



Work-related violence against educators in Minnesota: Rates and risks based on hours exposed

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ABSTRACT

Problem: Violence is a major occupational problem; yet, rigorous studies focused on educators to address this problem are limited. The objective was to identify educators' potential risks for physical assault (PA) and nonphysical violence (NPV), based on hours exposed. **Methods:** A total of 4,731 licensed kindergarten through grade 12 Minnesota educators, identified from the Minnesota Department of Education database, participated. Specially designed mailed questionnaires (12-month recall) enabled data collection. Calculated PA and NPV rates, per 100,000 working hours, used Poisson regression. Directed acyclic graphs identified confounders for multivariable analysis, adjusted for non-response and unknown eligibility. **Results:** The total PA rate was 5.3; PA risks increased for educators who: were non-married versus married; held master's degrees, or education specialist degrees, versus associate/bachelor's degrees; worked in public alternative and various school types, versus public schools; worked as social workers, in special education or multiple activities, versus standard classroom teaching; worked with <10, versus 10 to <25 students in the class. The total NPV rate was 26.4; subcategory rates were: threat (34.8); sexual harassment (7.6); verbal abuse (55.5); bullying (19.6). Increased risks for NPV included: 30–39 and 60–79, versus 50–59 years of age; non-married versus married; working in public alternative versus public schools; working part-time or substitute, versus full-time; teaching in special education or multiple activities, versus standard classroom teaching; teaching in class sizes <10 and ≥25, versus 10–24 students; teaching in grades 3–12 and multiple grades, versus kindergarten to second grade. The investigated results for PA and NPV were similar, with a few exceptions. **Discussion and Impact on Industry:** Results from this study provided information about factors associated with increased and decreased risks for violence against educators, based on hours worked. In addition, they provided a basis for further investigations to reduce violence against educators in the school environment.

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1. Problem

Physical assault (PA) and non-physical violence (NPV) have been recognized as a major public health issue in the work environment (Rosenberg & Fenley, 1991). According to the 1993–1999 National Crime Victimization Survey (NCVS), there was an average of 1.7 million people who experienced violent crimes while working or on duty in the United States (U.S.) (Duhart, 2001). One commonly overlooked occupation that has a high risk of work-related violence is teaching/education (DeVoe, Peter, Noonan, Snyder, & Baum, 2005; Dinkes, Cataldi, & Lin-Kelly, 2007; Duhart, 2001). In particular, educators reportedly have

a higher risk for simple assault (an attack without a weapon) than aggravated assault (an attack with a weapon) (Duhart, 2001).

Between 1999 and 2003, it was estimated that 183,000 teachers were victims of non-fatal crimes in schools, accounting for an annual rate of 39 crimes per 1,000 teachers (DeVoe et al., 2005). Furthermore, students play an important role in violence against educators as they have been identified as the primary perpetrators (DeVoe et al., 2005; Fisher & Kettl, 2003; Gerberich et al., 2011; Hashemi & Webster, 1998; Levin et al., 2006; Peek-Asa, Schaffer, Kraus, & Howard, 1998). It has also been reported that risk of school work-related violence varies across geographical locations; teachers working in city versus suburban or rural schools were more likely to have been physically attacked or threatened with injury by students (Dinkes et al., 2007). In addition to location, the grade level may also be associated with violence rates: U.S. junior high school teachers had a higher annual work-related violence rate per 1,000 teachers (54.2) than high school (38.1) and elementary school teachers (16.8); however, special education teachers had the highest rate among all teaching categories (68.4) (Duhart, 2001). It has been reported that violence affects teachers' performance

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in class and the quality of teaching; retention of educators is a major concern in such high-risk occupational environments (Fisher & Kettl, 2003).

To date, there has been no apparent investigation to examine the relations between various exposures of interest and rates of occupational violence, based on hours worked by educators. The objective of the current study was to identify the potential risk for both PA and NPV against licensed Minnesota educators, based on hours exposed.

2. Methods

2.1. Study population

The study population was licensed Kindergarten through Grade 12 (K-12) educators in Minnesota, who were identified in the Minnesota Department of Education (MDE) database as of 2003. This population was selected because of the ability to contact through home versus workplace addresses, and the availability of various demographic information including: year of birth; fiscal year data; zip code; principal and teacher years; salary; teaching time; grade level(s) taught; license type; and educational level.

Using a random number generator, 300 educators were randomly selected from 320,333 licensed educators in the comprehensive MDE database to participate in an initial pilot study to test the methods and data collection instruments. From the pilot study, it was discovered that there was a large proportion of educators listed in the database who were deceased, not licensed, or no longer working in the year prior to 2003; these were eliminated. Thus, in order to further identify the eligibility of the remaining license list before implementation of the comprehensive study, a random sample of 26,000 educators, generated from the remaining 116,661 in the MDE database received an eligibility screening survey; 8,614 (33%) educators responded, resulting in 6,469 (75%) who indicated having worked in Minnesota during the previous 12 months, and, thus, were considered eligible. Fig. 1 shows the response diagram.

2.2. Study design

The study population included educators who worked as licensed professionals (K-12) in Minnesota during a 12-month period prior to survey completion. This study entailed two phases; however, this paper focused only on Phase 1, which was designed to determine the frequency of work-related violence, and to identify the potential risks for both PA and NPV against educators in Minnesota, based on hours exposed. Data were collected between April 27, 2005 and March 31, 2006.

2.3. Definitions

Work-related violence includes PA and NPV, involving acts that use intentional physical force or emotional abuse with the potential for causing physical or emotional injury and consequences against an employee. In this study, work-related violence included any events or activities that were associated with and occurred in the educator's work-environment, including work-related travel.

PA occurred when educators were hit, slapped, kicked, pushed, choked, grabbed, sexually assaulted, or otherwise subjected to physical contact intended to injure or harm. NPV included threats, sexual harassment, verbal abuse, and bullying. Threat was defined as when someone used words, gestures, or actions with the intent of intimidating, frightening, or harming them (physically or otherwise). Sexual harassment occurred when educators experienced any type of unwelcome sexual behavior (words or actions) that created a hostile work environment. Verbal abuse occurred when another person yelled or swore at the educator, called the educator names, or used other words intended to control or hurt. Bullying was defined as

