Youth violence victims and perpetrators in Ontario: identifying a high-risk group and a focus for public health prevention

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Abstract

Objectives Bullying and violence are common experiences and pose significant lifelong burdens of disease for youth. This study identifies upstream determinants of youth violence and examines the shared characteristics of victims and perpetrators.

Methods Multivariable multinomial logistic regression modeling analyzed a subsample of 5403 students who participated in the 2015 Ontario Student Drug Use and Health Survey to estimate the likelihood that students with various risk profiles were victims and perpetrators.

Results Risk factors associated with an increased likelihood of being both a victim and a perpetrator, compared to neither, included harmful alcohol use, potential problem drug use, psychological distress, traumatic brain injury, problem video game playing, fighting, and carrying a weapon in the past 12 months. Many risk factors were more strongly associated with both victimization and perpetration relative to reporting either alone.

Conclusion This study demonstrates an association between risk factors of interest to public health for students reporting both victimization and perpetration. This group may warrant further targeted public health interventions to prevent violence alongside existing public health programs addressing other health risk behaviours.

Résumé

Objectifs L'intimidation et la violence sont des expériences courantes et constituent un lourd fardeau pour les jeunes, tout au long de leur vie. Cette étude cerne en amont les déterminants de la violence chez les jeunes et examine les caractéristiques communes des victimes et des agresseurs.

Méthodes La modélisation de régression logistique multinomiale et multivariable a été utilisée pour analyser un sous-échantillon de 5403 étudiants ayant participé au Sondage sur la consommation de drogues et la santé des élèves de l'Ontario de 2015 afin d'estimer la probabilité que les élèves présentant divers profils de risque soient victimes et agresseurs.

Résultats Les facteurs de risque associés à une probabilité accrue d'être à la fois une victime et un agresseur, sans autre comparaison, sont les suivants : consommation d'alcool nuisible, possible consommation problématique de drogues, détresse psychologique, traumatisme cérébral, usage problématique de jeux vidéo, enclen à la bagarre et au port d'arme au cours des 12 derniers mois. De nombreux facteurs de risque étaient plus fortement associés à la fois aux victimes et aux agresseurs, plutôt qu'à l'un ou à l'autre.

Conclusion Cette étude démontre un lien entre les facteurs de risque d'intérêt pour la santé publique touchant les élèves qui signalent à la fois être une victime et un agresseur. Ce groupe pourrait justifier des interventions ciblées sur d'autres comportements à risque afin de prévenir la violence, en plus des programmes de santé publique existants.

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Introduction

Bullying and violence are common experiences for youth. For example, the Ontario Student Drug Use and Health Survey found that 24% of the students reported being bullied at school and 10% reported physically fighting on school property in the past year (Boak et al. 2016). Among youth victims of bullying and violence, there is significant psychological distress and low self-esteem; in turn, there are demonstrated increases in rates of mental illness, substance abuse, and suicide (Sinyor et al. 2014; Cénat et al. 2015). Victims of bullying are more likely to experience obesity, cigarette smoking, and physical inactivity, leading to increases in the rates of chronic diseases (Janssen et al. 2004; Kukaswadia et al. 2011; McLaughlin et al. 2016; Azagba 2016). There is evidence to suggest that not all youth experience bullying and violence equally. Increased rates of bullying have been demonstrated among those with lower socio-economic standing, sexual minorities (LGBTQ), and youth already suffering from illness (Cénat et al. 2015; Due et al. 2009; Fekkes et al. 2006; O'Malley Olsen et al. 2014). Bullying further exacerbates existing poorer health statuses among these groups.

Extensive discussion on the definitions of bullying and violence exists in the literature (Arora 1996). Bullying refers to “aggressive behavior [...] carried out repeatedly over time [...] with an] imbalance of power.” (Smith et al. 1999). The World Health Organization has adopted the following definition of violence: “the intentional use of physical force or power, threatened or actual, against oneself, another person, or against a group or community, that either results in or has a high likelihood of resulting in injury, death, psychological harm, maldevelopment or deprivation” (Krug et al. 2002). There is therefore significant overlap between the concepts of bullying and violence, where bullying refers to a form of physical or non-physical violence that is perpetrated repeatedly over time.

