundreds if not thousands of schools. It remains for future research to improve on these characteristics and strengthen the statistical findings.

Future work of this sort can take several directions. Perhaps anonymity experienced by perpetrators can be analyzed qualitatively and considered in combination with school characteristics where the shootings took place. Also, school shootings date back to 1966, but school characteristics data were taken from current information. There is no reason to suspect that the three school groups were affected differentially by this fact, but it is a limitation, nonetheless. Strengths and limitations suggest that these findings should be considered suggestive and preliminary.

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