Minnesota Educators' Study- Phases 1: Response Numbers

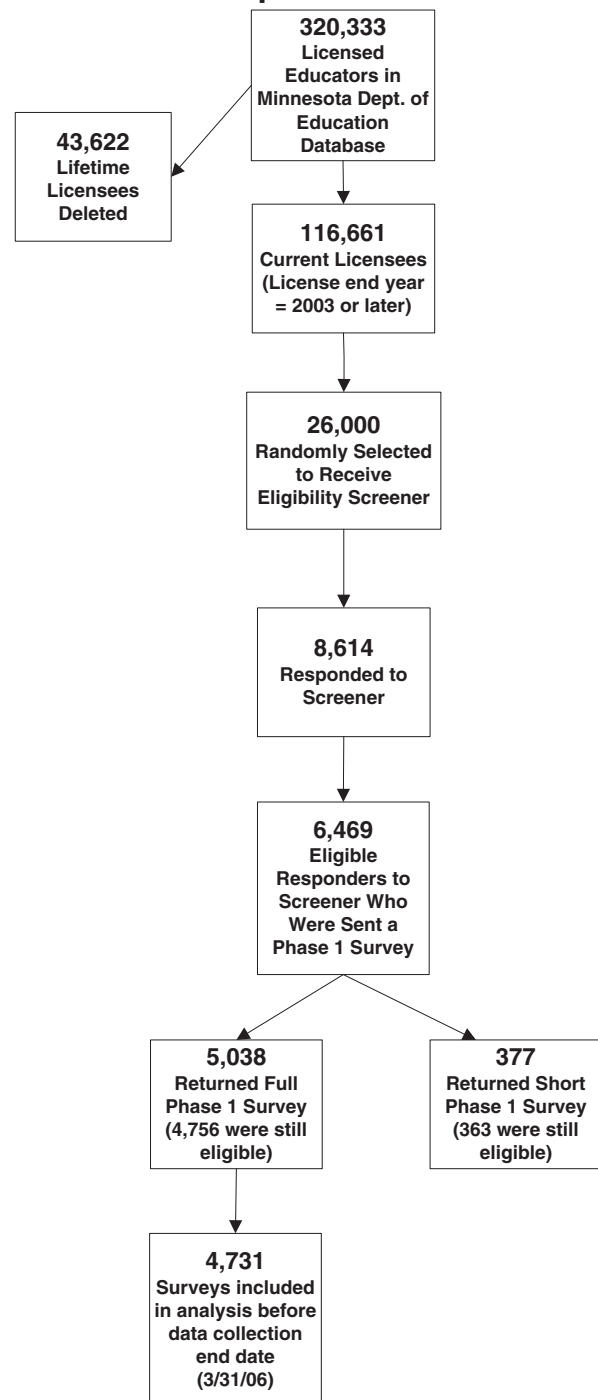


Fig. 1. Minnesota Educators' Study- Phase 1: Response Numbers.

repeated acts of intimidation or coercion. These definitions, primarily consistent with those incorporated in a prior occupational violence study (Gerberich et al., 2002, 2004, 2011; US, DHHS, NIOSH, 1996), reflect those identified by the National Institute for Occupational Safety and Health (UMN, 2002), 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.

2.4. Contact procedures

Approval to conduct this study was obtained from the Institutional Review Board at the University of Minnesota. An initial survey packet, sent to the 6,469 eligible educators, included: a specially designed survey instrument; a letter inviting participation; informed consent information; and a postage-paid, return envelope. All eligible educators received the initial survey packet; for those who did not respond, up to four reminder mailings with surveys were sent to increase the response rate. A final packet for the fourth mailing, that included only a one-page survey to collect important demographic and work-related violent event information, was sent to remaining non-respondents. Additional follow-up mailings were used to clarify ambiguous responses and missing information.

2.5. Data collection

The comprehensive survey data were collected via specially designed mailed questionnaires. Of those 6,469 educators who were mailed survey packets, 5,038 (78%) returned fully completed surveys and 4,756 were still eligible; however, those who returned their surveys after the data collection end date (March 31, 2006), were excluded. As a result, a total of 4,731 eligible educators were included in the study analysis (Fig. 1).

The comprehensive instrument enabled data collection pertinent to the occurrence of PA and NPV events, determination of the months in which they worked, and relevant exposures in the previous 12-month period. In the physical assault section, educators were asked, “Were you the target of a work-related physical assault at any time during the 12 months prior to today’s date? (Check yes or no).” If the answer was yes, they were asked to describe the event(s), whether these involved a “single event,” “multiple events,” or “on-going events” (events occurred so frequently they were only able to describe them generally). For those who reported “multiple events,” up to four distinct PA events could be specified in their responses. In the NPV section, participants were asked, “Did you experience any work-related threats, sexual harassment, verbal abuse, or bullying, according to the above definitions, within the 12 month prior to today’s date? (Check yes or no).” If yes, they were asked to answer each related question, separately, for the four NPV subcategories (threat, sexual harassment, verbal abuse, and bullying).

Further data collected included educator’s demographic information of: gender; age; race; ethnic classification; marital status; educational information; years of experience; and job classification (full/part-time, substitution, etc.); educators’ activities (classroom teacher, administrator, etc.); class size; grade levels taught; and characteristics of the teaching environment including type of school (public, private, etc.). Finally, working hours and number of days worked per week were also collected by using month-based calendars. Survey participants were asked to report their days worked and working hours per day for each month. Relevant data collection instruments and materials are located at the Center for Violence Prevention and Control website: <http://www1.umn.edu/cvpc/research.html>.

2.6. Data analysis

Data analysis commenced with descriptive statistics including, number of responses, number of educators with violent events, and calculation of rates and rate ratios (RR) per 100,000 working hours per year. In the data analysis, the number of events was based on educators who reported at least one violent PA or NPV event.

Outcomes of interests (PA and NPV) were dichotomous variables (yes/no). PA and NPV rates per 100,000 working hours were calculated using Poisson regression and log-transformed working hours as the offset variable. Multivariable regression models with Poisson distribution calculated rate ratios and associated 95% Confidence Intervals (C.I.) to determine the strength of the associations between exposures of

interest and violence-related outcomes (PA and NPV). Missing work hours were addressed through imputation (Madow, Nisselson, & Olkin, 1983). This imputation was accomplished by using average hours worked per month by educators from the same job classification (full-time/part-time contract or substitute categories).

Potential response bias, resulting from different response patterns, was minimized by inversely weighting observed responses by probabilities of response, estimated as a function of characteristics available from the licensing database. Those characteristics included: gender; zip code; year of birth; first and last year of licensure; last fiscal year of employment; years worked as a teacher/principal; salary; class period minutes; class periods per week; and grade levels taught. This method enabled re-weighting of estimates using group response characteristics to account for potential differences in responses (Horvitz & Thompson, 1952). The probability of eligibility of non-respondents was estimated from these same factors (Mongin, 2001).

A causal model was developed to determine the variables to be measured and controlled for in the overall study analyses. From this model, individual Directed Acyclic Graphs (DAGs) were, then, derived to select the minimum set of potential confounding factors for each exposure of interest (Greenland, Pearl, & Robins, 1999; Hernan, Hernandez-Diaz, Werler, & Mitchell, 2002). Each DAG reflects an exposure of interest and was used to define variables, a priori, to guide multivariable analyses of the data. For example, the estimated rate ratio for class size was calculated after adjustment for gender, race, age, education level, job classification, years worked as a teacher, years worked in the current school, school type, and professional activity. The DAG for this exposure of interest (class size) is shown in Fig. 2; adjustments, for each exposure of interest, are identified in the relevant results tables.

3. Results

A total of 4,731 eligible educators, who worked as licensed K-12 educators in Minnesota during the prior 12 months, were included in this analysis. Overall, the response rate was increased by follow-up mailings. The cumulative percent responses for the initial mailing and the three follow-up mailings were 61%, 71%, 76%, and 78%, respectively. There were no response differences between early and late respondents, according to analyses conducted previously with the same population (Gerberich et al., 2011). Overall, the item specific missing information ranged from 0.3% to 2.1%. Although some educators experienced more than one violent event (physical or nonphysical), according to the physical assault section in the instrument, only one event was included in the analysis to ensure a conservative estimate. Because of the frequency of “multiple events” reported by 34% of educators, of which 16% involved “on-going events,” comprehensive reporting of these outcomes was not possible. Tables 1a and 1b present the number of responses, number of educators reporting at least one violent event, and rates per 100,000 working hours per year for PA and NPV. Although no important differences were identified between imputed and non-imputed rates for PA and NPV, imputed working hours were used in the data analysis.

As shown in Table 1a, the PA rate for all educators in this analysis was 5.3 per 100,000 working hours per year; this rate was higher for educators who were female, versus male, and Hispanic, compared to Non-Hispanic. Educators who taught in classes with less than 10, versus 10 or more students, had a rate nearly three times higher. For NPV (Table 1a), the overall rate was 26.4 per 100,000 working hours per year. Female, versus male educators, had a higher rate of NPV. Higher rates are also noted for those who worked as substitute compared to full-time or part-time teachers. In addition, educators who taught in class sizes with less than 10 compared with 10 or more students had a higher NPV rate.