For victims and perpetrators of violence, there are both unique and shared risk factors and health impacts. Although attention traditionally has focused on the victims of violence, research has demonstrated that perpetrators are also impacted by adverse health outcomes (Resnick et al. 2004). The impacts may be felt in different ways for victims and perpetrators. A study on youth bullying in Italy demonstrated that victims have greater internalizing symptoms, while perpetrators had greater externalizing symptoms (Menesini et al. 2009). This study also showed that individuals reporting being both perpetrators and victims have a high rate of both externalizing and internalizing symptoms. For individuals reporting both

victimization and perpetration, there may be more severe symptoms, and this group therefore warrants special attention.

The complex victim and perpetrator overlap has been debated in the literature (Jennings et al. 2012). Empirical research has also identified that in many instances, these individuals may overlap over time: victims become perpetrators or perpetrators become victims (Mustaine and Tewksbury 2000; Gottfredson 1986). This is supported by evidence that bullying in adolescence has been shown to be a predictor of violence perpetration later in life (Ttofi et al. 2012; Schwartz et al. 2015).

One theory to explain the phenomenon of victim-perpetrator overlap is that of homogeneity. Homogeneity proposes that shared characteristics of victims and perpetrators make them more susceptible to become *both* victims and perpetrators (Hindelang et al. 1978). There is much debate in the literature as to why this is the case. One theory proposed is that shared exposures to particular risk factors for violence impact victims and perpetrators (Lauritsen et al. 1992). Alternatively, it has been suggested that it is common social networks, such as those provided in a gang context, that predispose individuals to both perpetration and victimization of violence (Singer 1981). Finally, other researchers have argued that perpetrators of violence may be less likely to report victimization of violence and therefore make more desirable targets (Jennings et al. 2012).

Much of the research exploring the victim-perpetrator overlap, that is, individuals who are both victims and perpetrators, has been from a criminal justice perspective (Moore 1995). A criminal justice perspective views violence as “crimes,” while a public health perspective views violence as preventable “intentional injuries” (Mustaine and Tewksbury 2000). We use a public health perspective to identify preventable risk factors and determinants of victimization and perpetration, in particular where they overlap has important implications for public health policy and programming to prevent youth bullying and violence. The purpose of this study is to assess the associations between risk factors for violence and bullying for Ontario youth who are victims, perpetrators, both victims and perpetrators, and neither victims nor perpetrators. The public health significance of the findings will be discussed.

Methods

This study utilizes data from the 2015 cycle of the Ontario Student Drug Use and Health Survey (OSDUHS). The study

was approved by the Public Health Ontario's Ethics Review Board. Ethics review and survey methodologies for OSDUHS are described in detail elsewhere (Boak et al. 2016). Briefly, OSDUHS is a repeated cross-sectional survey that collects surveillance data related to alcohol use, drug use, mental health, health-related behaviours, and self-reported height and weight in students in grades 7–12 in the province of Ontario. OSDUHS has been administered biennially in a random sample of Ontario schools since 1977. In recent cycles, OSDUHS has collected data from more than 150 schools and more than 10,000 students every cycle, and when sample weights are applied, OSDUHS data are considered to be representative of all Ontario students in grades 7–12 in publicly funded schools.

OSDUHS utilizes an anonymous self-administered pen and paper survey design conducted in French and English. Two survey versions (A and B) were assigned randomly to respondents. This study utilizes the subsample of OSDUHS respondents who were assigned the version of the survey that included questions about violence and bullying (Version A, $n = 5403$). Data for the 2015 OSDUHS is available by request through the Centre for Addictions and Mental Health.

OSDUHS 2015 asked questions about bullying and violence, which were useful to the current analysis. In the questionnaire, a segment using questions derived from the WHO Health Behaviour in School-Aged Children survey asks for occurrence, method, and frequency of being bullied and bullying others (Currie et al. 2008). Additional questions ask for frequency of being cyber-bullied, fighting, and being threatened with a weapon on school property. There are also questions in the segment on delinquent activity from the Monitoring the Future—National Institute on Drug Abuse survey, asking the number of times in the past 12 months that respondents have carried a weapon and beat up/hurt anyone. Although these two concepts can be characterized as acts of violence, whether they were in aggression or self-defense was not ascertained in the questionnaire. As described, violence and bullying are related concepts. For the multinomial analysis, experiences with bullying and physical violence were therefore combined in order to identify students who had any experience with victimization or perpetration of bullying or physical violence.

