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Original article

Case-control study of student-perpetrated physical violence against educators

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ABSTRACT

Purpose: Although prior research focused primarily on student-on-student school violence, educators are also at risk. This study was designed to identify risk factors for assaults against educators.
Methods: Kindergarten-grade 12 educators ($n = 26{,}000$), randomly selected from a state license database, were screened for eligibility (6,469, eligible) by mailed questionnaire. Phase 1 (12-month recall) identified eligible assault cases ($n = 372$) and controls ($n = 1{,}116$), June 2004 to December 2005; phase 2 (case-control study; response, 78%) enabled identification of exposures through 1-month recall before student-perpetrated assaults (cases) and randomly selected months (controls). Directed acyclic graphs enabled confounder selection for multivariable logistic regression analyses; reweighting adjusted for potential biases.
Results: Risks (odds ratios, 95% confidence intervals) increased for working in: Special Education (5.84; 4.07–8.39) and School Social Work (7.18; 2.72–18.91); kindergarten to second grade (1.81; 1.18–2.77); urban (1.95; 1.38–2.76) schools; schools with less than 50 (8.40; 3.12–22.63), 50–200 (3.67; 1.84–7.34), 201–500 (2.09; 1.32–3.29), and 501–1000 (1.94; 1.25–3.01) students versus more than 1000; schools with *inadequate* resources always/frequently (1.62; 1.05–2.48) versus infrequently/never; *inadequate* building safety always/frequently (4.48; 2.54–7.90) versus infrequently/never; and environments with physical barriers (1.50; 1.07–2.10). Risks decreased with routine locker searches (0.49; 0.29–0.85) and accessible exits (0.36; 0.17–0.74).
Conclusions: Identification of assault risk factors provides a basis for further investigation and interventions.

Introduction

Violence is an important cause of occupational mortality and morbidity [1,2]. In the United States, homicide is the second leading cause of occupational fatality for both men and women [3]. Although much is known about work-related fatalities, research on nonfatal violence, accounting for approximately 2 million events annually [4], and relevant risk factors is limited.

Based on 2005–2009 data, U.S. educators had the fifth highest annual nonfatal occupational violence rate: 6.5 events per 1000 educators—exceeded only by rates for law enforcement (47.7), mental health (20.5), transportation (12.2), and retail sales (7.7) employees [4]. Despite limited literature, it is evident that violence against educators is an international problem as well [5–9].

Students are primary perpetrators of violence against educators [10–14]. In the 2007–2008 school year, over 7% of U.S. elementary and secondary school educators were threatened and 4% physically attacked [15]. Greater percentages of public (vs. private) school educators reported being *threatened* (8% vs. 3%) or *physically attacked* (4% vs. 2%) by students [15]. Although student-on-student violence has been identified as a problem, little is known about nonfatal violence against educators, including risk factors.

The study objective was to examine specific exposures hypothesized *a priori* as associated with the risk of nonfatal work-related physical assault (PA) outcomes among Minnesota educators. This

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includes environmental factors that enable opportunities for more permanent types of interventions that can benefit greater numbers of people.

Methods

Overview of the Minnesota Educators' Study

This study design involved two phases: phase 1, a comprehensive study to collect data on incidence and consequences of PA and nonphysical violence and phase 2, a nested case-control study (http://www.strobe-statement.org) to identify risk factors for PA—*the primary focus of this article*. Approval for the conduct of this study was obtained from the University of Minnesota Institutional Review Board.

Study population

The target population included all educators (teachers, specialists, and administrators), identified from the Minnesota Department of Education's License List [16], who were working during the study period. This is a population for which a database of contact addresses and demographic information, used for selection of subjects and subsequent adjustment, was available.

Study cohort

From pilot study results, most "lifetime" licensees (no expiration date) were retired or deceased and, thus, excluded. Also excluded were those whose licenses expired before 2003. From the remaining 116,661 educators, a sample of 26,000 individuals [17–19] was randomly selected for a screening survey to further determine eligibility, requiring employment as a Minnesota licensed educator in a kindergarten through 12th grade (K-12) school within the past 12 months (based on survey completion date between June 2005 and December 2005). Among the 8,614 educators returning a screening survey, 6,469 indicated that they met the eligibility requirement and were considered potentially eligible to be sent the phase 1 questionnaire (Fig. 1).

Selection of cases and controls

Cases were initially identified by educators reporting at least one work-related PA event during the previous 12 months on the phase 1 survey ($n = 372$). Controls, selected randomly (3:1 ratio; $n = 1{,}116$), reported no PA events during their eligible reported working months.