Table 1b identifies total rates per 100,000 working hours per year for the four subcategories of NPV; these were: threat (34.8); sexual harassment (7.6); verbal abuse (55.5); and bullying (19.6). The rates

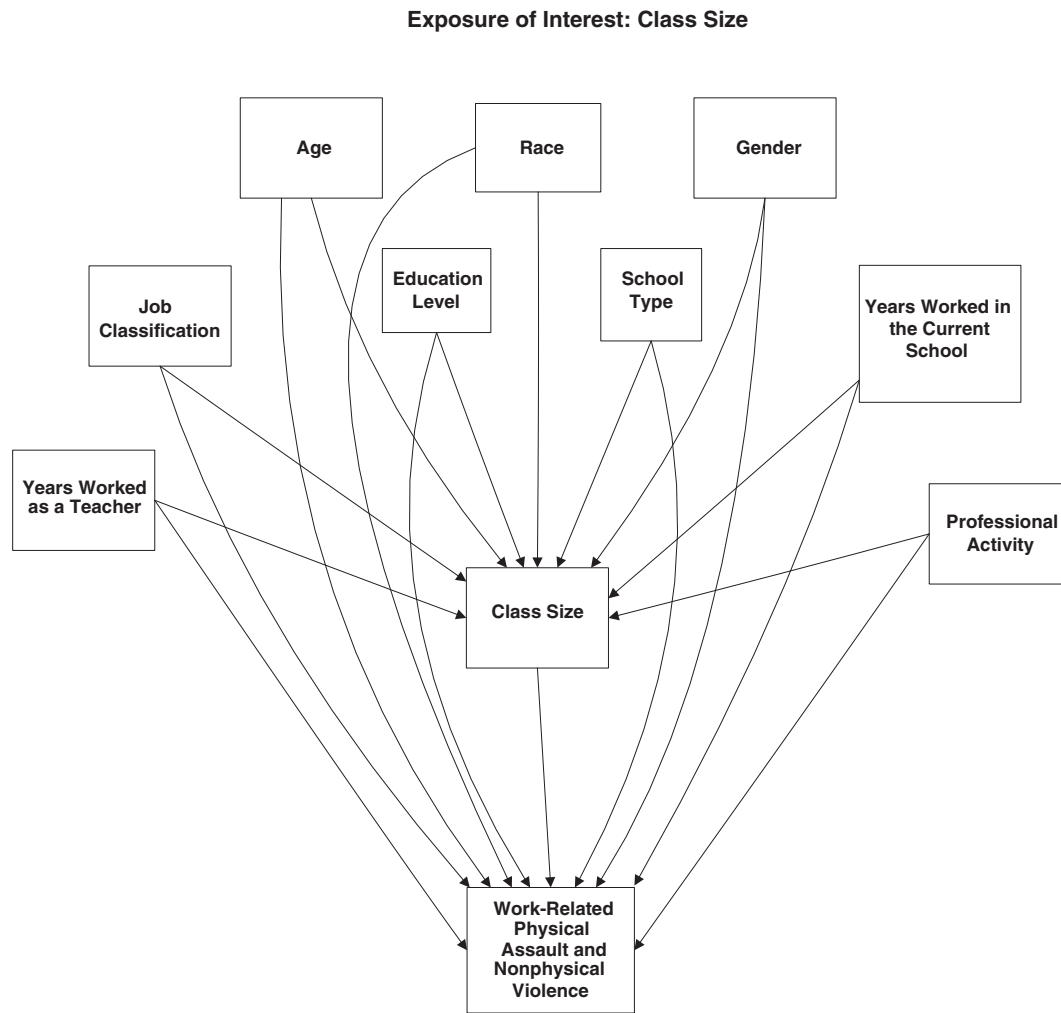


Fig. 2. Directed Acyclic Graph Example - Exposure of Interest: Class Size.

of educators who reported being threatened were higher among those who worked as substitute versus part-time and full-time teachers; and taught in class sizes smaller than 10, compared to more than 10 students. Greater rates of sexual harassment were seen among educators who were female versus male; not married versus married; and those who worked as substitute versus part-time and full-time teachers. Of all reported bullying experiences, female, compared with male educators, had a higher rate.

In Tables 2a and 2b, results of multivariable analyses for respective PA and NPV models are shown. These results are presented as rate ratios (RR) per 100,000 working hours per year, based on the exposures of interest.

As shown in Table 2a, increased risks for PA were shown for educators who: were not married versus married; held master's degrees, or education specialist degrees, versus associate/bachelor's degrees; worked in public alternative and various school types, compared to public schools; worked as social workers, in special education or in multiple activities, compared with standard classroom teaching; and worked with class sizes that were less than 10, compared to 10 to <25 students. Decreased risks for PA were identified for: male compared with female educators; those who worked in private (parochial), versus public schools; those who taught in class sizes larger than 25, compared to 10 to <25 students; and those who taught in grades 10–12, versus kindergarten to second grade.

Increased risks for NPV were identified for educators who: were aged 30–39 and 60–79, versus 50–59 years; were not married versus married; worked in public alternative compared to public schools; worked

part-time or in various substitute categories, versus full-time; taught in special education or multiple areas, compared with standard classroom teaching; taught in class sizes less than 10 and larger than 25, versus 10–24 students; and taught in grades three to 12 and in multiple grades, versus kindergarten to second grade. Decreased risks for NPV were identified among educators who were: male, compared with female; working as teachers for 20–29 and more than 30 years, compared to less than 10 years; and working in private (parochial), compared to public schools.

Table 2b shows rate ratios (RR) per 100,000 working hours per year for the NPV subcategories. For the threat subcategory, increased risks were identified for educators who were: aged 20–29, 30–39 and 60–79 years compared to 50–59; working in public alternative, compared to public schools; working in various substitute categories, versus full-time; and working in special education compared to standard classroom teaching. For sexual harassment, increased risks were shown for those who: were aged 20–29, 30–39, 40–49, compared to 50–59 years; were not married, versus married; held education specialist degrees, compared to associate/bachelor degrees; taught in public alternative and multiple school types, compared to public schools; and taught in class sizes with less than 10, compared to 10–24 students. Decreased risks were identified for sexual harassment among those who had worked for 10–19 years, versus less than ten years. For the verbal abuse subcategory, increased risks were seen in educators who: were aged 60–79, compared to 50–59 years; worked in public alternative, compared to public schools; and worked part-time or substitute versus full-time positions. For bullying, increased risks were identified for

Table 1a

Physical Assault and Non-Physical Violence Rates Per 100,000 Working Hours Per Year.