Experience with bullying and physical violence was grouped according to the manner experienced: “victims,” “perpetrators,” “both,” or “neither.” The victim category included only those individuals who experienced any instances of the following: “since September, how often have you been bullied at school,” “in the last 12 months, how often did other people bully or pick on you electronically or through the internet,” or “in the last 12 months, how often has someone threatened or injured you with a weapon (such as a gun, knife, or club) on school property.” The perpetrator category included only those who answered once or more frequently to: “since September, how often have you taken part in bullying

other students at school,” or “in the last 12 months, how often have you beaten up or hurt anyone (other than siblings).” The third category represented those who reported being both victims and perpetrators, whereas the fourth category represented those who were neither victims nor perpetrators. The fourth category of neither victims nor perpetrators was used as the reference group in a multinomial model to explore risk factors associated with reporting only victimization, only perpetration or both. For “fighting” and “carrying a weapon,” the directionality could not be ascertained from the questions asked. For fighting, the wording of the question in OSDUHS does not distinguish whether the respondent reporting fighting was the instigator or not. With respect to carrying a weapon, it is unknown whether the weapon carried was used and whether the decision to carry it originated before or after experiencing violence. Therefore, fighting and carrying a weapon were not included in the victim/perpetrator experience categories, however, were incorporated into the model as potential risk factors.

Risk factors to be assessed in the multinomial model were derived from a literature review as potential determinants of violence and bullying. We included subjective socioeconomic status (MacArthur Subjective Social Status (SSS) scale), harmful alcohol use (AUDIT), potential problem drug use (CRAFFT Scale), traumatic brain injury (TBI), tobacco use (in lifetime), symptoms of attention deficit-hyperactivity disorder (ADHD), problem video playing (PVP), and psychological distress (Kessler-6 scale).

The MacArthur SSS scale asks respondents to place their own social status on a 10-rung ladder in relation to their social position in their community. It is an accurate approximation for true socio-economic status that has been validated in adolescents (Goodman et al. 2001). For modeling, Subjective Social Status was coded as “high SSS” (≥ 5) or “low SSS” (≤ 4) in accordance with previous reporting (Lemeshow et al. 2008).

Harmful alcohol use was assessed using the Alcohol Use Disorders Identification Test (AUDIT). AUDIT is a validated 10-question screening instrument developed by the WHO, with each question scored zero to four based on the frequency of occurrence (Saunders et al. 1993). A score of ≥ 8 is representative of hazardous alcohol use and moderate risk of harm, and data were coded “yes” ≥ 8 or “no” < 8 .

Potential problem drug use was assessed using the validated CRAFFT screening tool (Knight et al. 1999). CRAFFT asks six questions about potential problem drug use, and a score of ≥ 2 indicates potential problem drug use. Data were coded yes with a score of ≥ 2 or no with a score of < 2 .

TBI was defined as a head injury resulting in unconsciousness for greater than 5 min, or an overnight hospitalization. TBI was assessed by asking respondents the number of times they had a traumatic brain injury in their lifetime. This question was introduced on the OSDUHS in 2011 and shows

strong relationships with mental health and substance abuse measures (Ilie et al. 2014; Ilie et al. 2016; Tejeiro Salguero and Morán 2002). Respondents reporting ≥ 1 TBI were coded as yes, respondents reporting zero occurrences were coded as no.

Tobacco cigarette use was assessed by asking respondents whether they had ever smoked a tobacco cigarette in their lifetime. Respondents reporting any tobacco cigarette smoking were coded as yes, respondents not reporting tobacco cigarette use were coded as no.

Symptoms of ADHD were assessed using the ADHD Self Report Scale (ASRS) (Kessler et al. 2007). The ASRS asks the frequency of psychological and physical symptoms of ADHD. The ASRS has been shown to be valid in Canada and with adolescent populations (Vingilis et al. 2015; Sonnby et al. 2011). A score of ≥ 17 represents symptoms indicative of likely or highly likely to have ADHD. Respondents were coded as having symptoms of ADHD with a score ≥ 17 , or no with a score of < 17 .

Problem video game playing was assessed using the PVP Questionnaire. Respondents were asked questions in relation to video game use addiction symptoms, including preoccupation, tolerance, loss of control, withdrawal, escape, lies and deception, disregard for the physical or psychological consequences, and family/schooling disruption (Tejeiro Salguero and Morán 2002). A score of ≥ 5 indicates symptoms of problem video game playing.