Variables and measures

Definitions

Violence is the intentional use of physical force or emotional abuse against an individual resulting in physical or emotional injury and consequences. In this article, only PA was addressed; PA occurs when one is hit, slapped, kicked, pushed, choked, grabbed, sexually assaulted, or otherwise subjected to physical contact intended to injure or harm. Violence is work-related if it occurs during any activities in the work environment or is associated with the job (including travel). These definitions, primarily consistent with those incorporated in a prior occupational violence study [20–22], reflect those identified by the National Institute for Occupational Safety and Health [23] and were approved for this study in consultation with the Educational Advisory Consulting Team, involving teachers and administrators who participated in study development, instrument review, and results discussions.

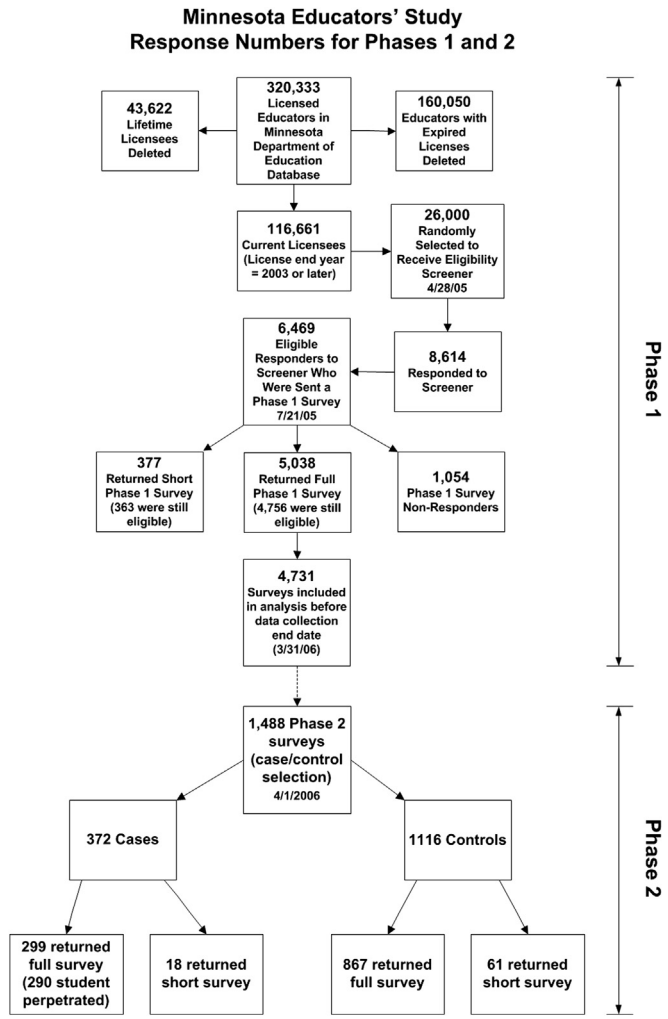

Fig. 1. Minnesota Educators' Study: response numbers for phases 1 and 2.

Exposure assessment

The following data were collected on specific characteristics and relevant exposures established *a priori*, based on a conceptual model derived from the literature [24]: *educator characteristics* (age; gender; race; highest education level; years worked as licensed educator and in current school; grade levels taught; job classification; and primary professional activity); *characteristics of students with whom educators interacted* (average number of students assigned per day; student contact hours per day; most common age group and primary gender of students taught; student race/ethnicity primarily same/different from educator; any type of student impairment; and parental involvement); *workplace/surrounding environmental factors* (type/location of school; average number of students enrolled; school resources and building safety; routine locker searches; level of lighting; exit accessibility; physical barriers; whether administration took corrective measures against workplace assault; and frequency of educators witnessing students involved in PA or nonphysical violence [threats; sexual harassment; verbal abuse; and bullying]. Continuous variables, such as years worked as a licensed educator and average number of students assigned per day, were categorized for data analysis using percentile cut points (median, quartiles).

Data collection

The specially designed data collection instruments and contact procedures were tested through a pilot study ($n = 300$) and, after

minimal modifications, implemented for the full study [24]. For both the phase 1 study [19] and phase 2 nested case-control study (described below), up to four follow-up mailings were sent following initial mailings to enhance response. As many as two follow-up attempts by mail and/or telephone to clarify responses, incompatible with logic checks, were also conducted. Mailings included a cover letter providing information for participant consent, together with the survey, and postage-paid, return envelope.

The phase 1 survey instrument was sent to the 6,469 eligible educators to determine those who worked as educators in Minnesota and did or did not experience work-related violence; collect comprehensive data on violent experiences during the previous 12-month period [18,19]. Based on these data [19], average participant age was 46 years (±SD, 10.6); 77% were women. The estimated annual adjusted PA rate (95% confidence interval), accounting for at least one PA, was 8.3 (7.6, 9.1) per 100 educators, primarily resulting in bruises/contusions, cuts/lacerations/scratches, or abrasions. Among the perpetrators (97% students), at least 78% were reported to have disabilities or developmental delays; 71% were aged younger than 13 years. "Assault instruments" primarily involved hands/arms (81%), feet/legs (53%), and teeth (14%). Up to 26% of cases required some type of treatment. Resulting symptoms were reported to last at least a month for up to 24% of the cases. Work status changes (quit; transfer; modification; leave of absence) involved up to 20% of educators.