Variable	Physical Assault (PA)				Nonphysical Violence (NPV)			
	Number Responses	Number of Educators with PA	PA Rate	95% C.I.	Number Responses	Number of Educators with NPV	NPV Rate	95% C.I.
Total Population	4725	372	5.3	4.8–5.9	4720	1834	26.4	25.2–27.6
Gender								
Male	1102	68	4.2	3.4–5.3	1102	399	23.4	21.2–25.8
Female	3623	304	5.8	5.2–6.5	3618	1435	27.6	26.2–29.1
Age group								
20–29	415	31	5.2	3.6–7.3	415	165	26.5	22.7–30.9
30–39	1032	83	5.3	4.3–6.6	1031	423	27.5	24.9–30.2
40–49	1242	107	5.7	4.7–6.9	1242	491	26.3	24.0–28.7
50–59	1730	134	5.1	4.3–6.0	1726	654	24.9	23.1–26.9
60–79	306	17	5.2	3.3–8.5	306	101	31.3	25.7–38.1
Ethnic								
Hispanic	29	6	14.5	6.5–32.1	28	14	37.0	22.2–61.7
Non Hispanic	4661	361	5.2	4.71–5.8	4659	1797	26.1	25.0–27.4
Race								
White	4611	359	5.3	4.8–5.9	4608	1775	26.2	25.0–27.4
Non white	75	7	5.3	2.4–11.7	75	34	28.5	20.3–40.1
Marital status								
Married	3749	271	4.9	4.4–5.6	3747	1377	25.1	23.8–26.4
Other than married ^a	942	93	6.4	5.2–7.9	940	436	30.6	27.8–33.6
Education								
Associate + Bachelor's Degree	1800	110	4.6	3.8–5.5	1799	616	25.9	24.0–28.0
Master	2529	214	5.5	4.8–6.3	2527	1038	36.5	24.9–28.2
Education specialist degree	309	36	6.7	4.8–9.3	309	138	26.4	22.3–31.2
Doctorate degree	69	7	5.7	2.6–12.2	65	28	24.6	17.0–35.7
Years worked as a teacher								
0–9 years	1387	115	5.8	4.8–6.9	1386	580	29.4	27.1–32.0
10–19 years	1426	122	5.6	4.7–6.7	1423	579	26.9	24.8–29.2
20–29 years	1109	83	4.7	3.8–5.9	1109	407	23.0	20.9–25.4
>30 years	778	47	4.1	3.0–5.4	778	251	21.7	19.2–24.6
Years worked in current school								
0–4 years	837	75	6.5	5.2–8.2	834	357	32.5	29.3–36.1
5–9 years	587	40	4.5	3.3–6.2	587	238	27.3	24.0–31.1
10–19 years	725	69	6.0	4.7–7.6	723	284	25.4	22.6–28.6
>20	536	17	2.1	1.3–3.4	536	179	21.4	18.4–24.8
Type of school								
Public	4004	327	5.5	5.0–6.2	3998	1553	26.4	25.1–27.7
Public Alternative	159	20	9.5	6.3–14.6	159	113	50.6	42.2–60.8
Public Charter	86	6	3.3	1.3–8.5	86	39	28.3	20.6–39.0
Public Magnet	64	8	8.1	4.1–16.0	64	34	33.2	23.7–46.6
Private (Parochial)	309	4	0.9	0.4–2.4	309	60	13.1	10.2–16.9
Private(Non-Parochial)	64	1	0.7	0.1–7.3	64	15	15.9	9.7–25.9
No one school type was most common	28	6	17.2	7.7–38.6	29	16	43.3	26.2–71.6
Job classification								
Full-time	3764	333	5.3	4.8–5.9	3759	1536	24.8	23.6–26.0
Part-time	420	18	4.4	2.7–6.9	420	138	34.5	29.3–40.7
Substitute ^b	523	21	6.3	4.1–9.8	523	158	47.8	40.8–56.0
Professional Activity								
Classroom teacher	3193	148	3.2	2.7–3.8	3191	1152	24.7	23.3–26.1
Administrator + Superintendent + Dean of students	197	19	4.8	3.0–7.5	196	89	22.7	18.5–27.9
School psychologist	46	7	11.0	5.4–22.7	46	23	35.6	23.7–53.2
School social worker	66	15	16.1	9.8–26.5	66	31	35.6	25.5–49.6
Special education	595	126	14.7	12.4–17.5	594	308	34.9	31.2–39.0
Department chair/instructional leader	22	5	14.6	6.0–35.7	22	7	20.9	9.9–44.2
Teacher assistant/aide + advisor to extra-curricular activities + other	346	24	5.2	3.5–7.8	344	124	28.0	23.5–33.4
No one activity was most common	250	28	7.6	5.2–11.1	251	98	27.4	22.5–33.5
Class size								
<10	723	140	14.0	11.9–16.5	721	342	33.6	30.3–37.3
10 to less than25	1665	115	4.7	3.9–5.6	1664	556	22.8	21.0–24.8
>= 25	1865	77	2.9	2.3–3.6	1864	755	27.4	25.5–29.4
Grade								
Kindergartern-2nd grade	659	56	6.0	4.7–7.8	659	161	17.1	14.7–20.0
3–6 grade	908	60	4.5	3.5–5.8	908	294	22.0	19.7–24.7
7–9 grade	609	30	3.4	2.4–4.9	609	276	29.5	26.2–33.2
10–12 grade	426	14	2.1	1.2–3.5	426	200	29.1	25.3–33.5
No one grade level was most frequently taught	1641	171	7.3	6.3–8.5	1637	719	31.5	29.3–33.9

^a Other than married: Living as married, living with a domestic partner, never married, separated, divorced, or widowed.^b Substitute: Long-call substitute, building substitute, or all other substitutes.

Table 1b
Non-Physical Violence Rates Per 100,000 Working Hours Per Year.

Variable	Threat (T)				Sexual Harassment (SH)				Verbal Abuse (V)				Bullying (B)			
	Number Responses	Number of Educators with T	T Rate	95% C.I.	Number Responses	Number of Educators with SH	SH Rate	95% C.I.	Number Responses	Number of Educators with V	V Rate	95% C.I.	Number Responses	Number of Educators with B	B Rate	95% C.I.
Total Population	4719	957	34.8	32.7–37.1	4717	212	7.6	6.6–8.7	4720	1576	55.5	52.8–58.3	4719	550	19.6	18.0–21.3
Gender																
Male	1102	219	35.7	31.4–40.6	1102	38	5.7	4.2–7.9	1102	348	52.9	47.6–58.8	1102	94	15.2	12.5–18.5
Female	3617	738	34.5	32.1–37.0	3615	174	8.3	7.2–9.7	3618	1228	56.5	53.4–59.8	3617	456	21.4	19.5–23.5
Age group																
20–29	415	95	37.9	31.1–46.3	415	26	9.5	6.3–14.1	415	134	52.0	43.9–61.7	415	61	23.7	18.4–30.5
30–39	1031	240	38.1	33.5–43.2	1031	53	8.1	6.2–10.7	1031	363	56.1	50.5–62.2	1031	124	19.2	16.1–23.0
40–49	1242	246	32.8	29.0–37.2	1242	66	8.6	6.7–10.9	1242	412	53.9	48.9–59.4	1242	141	18.6	15.8–22.0
50–59	1725	323	31.3	28.1–35.0	1732	56	5.3	4.1–7.0	1726	579	56.2	51.8–61.0	1725	195	18.6	16.2–21.5
60–79	306	53	41.8	31.8–55.0	306	11	8.1	4.3–15.01	306	88	69.9	56.5–86.4	306	29	22.1	15.2–32.3
Ethnic																
Hispanic	28	6	27.6	12.5–61.1	28	1	3.7	0.4–32.5	28	12	57.0	32.8–99.1	28	4	17.9	6.7–48.0
Non Hispanic	4658	942	34.9	32.8–37.2	4656	210	7.7	6.7–8.8	4659	1542	55.3	52.6–58.2	4658	538	19.6	18.0–21.3
Race																
White	4607	928	34.8	32.7–37.1	4605	204	7.6	6.6–8.7	4608	1524	55.3	52.6–58.2	4607	532	19.6	18.0–21.3
Non white	75	17	34.6	21.7–55.1	75	6	9.4	3.8–22.9	75	29	56.8	39.5–81.6	75	11	24.5	14.1–42.6
Marital status																
Married	3747	727	35.3	32.9–38.0	3745	141	6.6	5.6–7.8	3747	1169	54.7	51.6–58.0	3746	409	19.2	17.4–21.1
Other than married ^a	940	222	33.5	29.3–38.2	940	70	10.9	8.7–13.8	940	388	57.6	52.1–63.8	940	135	21.1	17.9–25.0
Education																
Associate + Bachelor's Degree	1798	304	35.7	31.9–39.8	1798	70	7.9	6.2–10.0	1799	533	60.3	55.4–65.7	1799	184	20.9	18.1–24.2
Master	2527	551	34.3	31.6–37.3	2525	113	7.1	5.9–8.6	2527	892	53.7	50.2–57.4	2526	310	19.0	17.0–21.2
Education specialist degree	309	81	35.7	28.8–44.3	309	27	11.0	7.5–16.2	309	115	47.9	39.8–57.7	309	46	20.4	15.3–27.1
Doctorate degree	68	17	35.6	22.1–57.3	68	2	4.5	1.2–17.2	68	23	48.4	32.2–72.8	68	6	11.6	5.0–26.7
Years worked as a teacher																
0–9 years	1386	320	38.5	34.5–43.0	1386	86	9.9	8.0–12.3	1386	481	56.7	51.8–62.1	1386	185	22.1	19.1–25.5
10–19 years	1423	302	33.8	30.2–37.9	1422	55	6.0	4.6–7.8	1423	499	54.0	49.4–59.0	1422	153	16.9	14.4–19.8
20–29 years	1109	201	30.6	26.7–35.2	1109	45	6.7	5.0–9.0	1109	357	53.8	48.5–59.8	1109	124	18.6	15.5–22.2
> 30 years	777	129	33.5	28.2–39.8	776	26	6.6	4.5–9.8	778	223	57.9	50.7–66.0	778	84	21.4	17.3–26.6
Years worked in current school																
0–4 years	834	201	41.1	35.8–47.0	834	43	8.8	6.6–11.8	834	306	59.6	53.2–66.8	834	113	22.3	18.5–26.8
5–9 years	587	118	34.6	28.9–41.3	586	25	6.7	4.5–10.1	587	204	56.7	49.3–65.2	586	67	19.5	15.4–24.8
10–19 years	723	158	35.3	30.1–41.3	722	30	6.9	4.8–9.8	723	244	54.9	48.3–62.3	723	84	18.5	14.9–23.0
>20	535	84	30.2	24.4–37.5	535	18	6.1	3.8–9.8	536	159	56.4	48.2–66.0	536	52	18.2	13.8–24.0