Psychological distress was assessed using the Kessler-6 (K6) screener for non-specific psychological distress and represents symptoms associated with anxiety and depression (Kessler et al. 2003). The questionnaire asks how often in the past 30 days respondents have felt: nervous, hopeless, restless or fidgety, so depressed that nothing could cheer you up, that everything was an effort, and worthless. Respondents classify the frequency of which they have experienced each of these in the past 30 days: none of the time, a little of the time, some of the time, most of the time, or all of the time. Total scores for psychological distress were coded in accordance with K6 interpretation: 0–11 “no/low,” 12–16 “moderate,” and ≥ 18 “high.”

Multivariable multinomial logistic regression modeling was performed using R (version 3.2.5). All analyses applied sample weights and adjusted for the complex survey design. Risk factor variables were assessed to determine the relative risk of students reporting victimization, perpetration, or both victimization and perpetration of violence and bullying in comparison to neither victimization nor perpetration of violence and bullying (i.e., the reference category).

Results

Table 1 describes the proportion of respondents reporting each risk factor variable. The proportion of respondents reporting

no involvement in bullying or violence was 63.2% (95% CI 60.6–65.5). The proportion reporting victimization was 21.4% (95% CI 19.7–23.2). The proportion reporting perpetration was 4.4 (95% CI 3.6–5.2). The proportion reporting both victimization and perpetration was 11.0 (95% CI 9.3–12.7). The proportion of respondents who reported fighting increased from 5.0% in the neither victim/perpetrator category to 27.7% in both victims and perpetrators. The proportion of respondents who reported carrying a weapon increased from 3.3% in the neither victim/perpetrator category to 15.7% in both victims and perpetrators.

The correlations between the individual questions that constituted “victim” and “perpetrator” categories were assessed using Spearman correlation coefficients. For victimization questions: the correlation coefficient between bullied and cyber-bullied was 0.420; the correlation coefficient between bullied and threatened or injured on school property was 0.175; and the correlation coefficient between cyber-bullied, threatened or injured on school property was 0.184. For the questions composing perpetration, the correlation coefficient between bullying and beating someone up on purpose was 0.210.

The final adjusted model (Table 2 and Fig. 1) demonstrated that with increasing grade, the likelihood of being a victim only, compared to being neither a victim nor a perpetrator, decreased significantly (relative risk (RR) 0.848; 95% CI 0.777–0.925). The likelihood of being a victim only was lower for males (RR 0.673; 95% CI 0.544–0.833); and, higher subjective SES was associated with a lower likelihood of being a victim only (RR 0.935; 95% CI 0.882–0.991). Behavioural risk factors that were significantly associated with an increased likelihood of being a victim only, compared to being neither a victim nor a perpetrator, included harmful alcohol use (RR 1.715; 95% CI 1.302–2.260), potential problem drug use (RR 1.454; 95% CI 1.066–1.981), moderate (RR 1.785; 95% CI 1.434, 2.223) and high psychological distress (RR 4.244; 95% CI 3.128–5.757) based on the Kessler-6, TBI (RR 1.361; 95% CI 1.073–1.727), problem video playing (RR 1.438; 95% CI 1.055–1.429), and fighting on school property in the past 12 months (RR 2.821; 95% CI 1.863–4.270).

There was no association between the grade and the likelihood of being a perpetrator only, versus being neither victim nor perpetrator. Relative to females, males were more likely to be perpetrators only (RR 1.748; 95% CI 1.179–2.592); and, there was no significant relationship with subjective social status. Behavioural risk factors that were significantly associated with an increased likelihood of being a perpetrator only, compared to being neither a victim nor a perpetrator, included harmful alcohol use (RR 1.907; 95% CI 1.177–3.090), fighting (RR 6.200; 95% CI 3.671–10.472), and carrying a weapon (RR 2.821; 95% CI 1.514, 5.259).