The focus of this article, a nested case-control study design (phase 2), was used to examine the relation between specific exposures of interest and work-related PA. Surveys were mailed to the cases and controls to obtain data on various characteristics and work-related exposures to identify potential risk factors. Cases were questioned about their exposures 1 month before the PA. If multiple events were reported, cases were surveyed about the month before the earliest event to reduce bias from more recent assault effects. Controls were questioned about their exposures on a randomly selected month worked during the study period to provide the person-time exposure information.

Data analyses

Among the 1,488 educators who were mailed a case-control survey, 1,166 (78%) returned the full survey. Although 299 of the 372 cases returned the full survey, only student-perpetrated cases ($n = 290$, 97%) were included in the analyses. The goal of the analyses was to estimate the effect of specific exposures of interest on work-related PA, whereas controlling for important confounding factors. For each exposure of interest, confounders were selected *a priori* for multivariable logistic regression, using the counterfactual principles in Maldonado and Greenland [25] and based on directed acyclic graphs (DAGs) [26,27]. The assumption behind the regressions is that adjustment for confounders can create a valid counterfactual substitute [25] for the comparison of exposed with unexposed members of the target population. A master DAG was created for the outcome of interest; then for each causal factor of interest, the DAG was reduced to the relevant pathways to identify a minimal set of confounders to be included in the regression [26]. This method identifies parsimonious models and excludes covariates that should not be entered into the regression lest they introduce bias [27].

Potential response bias was controlled by inversely weighting observed responses by probabilities of response [28], estimated as a function of characteristics available from the licensing database [16]: year of birth; first and last year of licensure; last fiscal year of employment; gender; zip code; years worked as a teacher or principal; salary; class period minutes; class periods per week; and grade levels taught. To adjust weighting for unknown eligibility among nonrespondents, probability was estimated from these same factors [29]. Validation procedures, reported elsewhere, were conducted for self-reported PA injury occurrences, through review of health-care records, and various workplace exposures through contact with school principals [18]. Health-care providers, who responded with injury treatment information for consenting cases and controls, confirmed that all controls and cases that indicated no treatment did not have any documented work-related assault injuries during the reference period (negative predictive value, 100%). Among the 12 consenting cases that had reported health-care treatment for their PAs and whose health-care providers responded to the validation survey, only four had health-care treatment confirmed. However, among the remaining eight cases, seven educators had experienced ongoing/multiple events, typically involving minor injuries, where perpetrators were special education students (six of eight) or students with disabilities.

Sensitivity analyses were conducted to determine the potential effect of an unmeasured confounder on PA risk for educators [30]. Home value, identified for an available subset of the respective schools in which educators worked, was used as an indicator of the economic status of the local school district. This factor was hypothesized as a potential unmeasured confounder that could influence associations between environmental and student characteristics and PA. Home value was analyzed as a binary variable: whether or not the home value surrounding the school was lower than the state average. This variable was included in models that tested the associations between the following characteristics and PA: inadequate school resources; inadequate building safety; routine locker searches; and the level of parental/family/guardian involvement.

Results

Cases and controls (Table 1) were not different by age, gender, and race. Cases versus controls were more likely to have advanced degrees; have less work experience; teach in primary-level grades; work full-time in specialized areas with smaller-sized classes of younger students versus classroom teaching; have primarily male students with race/ethnicity different from the educator; report poorer level of parental involvement; and work in urban public versus private schools where resources, building safety, and administrative support appeared deficient. Risk estimates are provided in Table 1 as odds ratios (with 95% confidence intervals) for the fully adjusted multivariable analysis, weighted for nonresponse and unknown eligibility; the unadjusted odds ratios are also presented.

Student-perpetrated PA risks increased for educators who had advanced versus bachelors' degrees; taught Kindergarten through second grades; and worked primarily as Social Workers or Special Education Teachers versus classroom teachers. Decreased risks were identified for educators who worked as: licensed educators or in the current school for 7 years or more versus less than 7 years; part-time contract or as substitutes versus full-time contract.

Based on characteristics of students with whom they primarily worked, educators were at increased risk if the students' race/ethnicity was not the same as theirs or they were unsure. Risk was also increased if students were perceived to be impaired because of disability or developmental delay. In addition, as the reported level of parental involvement declined, the associated risk of PA increased. When parental involvement was reported as poor versus outstanding/very good, risk was eight times greater.