Type of school																
Public	3997	787	33.7	31.5–36.2	3995	167	7.1	6.1–8.3	3998	1330	55.3	52.4–58.4	3997	456	19.0	17.3–20.8
Public Alternative	159	75	46.8	37.6–58.3	159	25	13.9	9.3–20.8	159	109	65.0	54.0–78.4	159	36	23.4	17.2–31.9
Public Charter	86	25	39.2	26.3–58.5	86	4	6.8	2.6–17.8	86	34	53.9	38.3–75.7	86	15	25.7	15.7–42.1
Public Magnet	64	25	45.8	30.8–67.9	64	5	10.0	4.3–23.3	64	30	55.7	39.0–79.7	64	7	12.5	5.9–26.6
Private (Parochial)	309	23	26.3	17.7–39.1	309	4	4.2	1.6–11.4	309	40	42.2	30.9–57.7	309	23	25.8	17.3–38.5
Private(Non-Parochial)	64	10	40.1	22.3–72.3	64	1	2.4	0.2–26.8	64	13	43.9	25.0–77.1	64	7	24.8	11.7–52.4
No one school type was most common	29	11	47.3	25.4–87.9	29	5	21.3	8.5–53.7	29	16	72.0	43.6–119.0	29	5	19.0	7.1–50.5
Job classification																
Full-time	3758	821	33.0	30.8–35.3	3756	184	7.2	6.3–8.4	3759	1322	51.5	48.8–54.4	3758	469	18.5	16.9–20.3
Part-time	420	64	45.0	35.6–57.0	420	11	7.3	4.0–13.0	420	119	79.0	66.2–94.4	420	35	24.4	17.7–33.6
Substitute ^b	523	71	59.6	47.2–75.1	523	16	14.5	9.1–23.2	523	133	107.5	90.4–127.8	523	45	35.9	26.6–48.4
Professional Activity																
Classroom teacher	3190	557	32.8	30.2–35.6	3189	125	7.3	6.1–8.6	3191	984	55.5	52.1–59.1	3191	346	19.5	17.5–21.7
Administrator + Superintendent + Dean of students	196	57	32.5	25.1–42.1	196	9	4.9	2.5–9.5	196	74	41.1	32.6–51.7	196	27	15.4	10.5–22.4
School psychologist	46	14	39.7	23.7–66.5	46	2	7.7	2.4–24.8	46	20	56.9	37.0–87.7	46	11	34.1	19.5–59.6
School social worker	66	17	39.1	25.3–60.4	66	4	8.8	3.5–22.0	66	25	54.5	37.7–78.7	66	6	14.0	6.8–29.0
Special education	594	201	44.3	38.6–50.7	593	37	8.1	5.9–11.1	594	274	59.0	52.4–66.3	593	96	21.5	17.7–26.1
Department chair/instructional leader	22	7	69.1	32.8–145.7	22	3	29.8	9.6–92.9	22	7	69.1	32.8–145.7	22	3	28.4	8.9–91.0
Teacher assistant/aide + advisor to extra- curricular activities + other	344	54	31.2	24.0–40.6	344	17	9.7	6.1–15.6	344	103	57.7	47.6–70.0	344	30	17.6	12.4–25.0
No one activity was most common	251	49	33.7	25.5–44.6	251	14	8.5	4.9–14.9	251	87	57.8	46.7–71.6	251	30	19.9	13.8–28.6
Class size																
<10	721	212	43.2	37.8–49.2	720	47	9.5	7.2–12.6	721	304	59.9	53.6–67.0	720	118	24.1	20.2–28.8
10 to less than25	1663	290	35.1	31.3–39.4	1663	59	6.9	5.3–9.0	1664	473	55.6	50.7–60.9	1664	181	21.5	18.5–24.9
>= 25	1864	357	31.6	28.6–35.1	1863	89	7.7	6.3–9.5	1864	645	54.8	50.7–59.2	1864	205	17.2	15.0–19.8
Grade																
Kindergartern-2nd grade	659	82	34.3	27.8–42.3	659	11	4.2	2.3–7.6	659	128	50.3	42.3–59.8	659	58	23.7	18.4–30.5
3–6 grade	907	156	34.2	29.3–40.0	907	25	6.2	4.3–9.0	908	239	51.4	45.3–58.3	908	97	20.9	17.1–25.5
7–9 grade	609	140	33.2	28.2–39.2	607	38	8.7	6.3–12.0	609	239	54.9	48.2–62.4	608	104	24.5	20.2–29.7
10–12 grade	426	106	34.2	28.3–41.4	426	24	7.9	5.3–11.7	426	181	57.1	49.3–66.2	426	43	13.3	9.8–18.1
No one grade level was most frequently taught	1637	375	36.7	33.2–40.6	1637	97	9.0	7.4–11.1	1637	631	59.8	55.3–64.7	1637	203	18.7	16.3–21.5

^a Other than married: Living as married, living with a domestic partner, never married, separated, divorced, or widowed.

^b Substitute: Long-call substitute, building substitute, or all other substitutes.

Table 2a
Rate Ratios (RR) for Physical Assault and Non-Physical Violence Rates Per 100,000 Working Hours Per Year.