There were no significant relationships between grade or sex and the likelihood of being both a perpetrator and victim,

Table 1 Violence/bullying outcomes by variables assessed

Variable	Victims (%; 95% CI)	Perpetrators (%; 95% CI)	Both (%; 95% CI)	Neither (%; 95% CI)
Overall	21.4 (19.7–23.2)	4.4 (3.6–5.2)	11.0 (9.3–12.7)	63.2 (60.6–65.5)
Grade				
Grade 7	26.0 (18.8–33.2)	5.3 (2.4–8.1)	5.6 (2.5–8.8)	63.1 (58.0–68.2)
Grade 8	21.0 (16.5–25.4)	4.9 (2.1–7.6)	13.3 (7.7–18.9)	61.0 (54.0–67.8)
Grade 9	23.1 (19.3–27.0)	4.0 (2.2–5.8)	9.6 (6.9–12.4)	63.2 (58.6–67.8)
Grade 10	22.2 (18.6–25.9)	4.1 (2.5–5.7)	11.9 (8.6–15.2)	61.8 (56.8–66.7)
Grade 11	19.8 (16.1–23.4)	4.0 (2.5–5.4)	9.2 (6.4–12.0)	67.1 (62.4–71.8)
Grade 12	18.7 (14.9–22.4)	4.3 (2.5–6.2)	14.3 (10.2–18.4)	62.7 (57.1–68.4)
Sex				
Males	17.1 (15.1–19.2)	6.0 (4.7–7.4)	12.1 (9.6–14.7)	61.5 (58.1–65.0)
Females	26.0 (22.8–29.2)	2.7 (1.7–3.6)	9.9 (8.1–11.6)	64.7 (61.6–67.9)
Region				
East	20.1 (17.8–23.9)	3.4 (2.2–4.6)	11.8 (8.5–15.1)	63.9 (59.7–68.1)
North	25.0 (21.8–28.3)	2.3 (1.1–3.4)	14.0 (10.8–17.2)	58.7 (54.4–62.9)
West	22.3 (19.3–25.4)	5.3 (3.8–6.7)	10.5 (7.9–13.0)	62.0 (58.4–65.5)
Toronto	18.9 (15.6–22.2)	4.9 (3.0–6.7)	9.8 (6.4–13.1)	66.5 (61.0–72.0)
Subjective social status				
Mean score	6.8 (6.6–7.0)	7.2 (6.9–7.5)	6.7 (6.5–7.0)	7.1 (7.0–7.2)
Score < 5 (low SES)	21.4 (17.9–24.9)	15.9 (9.8–22.0)	11.3 (6.9–15.7)	14.9 (12.7–17.0)
Substance use				
Harmful alcohol use (AUDIT 8+)	25.2 (20.2–30.2)	30.6 (19.9–41.2)	42.0 (33.4–50.7)	13.4 (10.7–16.2)
Potential drug use problem (CRAFFT 2+)	23.5 (18.9–28.2)	26.3 (16.1–36.6)	37.8 (31.9–43.7)	8.9 (7.1–10.8)
Tobacco Use (life)	23.3 (19.6–26.9)	25.7 (18.2–33.1)	36.7 (28.1–45.3)	13.2 (11.1–15.4)
Psychological distress (Kessler-6)				
Low	34.0 (29.9–38.1)	56.5 (45.8–67.3)	28.6 (22.5–34.6)	63.1 (60.4–65.9)
Moderate	43.9 (39.8–48.0)	36.1 (26.3–45.8)	52.1 (45.6–58.6)	30.1 (27.6–32.5)
High	22.1 (18.1–26.1)	7.4 (3.5–11.3)	19.3 (13.5–25.2)	6.8 (5.4–8.2)
Traumatic brain injury	22.2 (19.1–25.3)	26.4 (19.5–33.4)	30.7 (24.4–36.9)	14.4 (12.6–16.2)
ADHD (ASRS)	28.8 (24.2–33.3)	18.3 (10.3–26.3)	32.5 (25.5–39.6)	15.9 (13.9–17.9)
Problem video game use	14.3 (10.8–17.7)	14.8 (6.6–23.1)	23.9 (18.4–29.3)	10.0 (8.3–11.7)
Fought	13.6 (10.3–16.8)	23.9 (14.0–33.8)	27.7 (21.5–34.0)	5.0 (3.6–6.4)
Carried a weapon	4.3 (2.9–5.6)	9.0 (4.4–13.6)	15.7 (9.7–21.7)	3.3 (2.2–4.5)