Risks decreased in a dose-response relation with increasing numbers of students assigned to the educator, on average per day. Decreased risks were also reported for working with students aged

Table 1
Minnesota educators' study: case-control participant demographics and exposures and univariate and multivariate analyses of risk of PA

Characteristics/exposures	Cases	Controls	Univariate	Multivariate
	N[*] (%)	*N*[*] (%)	Odds ratio (95% CI)	Odds ratio (95% CI)
Educator characteristics				
Age				
<25	2 (0.7)	7 (0.8)	1.19 (0.26–5.51)	1.19 (0.26–5.51)
≥25 to <35	59 (20.3)	138 (15.9)	1.47 (0.96–2.25)	1.47 (0.96–2.25)
≥35 to <45	63 (21.7)	217 (25.0)	0.93 (0.62–1.41)	0.93 (0.62–1.41)
≥45 to <55	107 (36.9)	305 (35.2)	1.04 (0.72–1.51)	1.04 (0.72–1.51)
≥55	59 (20.3)	200 (23.1)	1 (—)	1 (—)
Gender				
Male	55 (19.0)	197 (22.7)	1 (—)	1 (—)
Female	235 (81.0)	670 (77.3)	1.01 (0.73–1.40)	1.01 (0.73–1.40)
Race				
White	283 (97.6)	849 (97.9)	1 (—)	1 (—)
Non-white	6 (2.1)	14 (1.6)	0.79 (0.26–2.37)	0.79 (0.26–2.37)
Highest level of education[‡]				
Associate/bachelor's degree	91 (31.4)	334 (38.5)	1 (—)	1 (—)
Master's degree	163 (56.2)	450 (51.9)	1.34 (0.99–1.80)	1.41 (1.04–1.91)
Education specialist degree	27 (9.3)	64 (7.4)	1.76 (1.07–2.91)	1.89 (1.14–3.16)
Doctorate degree	6 (2.1)	6 (0.7)	4.31 (1.36–13.72)	5.06 (1.57–16.35)
Years worked as licensed educator[§]				
<7	76 (26.2)	157 (18.1)	1 (—)	1 (—)
≥7	212 (73.1)	706 (81.4)	0.62 (0.45–0.86)	0.54 (0.36–0.80)
Years worked in current school[§]				
<7	161 (55.5)	396 (45.7)	1 (—)	1 (—)
≥7	120 (41.4)	459 (52.9)	0.61 (0.46–0.80)	0.59 (0.44–0.81)
Grade level taught[‖] (Yes vs. no for each category)				
K to 2nd grade	92 (31.7)	211 (24.3)	1.65 (1.19–2.28)	1.81 (1.18–2.77)
3rd to 6th grade	114 (39.3)	292 (33.7)	1.34 (0.98–1.85)	1.33 (0.90–1.95)
7th to 9th grade	78 (26.9)	281 (32.4)	0.88 (0.64–1.22)	1.35 (0.87–2.10)
10th to 12th grade	45 (15.5)	207 (23.9)	0.60 (0.41–0.88)	0.61 (0.37–1.00)
Job classification[¶]				
Full-time contract	252 (86.9)	694 (80.1)	1 (—)	1 (—)
Part-time contract	18 (6.2)	99 (11.4)	0.52 (0.31–0.87)	0.37 (0.20–0.68)
Substitute	15 (5.2)	65 (7.5)	0.54 (0.29–1.00)	0.55 (0.26–1.14)
Primary professional activity[#]				
Classroom teacher	113 (39.0)	601 (69.3)	1 (—)	1 (—)
Administrator/superintendent/dean of students	14 (4.8)	53 (6.1)	1.18 (0.62–2.25)	0.89 (0.40–1.96)
Guidance counselor/school psychologist	11 (3.8)	25 (2.9)	2.22 (1.06–4.65)	2.00 (0.88–4.50)
School social worker	15 (5.2)	8 (0.9)	9.59 (3.97–23.12)	7.18 (2.72–18.91)
Special education	117 (40.3)	109 (12.6)	6.16 (4.43–8.56)	5.84 (4.07–8.39)
Other[†]	10 (3.5)	45 (5.2)	0.95 (0.44–2.02)	0.93 (0.41–2.10)
Multiple	5 (1.7)	12 (1.4)	1.86 (0.62–5.56)	1.97 (0.63–6.19)
Student characteristics				
Number of students, on average per day, assigned to educator[**]				
>0 to ≤23	81 (27.9)	141 (16.3)	1 (—)	1 (—)
>23 to ≤45	48 (16.6)	159 (18.3)	0.47 (0.31–0.72)	0.60 (0.37–0.97)
>45 to ≤120	42 (14.5)	186 (21.5)	0.30 (0.20–0.48)	0.42 (0.24–0.73)
>120	31 (10.7)	167 (19.3)	0.29 (0.18–0.47)	0.31 (0.17–0.57)
Number of hours per day of student contact[††]				
Per hour increase			0.991 (0.933–1.052)	1.033 (0.944–1.131)
Most common age group among students[‡‡]				
<10 y	91 (31.4)	226 (26.1)	1 (—)	1 (—)
≥10 y	93 (32.1)	382 (44.1)	0.66 (0.47–0.92)	0.64 (0.44–0.92)
Mixed age groups	17 (5.9)	41 (4.7)	1.01 (0.54–1.90)	1.03 (0.51–2.04)
Unsure	2 (0.7)	5 (0.6)	0.84 (0.15–4.83)	0.78 (0.12–5.03)
Primary gender of students[§§]				
Male	82 (28.3)	112 (12.9)	1 (—)	1 (—)
Female	5 (1.7)	34 (3.9)	0.16 (0.06–0.46)	0.23 (0.07–0.73)
Equivalent	113 (39.0)	501 (57.8)	0.29 (0.20–0.41)	0.47 (0.30–0.73)
Unsure	3 (1.0)	8 (0.9)	0.37 (0.09–1.57)	0.51 (0.11–2.37)
Students of same race/ethnicity as educator[‖‖]				
Yes	119 (41.0)	515 (59.4)	1 (—)	1 (—)
No	75 (25.9)	128 (14.8)	2.65 (1.87–3.76)	2.41 (1.54–3.77)
Unsure	9 (3.1)	10 (1.2)	3.33 (1.31–8.46)	3.48 (1.18–10.24)
Any students impaired because of injury or illness[¶¶]				
No	118 (40.7)	388 (44.8)	1 (—)	1 (—)
Yes	84 (29.0)	262 (30.2)	1.00 (0.72–1.39)	1.12 (0.77–1.61)
Any students impaired because of disability or developmental delay[¶¶]				
No	9 (3.1)	97 (11.2)	1 (—)	1 (—)
Yes	193 (66.6)	553 (63.8)	3.84 (1.88–7.87)	2.79 (1.31–5.97)
Any students impaired because of alcohol, aerosols, or drugs[¶¶]				
No	145 (50.0)	454 (52.4)	1 (—)	1 (—)
Yes	57 (19.7)	196 (22.6)	0.94 (0.66–1.33)	1.06 (0.70–1.61)