Variable	Physical Assault (PA)				Nonphysical Violence (NPV)			
	Number Responses	Number of Educators with PA	Estimate RR	95% C.I.	Number Responses	Number of Educators with NPV	Estimate RR	95% C.I.
<i>Gender^b</i>								
Male	1103	68	0.7	0.6–0.9	1103	399	0.9	0.8–0.9
Female	3628	304	1.0	–	3628	1435	1.0	–
<i>Age group^b</i>								
20–29	416	31	1.0	0.7–1.5	416	165	1.1	0.9–1.3
30–39	1033	83	1.1	0.8–1.4	1033	423	1.1	1.0–1.3
40–49	1242	107	1.1	0.9–1.4	1242	491	1.1	0.9–1.2
50–59	1732	134	1.0	–	1732	654	1.0	–
60–79	308	17	1.0	0.6–1.7	308	101	1.3	1.0–1.6
<i>Race^b</i>								
White	4613	359	1.0	–	4613	1775	1.0	–
Non white	75	7	1.0	0.5–2.2	75	34	1.1	0.8–1.5
<i>Marital status^c</i>								
Married	3740	271	1.0	– 3740	1373	1.0	–	
Other than married ^a	935	92	1.3	1.0–1.6	935	431	1.2	1.1–1.3
<i>Education^d</i>								
Associate + Bachelor's Degree	1781	108	1.0	–	1781	607	1.0	–
Master	2516	213	1.2	1.0–1.6	2516	1032	1.0	0.9–1.2
Education specialist degree	307	35	1.5	1.0–2.3	307	136	1.1	0.9–1.3
Doctorate degree	68	7	1.4	0.6–3.1	68	28	1.0	0.7–1.5
<i>Years worked as a teacher^e</i>								
0–9 years	1371	114	1.0	1371	572	1.0	–	
10–19 years	1414	121	0.9	0.6–1.2	1414	573	0.8	0.7–1.0
20–29 years	1103	82	0.7	0.5–1.0	1103	405	0.7	0.6–0.8
> 30 years	774	46	0.6	0.4–0.9	774	249	0.6	0.5–0.7
<i>Years worked in current school^f</i>								
0–4 years	823	71	1.0	–	823	348	1.0	–
5–9 years	575	40	0.8	0.5–1.1	575	233	0.9	0.8–1.1
10–19 years	719	69	1.1	0.7–1.6	719	284	0.9	0.7–1.1
> 20	528	17	0.4	0.2–0.7	528	175	0.8	0.6–1.0
^a Other than married: Living as married, living with a domestic partner, never married, separated, divorced, or widowed.								
^b Adjusted for non-response.								
^c Adjusted for gender, race, and age.								
^d Adjusted for gender, race, age, and marital status.								
^e Adjusted for gender, race, age, marital status, and education.								
^f Adjusted for gender, race, age, marital status, education, job classification, years worked as a teacher, and professional activity.								
<i>Type of school^b</i>								
Public	3937	319	1.0	–	3935	1520	1.0	–
Public Alternative	157	20	1.7	1.1–2.7	157	112	1.9	1.6–2.3
Public Charter	85	6	0.6	0.2–1.5	85	39	1.0	0.8–1.5
Public Magnet	63	7	1.2	0.6–2.6	63	33	1.2	0.9–1.7
Private (Parochial)	309	4	0.2	0.1–0.4	309	60	0.5	0.4–0.7
Private(Non-Parochial)	64	1	0.1	0.0–1.4	64	15	0.6	0.4–1.0
No one school type was most common	29	6	3.1	1.3–7.0	29	16	1.4	0.8–2.3
<i>Job classification^c</i>								
Full-time	2071	174	1.0	–	1914	773	1.0	–
Part-time	249	12	0.8	0.4–1.4	205	75	1.4	1.1–1.8
Substitute ^a	343	11	0.7	0.4–1.4	308	97	1.7	1.4–2.2
<i>Professional Activity^d</i>								
Classroom teacher	1837	78	1.0	–	1837	654	1.0	–
Administrator + Superintendent + Dean of students	71	9	1.8	0.8–4.0	71	38	1.1	0.8–1.6
School psychologist	18	1	1.0	0.2–6.5	18	10	1.3	0.7–2.6
School social worker	33	7	4.5	2.1–9.8	33	13	1.1	0.7–2.0
Special education	348	69	4.4	3.1–6.2	348	183	1.5	1.2–1.7
Department chair/instructional leader	11	2	3.0	0.7–12.9	11	2	0.5	0.1–1.9
Teacher assistant/aide + advisor to extra- curricular activities + other	194	11	1.4	0.7–2.6	194	74	1.1	0.9–1.4
No one activity was most common	131	20	4.0	2.4–6.6	131	64	1.4	1.1–1.8
<i>Class size^e</i>								
< 10	411	79	2.7	1.9–3.8	411	205	1.4	1.2–1.7
10 to less than 25	952	59	1.0	–	952	317	1.0	–
> = 25	1069	44	0.5	0.4–0.8	1069	427	1.2	1.0–1.4

Table 2a (continued)

Variable	Physical Assault (PA)				Nonphysical Violence (NPV)			
	Number Responses	Number of Educators with PA	Estimate RR	95% C.I.	Number Responses	Number of Educators with NPV	Estimate RR	95% C.I.
<i>Grade^f</i>								
Kindergarten–2nd grade	371	28	1.0	–	371	91	1.0	–
3–6 grade	530	32	0.8	0.5–1.3	530	169	1.3	1.0–1.7
7–9 grade	319	17	0.7	0.4–1.3	319	146	1.8	1.4–2.3
10–12 grade	219	6	0.4	0.2–0.9	219	103	1.8	1.3–2.4
No one grade level was most frequently taught	982	98	1.4	0.9–2.1	982	435	1.8	1.4–2.2

^aSubstitute: Long-call substitute, building substitute, or all other substitutes.

^bAdjusted for gender, race, age, marital status, education, job classification, and years worked as a teacher.

^cAdjusted for gender, race, age, marital status, education, school type, grade, and years worked in the current school.

^dAdjusted for gender, race, age, marital status, education, job classification, years worked as a teacher, years worked in the current school, and school type.

^eAdjusted for gender, race, age, education, job classification, years worked as a teacher, years worked in the current school, school type, and professional activity.

^fAdjusted for gender, race, age, marital status, education, job classification, years worked as a teacher, years worked in the current school, school type, and professional activity.

educators who: were aged 20–29, compared to 50–59 years; and worked in part-time or substitute versus full-time positions. In addition, a decreased risk was seen for male compared to female educators. Years of working in the current school and grade taught were not associated with any of the outcomes.

4. Discussion

This current study was based on a comprehensive population investigation of violence against licensed educators in Minnesota. As noted, the numerator of the rates and risks calculations was the number of educators who experienced at least one PA or NPV event while the denominator was 100,000 working hours per year. This was considered as a conservative approach and would be expected to minimize overestimation due to recall bias.

Some of the findings in this study appeared to vary from other studies due to the use of different methods, definitions of violence, and study populations. The majority of respondents were female who were more likely to experience PA and NPV compared to male educators; however, other studies reported that males were more likely than female educators to experience violence (DeVoe et al., 2005; Duhart, 2001; Liss & McCaskell, 1994; Peek-Asa, Howard, Vargas, & Kraus, 1997; Peek-Asa et al., 1998). According to working experience, educators in the current study with greater years of teaching experience, had decreased PA and NPV rates; however, an opposite finding from another study, using a different study population, suggested that teachers with more experience were more likely to report an assault (Casteel, Peek-Asa, & Limbos, 2007). In the current study, educators who worked in special education, compared with classroom teaching, were at increased risks of 4.4 and 1.4, respectively, for PA and NPV. Thus, it is important to consider specific intervention strategies, including focused violence prevention education and training, to reduce both PA and NPV among those particular educators.