in comparison to being neither. High subjective social status was protective of being both a victim and perpetrator, in comparison to neither (RR 0.919; 95% CI 0.850, 0.993). Behavioural risk factors that were significantly associated with an increased likelihood of being both a victim and a perpetrator compared to being neither included harmful alcohol use (RR 2.587; 95% CI 1.848–3.621), potential problem drug use (RR 2.209; 95% CI 1.539–3.171), moderate (RR 2.349; 95% CI 1.728–3.192) and high (RR 2.888; 95% CI 1.874–4.451) psychological distress based on the Kessler-6, TBI (RR 1.443; 95% CI 1.064–1.958), PVP (RR 2.031; 95% CI 1.402–2.941), fighting (RR 4.715; 95% CI 3.034–7.327), and carrying a weapon (RR 2.836; 95% CI 1.752–4.592). All aforementioned risk factor variables demonstrated a stronger association with both victim and perpetrator than with victim

or perpetrator alone, with the exception of high psychological distress, which was more strongly associated with victim only (RR 4.244; 95% CI 3.128–5.757).

Discussion

This study explored risk factors known in the youth violence literature and of importance to public health. The analysis assessed their relative associations with victimization and perpetration of bullying and violence. The primary finding of this study is that individuals who are both victims and perpetrators constitute a unique group reporting the highest risk rates for many of the risk factor variables assessed: harmful alcohol use, potential drug problems, traumatic brain injury, and

Table 2 Adjusted relative risk of being a victim only, a perpetrator only, or both, relative to being “neither victim nor perpetrator” (reference group) for multinomial logistical regression model variables

Variable	Victim only	Perpetrator only	Both victim and perpetrator
Grade (high)	0.848 (0.777, 0.925)**	0.951 (0.807, 1.120)	0.896 (0.793, 1.011)
Sex—male	0.673 (0.544, 0.833)**	1.748 (1.179, 2.592)**	1.269 (0.748, 2.153)
Subjective social status (high)	0.935 (0.882, 0.991)*	0.966 (0.866, 1.077)	0.919 (0.850, 0.993)*
Harmful alcohol use	1.715 (1.302, 2.260)**	1.907 (1.177, 3.090)**	2.587 (1.848, 3.621)**
Potential problem drug use	1.454 (1.066, 1.981)*	1.562 (0.918, 2.655)	2.209 (1.539, 3.171)**
Tobacco use	1.131 (0.893, 1.429)	1.095 (0.682, 1.759)	1.314 (0.939, 1.838)
Psychological distress (moderate)	1.785 (1.434, 2.223)**	1.313 (0.880, 1.958)	2.349 (1.728, 3.192)**
Psychological distress (high)	4.244 (3.128, 5.757)**	1.751 (0.945, 3.244)	2.888 (1.874, 4.451)**
Traumatic brain injury	1.361 (1.073, 1.727)*	1.356 (0.895, 2.054)	1.443 (1.064, 1.958)*
ADHD (ASRS)	1.130 (0.893, 1.429)	1.024 (0.651, 1.613)	1.289 (0.952, 1.744)
Problem video playing	1.438 (1.055, 1.959)*	0.883 (0.503, 1.552)	2.031 (1.402, 2.941)**
Fought	2.821 (1.863, 4.270)**	6.200 (3.671, 10.472)**	4.715 (3.034, 7.327)**
Carried a weapon	1.457 (0.903, 2.349)	2.821 (1.514, 5.259)**	2.836 (1.752, 4.592)**

*Significant at $p < 0.05$; **significant at $p < 0.01$

problem video game playing. No significant association was demonstrated for tobacco use or ADHD. The overlap between victimization and perpetration has been identified and examined in the criminological and sociological literature, and this study demonstrates its significance in relation to these other risk factors of public health concern (Jennings et al. 2012; Cook 2017).

Regarding the role of sex, this study found that males were more likely to be perpetrators and less likely to be victims; however, while the relative risk ratio was higher for males being both victims and perpetrators (RR 1.269; 95% CI 0.748–2.153), this was not found to have statistical significance at the 95% confidence level. This finding contrasts with that demonstrated elsewhere in the literature on violence, where males have been

Fig. 1 Graph demonstrating adjusted relative risk of multinomial logistic regression model variables in relation to “neither victims nor perpetrators” (reference group). Where relative risks (displayed on the y-axis) are below one, this indicates an increased risk in the “both victims and perpetrators” category; where relative risk is above one, this indicates a decreased risk in both victims and perpetrators

shown to be more likely to be both victims and perpetrators in comparison to females (Sampson and Lauritsen 1990). The lack of statistical significance in this relationship may be due to insufficient power in the number of individuals reporting both victimization and perpetration; only 12.1% of the males and 9.9% of the females reported both. A second explanation could include a response bias, where males reporting perpetration may be less likely to also report victimization as compared to females. A third plausible explanation for the absence in statistical significance may be the manner that victimization and perpetration categories were defined in this model. For example, this model incorporates cyber bullying in its definition of victim; it may be that males are less likely to be victims of cyber bullying compared to females in this population. Future research should further assess the differences by sex of Ontario youth reporting both victimization and perpetration of violence.