(*continued on next page*)

Table 1 (*continued*)

Characteristics/exposures	Cases	Controls	Univariate	Multivariate
	N* (%)	N* (%)	Odds ratio (95% CI)	Odds ratio (95% CI)
Parental involvement for students¶¶				
Outstanding/very good	23 (7.9)	221 (25.5)	1 (—)	1 (—)
Good	67 (23.1)	199 (23.0)	3.01 (1.80–5.06)	3.08 (1.77–5.37)
Fair	57 (19.7)	130 (15.0)	3.87 (2.26–6.62)	4.12 (2.29–7.41)
Poor	52 (17.9)	88 (10.2)	6.49 (3.75–11.23)	7.96 (4.21–15.04)
Unsure	4 (1.4)	14 (1.6)	2.23 (0.63–7.89)	2.07 (0.48–8.98)
Environmental characteristics				
Type of school##				
Public	253 (87.2)	713 (82.2)	1 (—)	1 (—)
Public alternative/public charter	22 (7.6)	47 (5.4)	1.37 (0.81–2.32)	1.24 (0.72–2.13)
Public magnet	7 (2.4)	5 (0.6)	3.59 (1.14–11.30)	3.40 (1.08–10.74)
Private (parochial/non-parochial)	4 (1.4)	93 (10.7)	0.13 (0.05–0.35)	0.13 (0.05–0.36)
Location of school##				
Rural	91 (31.4)	327 (37.7)	1.00 (0.72–1.39)	1.10 (0.79–1.53)
Urban	90 (31.0)	183 (21.1)	1.84 (1.31–2.58)	1.95 (1.38–2.76)
Suburban	105 (36.2)	348 (40.1)	1 (—)	1 (—)
Number of students, on average, enrolled in school***				
<50	12 (4.1)	16 (1.9)	3.91 (1.71–8.96)	8.40 (3.12–22.63)
50–200	33 (11.4)	100 (11.5)	1.67 (0.98–2.84)	3.67 (1.84–7.34)
201–500	106 (36.6)	269 (31.0)	1.72 (1.12–2.64)	2.09 (1.32–3.29)
501–1000	99 (34.1)	290 (33.5)	1.73 (1.13–2.65)	1.94 (1.25–3.01)
>1000	36 (12.4)	183 (21.1)	1 (—)	1 (—)
Frequency of inadequate school resources†††				
Always/frequently	60 (20.7)	111 (12.8)	1.87 (1.28–2.72)	1.62 (1.05–2.48)
Sometimes	88 (30.3)	292 (33.7)	0.94 (0.69–1.30)	0.87 (0.61–1.23)
Infrequently/never	127 (43.8)	407 (46.9)	1 (—)	1 (—)
Unsure	5 (1.7)	13 (1.5)	1.00 (0.33–3.09)	0.68 (0.18–2.64)
Frequency of inadequate building safety†††				
Always/frequently	34 (11.7)	36 (4.2)	3.94 (2.39–6.51)	4.48 (2.54–7.90)
Sometimes	52 (17.9)	135 (15.6)	1.50 (1.04–2.15)	1.51 (1.00–2.27)
Infrequently/never	178 (61.4)	624 (72.0)	1 (—)	1 (—)
Unsure	6 (2.1)	29 (3.3)	0.79 (0.32–1.98)	0.57 (0.21–1.55)
Routine locker searches at school‡‡‡				
Yes	31 (10.7)	144 (16.6)	0.51 (0.33–0.79)	0.49 (0.29–0.85)
No	224 (77.2)	596 (68.7)	1 (—)	1 (—)
Unsure	27 (9.3)	102 (11.8)	0.62 (0.38–0.99)	0.72 (0.41–1.29)
Typical level of lighting§§§				