Findings relevant to the work environment were consistent with previous reports (Dinkes et al., 2007; Nolle, Guerino, & Dinkes, 2007); educators who taught in public alternative, versus public schools, had increased risks for both PA and NPV, and decreased risks for those who taught in private compared to public schools. It was also shown that class sizes may affect violence rates; both PA and NPV rates were the highest among educators who taught classes with fewer than 10 students. Based on multivariable analysis, those educators who taught in classrooms with more than 25, versus 10 to less than 25 students, had decreased rates for PA but increased rates for NPV. Similarly, risks for educators who taught in grades 10–12, versus kindergarten through second grades, had decreased risks for PA and increased risks for NPV. These findings were consistent with a previous study, showing that secondary school educators

were less likely to experience PA than elementary school teachers, but more likely to experience NPV, including threats (DeVoe et al., 2005).

It has been reported that violence directly impacts on teachers' performance in class and the quality of teaching (Fisher & Kettl, 2003). Work-related violence has been associated with consequences of work performance, including reduced productivity, reduced quality of life, increased turnover, and absenteeism (Gerberich et al., 2004; Lanza, 1983; Martino, Hoel, & Cooper, 2003) as well as fear of recurrent assault, family disruption, and career changes (Liss & McCaskell, 1994). Work-related violence has also been associated with short-term and long-term physical, emotional and professional effects (Gerberich et al., 2004; Levin, Hewitt, & Misner, 1998). The impact of NPV cannot be neglected since the consequences of nonphysical violence have been shown to be more severe than PA (Gerberich et al., 2004, 2011) and may lead to more advanced mental health problems such as acute stress disorder or post-traumatic stress syndrome (Brewin, Andrews, Rose, & Kirk, 1999). According to another analysis conducted with the same population (Gerberich et al., 2011), it was identified that the most frequently reported symptoms and feelings after violent events (PA or NPV) were frustration, anger, fear/anxiety/stress, and sadness. In particular, educators who experienced NPV, compared with PA, reported much higher percentages of these symptoms. Moreover, the resulting impact on work status (including restricted or modified work, quitting, transferring, and/or obtaining a leave of absence) for NPV, versus PA, has also been shown to be greater (Gerberich et al., 2004, 2011). Knowledge of these risks and potential consequences is important not only to the educators but, also, to the administrators who have a responsibility for maintaining a safe working environment and can facilitate targeted intervention efforts for at-risk groups; this is essential to ensure retention of the best educators and ensure quality education in primary and secondary schools (Gerberich et al., 2011).

4.1. Limitations

Limitations in this study include the fact that data, pertinent to violent events and relevant exposures, were collected through self-report, which may involve potential biases. Numerous strategies to minimize these potential biases were incorporated; for example, recall bias, was ideally minimized, by limiting the recall of violent events to the previous 12 months. In addition, a calendar with relevant holidays was included in the questionnaire to assist participants' recall of events. This approach has also been implemented in previous studies (Gabel & Gerberich, 2002; Gerberich et al., 2004, 2005, 2011; Sage et al., 2010). Information bias was further addressed by follow-up via mail to clarify ambiguous and missing information. As previously

Table 2b
Rate Ratios (RR) for Non-Physical Violence Rates Per 100,000 Working Hours Per Year.

Variable	Threat (T)				Sexual Harassment (SH)				Verbal Abuse (V)				Bullying (B)			
	Number Responses	Number of Educators with T	Estimate RR	95% C.I.	Number Responses	Number of Educators with SH	Estimate RR	95% C.I.	Number Responses	Number of Educators with V	Estimate RR	95% C.I.	Number Responses	Number of Educators with B	Estimate RR	95% C.I.
<i>Gender^b</i>																
Male	1103	219	1.0	0.9–1.2	1103	38	0.7	0.5–1.0	1103	348	0.9	0.8–1.1	1103	94	0.7	0.6–0.9
Female	3628	738	1.0	–	3628	174	1.0	–	3628	1228	1.0	–	3628	456	1.0	–
<i>Age group^b</i>																
20–29	416	95	1.2	1.0–1.5	416	26	1.8	1.1–2.9	416	134	0.9	0.8–1.1	416	61	1.3	1.0–1.7
30–39	1033	240	1.2	1.0–1.4	1033	53	1.5	1.0–2.2	1033	363	1.0	0.9–1.1	1033	124	1.0	0.8–1.3
40–49	1242	246	1.1	0.9–1.2	1242	66	1.6	1.1–2.3	1242	412	1.0	0.8–1.1	1242	141	1.0	0.8–1.3
50–59	1732	323	1.0	–	1732	56	1.0	–	1732	579	1.0	–	1732	195	1.0	–
60–79	308	53	1.3	1.0–1.8	308	11	1.5	0.8–3.0	308	88	1.2	1.0–1.6	308	29	1.2	0.8–1.8
<i>Race^b</i>																
White	4613	928	1.0	–	4613	1775	1.0	–	4613	1524	1.0	–	4613	532	1.0	–
Non white	75	17	1.0	0.6–1.6	75	34	1.1	0.8–1.5	75	29	1.0	0.7–1.5	75	11	1.3	0.7–2.2
<i>Marital status^c</i>																
Married	3740	726	1.0	–	3740	140	1.0	–	3740	1166	1.0	–	3740	408	1.0	–
Other than married ^a	935	218	0.9	0.8–1.1	935	70	1.6	1.2–2.1	935	383	1.1	0.9–1.2	935	134	1.0	0.9–1.3
<i>Education^d</i>																
Associate + Bachelor's Degree	1781	302	1.0	–	1781	69	1.0	–	1781	525	1.0	–	1781	182	1.0	–
Master	2516	546	1.0	0.8–1.1	2516	112	1.0	0.7–1.3	2516	887	0.9	0.8–1.0	2516	308	0.9	0.8–1.1
Education specialist degree	307	79	1.0	0.8–1.3	307	27	1.6	1.0–2.5	307	113	0.8	0.6–1.0	307	45	1.0	0.7–1.4
Doctorate degree	68	17	1.1	0.6–1.7	68	2	0.8	0.2–3.1	68	23	0.8	0.5–1.2	68	6	0.6	0.3–1.4
<i>Years worked as a teacher^e</i>																
0–9 years	1371	318	1.0	–	1371	85	1.0	–	1371	474	1.0	–	1371	183	1.0	–
10–19 years	1414	297	0.9	0.7–1.1	1414	54	0.6	0.4–0.9	1414	494	0.9	0.8–1.1	1414	151	0.8	0.6–1.0
20–29 years	1103	200	0.8	0.7–1.0	1103	45	0.7	0.5–1.2	1103	355	0.9	0.8–1.1	1103	123	0.9	0.7–1.3
> 30 years	774	128	0.9	0.7–1.2	774	26	1.0	0.5–1.8	774	221	1.0	0.7–1.2	774	83	1.1	0.8–1.7
<i>Years worked in current school^f</i>																
0–4 years	823	198	1.0	–	823	43	1.0	–	823	298	1.0	–	823	111	1.0	–
5–9 years	575	115	0.9	0.7–1.1	575	25	0.8	0.5–1.4	575	199	1.0	0.8–1.2	575	65	1.0	0.7–1.3
10–19 years	719	158	1.0	0.8–1.4	719	30	1.0	0.6–1.8	719	244	1.0	0.8–1.2	719	84	1.0	0.7–1.4
> 20	528	84	0.9	0.7–1.3	528	18	0.9	0.4–1.9	528	155	1.0	0.8–1.3	528	51	0.9	0.6–1.4

^aOther than married: Living as married, living with a domestic partner, never married, separated, divorced, or widowed.