As bright as daylight	220 (75.9)	695 (80.2)	1 (—)	1 (—)
Soft light	59 (20.3)	129 (14.9)	1.30 (0.92–1.85)	1.40 (0.95–2.06)
Dim light	1 (0.3)	10 (1.2)	0.57 (0.11–3.04)	0.64 (0.11–3.82)
Unsure	4 (1.4)	9 (1.0)	1.43 (0.43–4.71)	2.19 (0.60–7.99)
Easily accessible exits§§§				
Yes	267 (92.1)	812 (93.7)	0.36 (0.19–0.68)	0.36 (0.17–0.74)
No	16 (5.5)	24 (2.8)	1 (—)	1 (—)
Unsure	1 (0.3)	7 (0.8)	0.14 (0.01–1.44)	0.13 (0.01–1.57)
Physical barriers that prevented you from seeing others in your work environment§§§				
Yes	85 (29.3)	197 (22.7)	1.50 (1.10–2.04)	1.50 (1.07–2.10)
No	184 (63.5)	592 (68.3)	1 (—)	1 (—)
Unsure	15 (5.2)	51 (5.9)	1.40 (0.80–2.45)	1.47 (0.79–2.71)
Administration took corrective/preventive measures against assault in the workplace†††				
Strongly agree	50 (17.2)	171 (19.7)	0.57 (0.37–0.87)	0.55 (0.34–0.88)
Agree	137 (47.2)	391 (45.1)	0.72 (0.52–1.01)	0.68 (0.47–0.99)
Disagree/strongly disagree	81 (27.9)	160 (18.5)	1 (—)	1 (—)
Unsure	16 (5.5)	122 (14.1)	0.25 (0.13–0.45)	0.22 (0.12–0.43)
During target month, how often did you witness students involved in physical assault?‖‖‖				
Never	57 (19.7)	426 (49.1)	1 (—)	1 (—)
1–3 times	125 (43.1)	346 (39.9)	2.91 (2.04–4.15)	2.93 (1.95–4.41)
4–10 times	51 (17.6)	56 (6.5)	7.31 (4.54–11.77)	6.95 (3.96–12.18)
>10 times	45 (15.5)	21 (2.4)	15.10 (8.45–26.99)	15.00 (7.57–29.71)
During target month, how often did you witness students involved in making threats?‖‖‖				
Never	65 (22.4)	354 (40.8)	1 (—)	1 (—)
1–3 times	99 (34.1)	351 (40.5)	1.51 (1.05–2.16)	1.51 (0.99–2.29)
4–10 times	57 (19.7)	94 (10.8)	3.30 (2.15–5.08)	3.90 (2.31–6.56)
>10 times	57 (19.7)	49 (5.7)	7.25 (4.53–11.61)	7.92 (4.42–14.19)
During target month, how often did you witness students involved in sexual harassment?‖‖‖				
Never	154 (53.1)	570 (65.7)	1 (—)	1 (—)
1–3 times	78 (26.9)	216 (24.9)	1.43 (1.04–1.98)	1.98 (1.34–2.94)
4–10 times	25 (8.6)	43 (5.0)	2.65 (1.57–4.46)	3.20 (1.68–6.08)
>10 times	21 (7.2)	19 (2.2)	4.80 (2.51–9.17)	10.11 (4.57–22.40)
During target month, how often did you witness students involved in verbal abuse?‖‖‖				
Never	50 (17.2)	225 (26.0)	1 (—)	1 (—)
1–3 times	83 (28.6)	350 (40.4)	1.02 (0.68–1.53)	0.98 (0.61–1.59)

(*continued on next page*)

Table 1 (*continued*)

Characteristics/exposures	Cases	Controls	Univariate	Multivariate
	N[*] (%)	*N*[*] (%)	Odds ratio (95% CI)	Odds ratio (95% CI)
4–10 times	65 (22.4)	153 (17.7)	1.89 (1.23–2.92)	2.26 (1.33–3.81)
>10 times	80 (27.6)	120 (13.8)	3.39 (2.22–5.17)	3.82 (2.25–6.48)
During target month, how often did you witness students involved in bullying?[|||||]				
Never	69 (23.8)	244 (28.1)	1 (—)	1 (—)
1–3 times	87 (30.0)	344 (39.7)	0.89 (0.61–1.28)	0.92 (0.59–1.42)
4–10 times	48 (16.6)	162 (18.7)	1.17 (0.76–1.78)	1.33 (0.80–2.20)
>10 times	74 (25.5)	95 (11.0)	3.04 (2.02–4.59)	3.14 (1.86–5.30)

CI = confidence interval.

[*] Response totals vary between characteristics/exposures due to missing values.

[†] Includes Librarian/Media Specialist, School Nurse, Teacher Assistant/Aide, Advisor to Extra-Curricular Activities, Coach, Department Chair/Instructional Leader.

[‡] Age, gender, race.

[§] Age, gender, education level.

[||] Age, gender, race, education level, years worked as educator, years worked in school, school type.

[¶] Age, gender, race, education level, primary professional activity, years worked as educator, years worked in school, school type, grades taught at school.

[#] Age, gender, race, education level, years worked as educator, years worked in school, school type, grades taught at school.

[**] Type of school, school location, job classification, grades taught, student impairment status.

[††] Other personnel in classroom, primary professional activity, job classification, number of students on average per day, hours worked during month.

[‡‡] Type of school, school location, primary professional activity, job classification.

[§§] Type of school, school location, primary professional activity, job classification, grades taught at school.

[||||] Type of school, school location, primary professional activity, grades taught.

[¶¶] Age, gender, race, education level, years worked as educator, years worked in school, school type, grades taught at school.

[##] Age, gender, race, education level.

[***] Age, education level, type of school, school location.

[†††] Age, gender, race, education level, years worked as educator, years worked in school, type of school, school location, job classification, grades taught at school.

[‡‡‡] Type of school, school location, school size, grade levels taught at school, policies, administrators' attitude, student demographics, student impairment status, percentage of students receiving free lunches, other personnel in classroom.

[§§§] Type of school, school location, school size, student impairment status, percentage of students receiving free lunches.

[|||||] Type of school, school size, primary professional activity, job classification, grades taught at school, number of students on average per day, hours worked during month.

10 years or older versus less than 10 years and who were primarily female, compared with male, or equivalent in gender numbers.

Environmental and school characteristics also appeared to be important student-perpetrated PA risks. Increased risks were identified for those working in the following schools: public magnet versus public; urban versus suburban; with inadequate resources (always/frequently vs. infrequently/never), inadequate building safety (always/frequently vs. infrequently/never); soft light versus bright as daylight; and with physical barriers. An inverse relation was observed between PA risk and increasing school enrollment with less than 50, 50–200, 201–500, and 501–1000 versus 1000+ students. Increasing risks of PA were associated with the increasing number of times educators reported witnessing students involved in PAs, threats, sexual harassment, verbal abuse, and bullying.

Decreased risks of PA were identified for educators working in schools that conducted routine locker searches, had easily accessible exits, and where administration took corrective/preventive measures against workplace assault.

Results of the sensitivity analyses (not shown) indicated that the hypothesized previously unmeasured confounder—average home values, surrounding the respective schools in which the educators worked—had very modest effects on the associations between the examined exposures and risks of PA. After adjusting for this confounder among the 73% of cases and controls for which it was available, the risks of PA did not increase or decrease more than 10% for any of the tested characteristics and all remained statistically associated with PA.

Discussion

A number of factors were associated with increased or decreased risks of work-related PA against educators. Although no comparably designed studies have been conducted, there were a few similarities with previous literature and other findings that merit attention.

Educator and student characteristics

In this study, risks were decreased for educators who had worked in teaching and in the current school for 7 years or more versus less than 7 years—findings contrary to those identified from a study involving school-based versus the current educator-based reporting [10]. However, gender of the student population and school characteristics were found to be associated with assault in both studies. Also important, in the present study, was the increased risk among educators if the perceived race/ethnicity of the aggressor was not the same as theirs or they were unsure. Based on a publication, relevant to national diversity by state, it was reported that the 2008 Minnesota teacher workforce was 97% white [31], consistent with present study participation. Given the identified risk associated with the perceived disparity in race/ethnicity, between educators and students, focused efforts to identify opportunities for reversing this risk are particularly important; among the key identified strategies is increasing the teacher workforce diversity [32]. In addition, the finding that decreasing levels of parental involvement were associated with incremental increases in risks is particularly important as a basis for comprehensive strategic involvement of the school with faculty, parents, students, and relevant community.