^bAdjusted for non-response.

^cAdjusted for gender, race, and age.

^dAdjusted for gender, race, age, and marital status.

^eAdjusted for gender, race, age, marital status, and education.

^fAdjusted for gender, race, age, marital status, education, job classification, years worked as a teacher, and professional activity.

<i>Type of school^b</i>																
Public	3935	775	1.0	–	3935	165	1.0	–	3935	1300	1.0	–	3935	446	1.0	–
Public Alternative	157	74	1.4	1.8–1.7	157	25	1.9	1.3–3.0	157	108	1.2	1.0–1.5	157	36	1.3	0.9–1.8
Public Charter	85	25	1.1	0.8–1.7	85	4	0.8	0.3–2.1	85	34	1.0	0.7–1.4	85	15	1.3	0.8–2.2
Public Magnet	63	24	1.3	0.9–2.0	63	5	1.3	0.6–3.2	63	29	1.0	0.7–1.5	63	7	0.7	0.3–1.4
Private (Parochial)	309	23	0.8	0.5–1.2	309	4	0.6	0.2–1.6	309	40	0.8	0.6–1.1	309	23	1.4	0.9–2.1
Private(Non-Parochial)	64	10	1.2	0.6–2.1	64	1	0.4	0.0–4.1	64	13	0.8	0.5–1.5	64	7	1.3	0.6–2.8
No one school type was most common	29	11	1.2	0.6–2.3	29	5	2.8	1.1–7.5	29	16	1.0	0.6–1.8	29	5	0.9	0.3–2.4
<i>Job classification^c</i>																
Full-time	1914	425	1.0	–	1914	92	1.0	–	1914	672	1.0	–	1914	240	1.0	–
Part-time	205	34	1.2	0.9–1.7	205	9	1.3	0.7–2.7	205	64	1.5	1.2–2.0	205	23	1.5	1.0–2.4
Substitute ^a	308	50	2.2	1.6–3.0	308	7	1.6	0.7–3.6	308	78	1.9	1.5–2.5	308	26	2.0	1.3–3.2
<i>Professional Activity^d</i>																
Classroom teacher	1837	332	1.0	–	1837	69	1.0	–	1837	563	1.0	–	1837	195	1.0	–
Administrator + Superintendent + Dean of students	71	23	1.0	0.6–1.6	71	5	0.5	0.2–1.5	71	33	0.9	0.6–1.3	71	14	1.2	0.6–2.2
School psychologist	18	7	1.3	0.6–2.8	18	1	0.6	0.1–3.9	18	9	1.1	0.6–2.2	18	4	1.7	0.6–4.8
School social worker	33	7	1.3	0.6–2.7	33	1	0.6	0.1–5.6	33	11	1.2	0.7–2.1	33	3	1.0	0.4–3.0
Special education	348	123	1.4	1.2–1.8	348	20	1.0	0.6–1.6	348	159	1.1	0.9–1.3	348	60	1.2	0.9–1.6
Department chair/instructional leader	11	2	1.7	0.4–6.5	11	1	3.2	0.4–24.4	11	2	1.0	0.3–3.8	11	1	1.1	0.2–7.6
Teacher assistant/aide + advisor to extra- curricular activities + other	194	29	0.8	0.6–1.2	194	9	1.2	0.6–2.5	194	61	1.0	0.7–1.3	194	15	0.8	0.5–1.3
No one activity was most common	131	32	1.1	0.7–1.5	131	10	1.2	0.6–2.4	131	56	1.1	0.8–1.4	131	19	1.0	0.6–1.7
<i>Class size^e</i>																
<10	411	127	1.1	0.9–1.4	408	29	1.6	1.0–2.7	411	177	1.0	0.8–1.2	411	75	1.2	0.9–1.6
10 to less than25	952	179	1.0	–	950	32	1.0	–	952	281	1.0	–	952	109	1.0	–
>= 25	1069	205	0.8	0.7–1.0	1068	47	1.3	0.8–2.1	1069	360	0.9	0.8–1.1	1069	107	0.8	0.6–1.1
<i>Grade^f</i>																
Kindergartern-2nd grade	371	48	1.0	–	371	7	1.0	–	371	75	1.0	–	371	33	1.0	–
3–6 grade	530	97	1.0	0.7–1.5	530	10	0.9	0.3–2.3	530	137	1.0	0.8–1.3	530	59	1.1	0.7–1.6
7–9 grade	319	72	0.9	0.6–1.3	319	22	2.0	0.9–4.7	319	128	1.1	0.8–1.5	319	50	1.1	0.7–1.8
10–12 grade	219	58	1.0	0.7–1.4	219	7	1.0	0.3–2.7	219	93	1.1	0.8–1.5	219	19	0.6	0.3–1.0
No one grade level was most frequently taught	982	234	1.0	0.7–1.4	982	62	1.9	0.9–4.2	982	380	1.1	0.8–1.4	982	128	0.9	0.6–1.3

^aSubstitute: Long-call substitute, building substitute, or all other substitutes.

^bAdjusted for gender, race, age, marital status, education, job classification, and years worked as a teacher.

^cAdjusted for gender, race, age, marital status, education, school type, grade, and year worked in the current school.

^dAdjusted for gender, race, age, marital status, education, job classification, years worked as a teacher, years worked in the current school, and school type.

^eAdjusted for gender, race, age, education, job classification, years worked as a teacher, years worked in the current school, school type, and professional activity.

^fAdjusted for gender, race, age, marital status, education, job classification, years worked as a teacher, years worked in the current school, school type, and professional activity.

noted, missing working hours were addressed through imputation (Madow et al., 1983). Potential response bias was reduced by inversely weighting observed responses by probabilities of response, estimated as a function of educator characteristics available from the licensing database (Horvitz & Thompson, 1952). To account for unknown eligibility among non-respondents, probability of eligibility was estimated from these same factors (Mongin, 2001). Selection of confounders for multiple regression models, a priori, was based on DAGs to reduce the effects of confounding (Greenland et al., 1999). Of note, is that the calculated rates may be underestimated, given that a maximum of one event was included per educator in the data analysis; yet, many educators experienced multiple violent events.

5. Summary

Work-related violence has been recognized as a serious public health issue, and educators are at increased risk of occupational violence. No apparent comparable comprehensive studies, that focused on violence against educators, based on hours exposed, have been conducted previously. It is of particular concern that violence may impact on teachers' performance in class and the quality of teaching. The fact that the impact of non-physical, compared to physical, violence has been shown to be more severe requires great attention. This includes the resulting impact of NPV versus PA on work status (including restricted or modified work, quitting, transferring, and/or obtaining a leave of absence).

6. Impact on industry

Results of this study identified the magnitude of the violence problem, based on hours exposed. Factors found to be associated with increased or decreased risks for violence against educators enable opportunities for further investigation and consideration of interventions to reduce violence in the school environments. As noted, overall the NPV rate (26.4 per 100,000 working hours per year) was much higher than the PA rate (5.3 per 100,000 working hours per year). Although NPV events, such as threat, sexual harassment, verbal abuse, and bullying are of a non-physical nature, they are associated with consequences that can impact teaching effectiveness and retention, thus, requiring consideration of development of prevention strategies for this type of violence. The findings of this study serve as the basis for additional analytical studies that would enable future development of appropriate prevention and control efforts in work-related violence. Therefore, this information is not only important to educators but, also, it provides opportunities for administrators to ensure safe working environments in schools.

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