Consistent with current findings that the risk of PA was greater for educators involved with younger students in the lower elementary grades, Robers et al. [33] reported that a greater percentage of elementary than secondary school teachers had been physically attacked in the United States. This is contrary to other studies involving different methods, which reported greater risks in middle schools than high schools or elementary schools [10,15]. Findings regarding increased risk for educators with advanced degrees were comparable with those identified, previously [10], and consistent with the elevated risks identified for School Social Workers and Special Education Teachers who have advanced degrees. Also, consistent with previous findings [10] was that the risk of educator assault decreased as the student-to-teacher ratio increased. Given current findings that risk was also increased if

students were perceived to be impaired because of disability or developmental delay, such students require focused attention by Special Education Teachers and School Social Workers involved with low student-to-teacher ratios, in view of the potential challenges and associated exposures posed by these students. Recognition that this may involve interactions consisting of multiple factors, not easily discerned, is also important.

Environmental factors

Environmental exposures are particularly important to address because they offer the greatest opportunities for successful interventions that can potentially benefit larger populations, not just individuals. From this study, it was identified that interior environments not fully illuminated had a suggested increased risk of assault, a finding comparable with that in a similarly designed occupational violence study of nurses [21], and consistent with a previous case-control study of occupational homicide in nonschool work settings in which reduced risks with bright exterior lighting were identified [34]. Ensuring easily accessible exits and conduct of routine locker searches, associated with reduced risks, are also important considerations.

Equally important is the total environmental climate that school administrators in collaboration with teachers, students, parents, and the community, at large can potentially affect through preventive measures, based on identified risk factors. The decreased risk for those working in private versus public schools, identified in this study, has also been reported nationally by Robers et al. [33]. At least two times as many public as private school teachers have reported being physically assaulted by students during the previous 12 months; three times as many reported being threatened [33]. Differences reported among schools by geographical location by Robers et al. [33] are also comparable with present study findings. Further important are the greater proportions of private versus public schools (2007–2008), in which teachers (80% and 71%, respectively) reportedly contributed to enforcement of school rules [33]. In the present study, a high risk of PA was associated with "always/frequently" (compared with infrequently/never) having inadequate building safety. Increasing risks of PA for educators were also associated with increasing frequencies of witnessing students in school environments involved in threats, sexual harassment, verbal abuse and bullying. Given these findings, follow-up investigation and identification of strategies through a school and community-based collaboration to reduce these risks appear essential.

An estimated 3.7 million full-time equivalent elementary and secondary school teachers were engaged in classroom instruction in fall 2010 (3.2, public schools; 0.5, private schools) [35,36]. During the same period, an estimated 55.4 million students were enrolled in pre-kindergarten through grade 12 [35]. In the previous year, more than 17% of educators left the teaching profession (9%) or moved to another school (8%) [37]. A study, in Belgium, reported that violence against teachers was a significant factor in decisions to leave the teaching profession [38]. With fewer people entering the profession, rising retirement numbers, and the growth of school age populations, teacher shortages are a concern. Fisher and Kettl [39] noted that violence and threats of violence have a direct impact on the quality of education teachers can provide to students and likely affect teacher retention rates. Based on the potential for teacher shortages, and the study findings of relevant risk factors, additional research will be important to assess the efficacy of relevant intervention efforts.

Strengths and limitations

This study addressed a major problem for which there is a paucity of research. Limitations include the fact that information on both exposures and outcome was based on self-report. Attempts to reduce these biases were made by limiting recall of violent events to the previous 12 months and recall of exposures to a relevant 1-month period, comparable with previous studies [20–22,40,41]. To further reduce information bias, educators were recontacted by mail to clarify missing or ambiguous information, as necessary [18,19]. Validation substudies were also conducted of environmental exposures and health-care treatment [18]. Some potential response bias was controlled for by reweighting and using weights adjusted for the probability of being eligible among nonrespondents [28,29]. To reduce the effect of confounding, selection of confounders for multiple logistic regression models was based on DAGS, developed for each of the models, following the methods described by Greenland et al [26]. Sensitivity analyses [30] conducted on key exposures of interest suggested that the results were not due to unmeasured confounding by home value.

In summary, important factors associated with student-perpetrated PAs against a large population of K-12 grade educators were identified through a case-control study. It is important that school administrators recognize the increased risks to less experienced educators with advanced degrees who teach in public schools and the elementary grades with small numbers of students, having disabilities or developmental impairments, and are of a different race/ethnicity from their students. Based on the strong evidence of an inverse relation between parental involvement and risk of PA to the educator, it appears essential to address this issue rigorously. Moreover, attention to environmental factors, including lighting, accessible exits, school resources, and an environment focused on safety is key. These results provide a basis for development and testing of effective methods for controlling the substantial risk of PA among elementary and secondary school educators that may also benefit others within the school environments.

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