Relative to those who were neither victims nor perpetrators, reporting being in a fight in the previous 12 months on school property was associated with increased likelihood of being a victim only, perpetrator only, and both. This was an anticipated result, as the reference category implied no experience of violence, and fighting is inherently violent. However, there is a suggestion from this result that the association observed for fighting may be driven primarily by perpetrators. This is something that could be confirmed by research using different approaches to those used here (e.g., qualitative methods, longitudinal analyses). Similarly, those who reported carrying a weapon in the previous year were more likely to be perpetrators, or both perpetrators and victims. Our analysis limits the extent to which definitive conclusions can be drawn from these results; however, future research could explore whether or not weapons are carried for offensive or defensive reasons. This would help to characterize the implications of fighting and weapon carrying in the experience of violence for school-aged youth.

The strong correlates demonstrated between substance use and the victim-perpetrator overlap (harmful alcohol and problem drug use) represent an important finding for the public health community. Preventing substance use and related problems at the individual and population levels is a public health priority (World Health Organization 2010). The finding that substance use is also linked to bullying and violence supports the continuation and strengthening of these efforts. Additionally, this research suggests opportunities to tailor public health substance use prevention programs to individuals experiencing violence, especially those who are both perpetrators and victims, the group identified as having the highest rates of risk factors in this study.

The differences observed for the group reporting both victimization and perpetration in terms of traumatic brain injury and problem video game playing warrant particular attention. Exposure to TBI has been shown to be associated with a 2.5-fold increase in rates of incarceration compared to those

without exposure (McIsaac et al. 2016). This study did not demonstrate an increase in rates of perpetration in those reporting TBI; however, it was associated with being a victim only, or being both a victim and a perpetrator. This finding suggests that perpetrators with TBI may also be victims themselves. Better understanding the underlying causes leading to TBI and PVP may also have important implications for how these are linked to both victimization and perpetration. Further research should better characterize these underlying factors and whether intervening early for individuals with TBI or PVP may help prevent victimization and perpetration of bullying and violence.

In analyzing psychological distress, the highest risk of “moderate psychological distress” was observed in the combined victim/perpetrator category, while the risk of “high psychological distress” was the highest among the victim-only category. This association may not be surprising given the higher rates of mental illness reported in the literature for victims of violence (Fekkes et al. 2006; Schwartz et al. 2015).

The risk factors assessed for perpetration and victimization can also be analyzed in the context of externalizing and internalizing symptoms of mental illness (Laukkanen et al. 2002). Externalizing symptoms include aggression and behavioural issues, while internalizing symptoms include psychological distress. Research has demonstrated higher externalizing symptoms in perpetrators of bullying and higher internalizing symptoms in victims (Laukkanen et al. 2002). Another explanation could be that victims who become perpetrators are exhibiting externalizing symptoms of mental illness, rather than the internalizing symptoms including psychological distress, which victims in this study reported more commonly. The externalizing symptoms may mask some of the internalizing symptoms for individuals reporting both victimization and perpetration.

For the public health community, there is value in exploring the victim-perpetrator overlap from a public health lens, examining risk behaviours and determinants of health. Identifying antecedents of youth violence and bullying may suggest potential intervention points for public health. Furthermore, public health initiatives already addressing health hazards such as tobacco, alcohol, and drug use might also be utilized to address violence given the propensity of victims and perpetrators of violence to also report these issues.

Limitations

The variables available for analysis in the current study were limited to those included in the Version A survey of the 2015 iteration of OSDUHS. This analysis was cross-sectional in nature and cannot comment on temporality and whether victimization or perpetration came first for individuals reporting both. Furthermore, as discussed, certain variables such as carrying a weapon or fighting do not ascertain whether this was done in self-defense or initiated by the individual. Additional

research is needed to explore the temporality for the victim-perpetrator overlap for Ontario youth.

The multinomial variables constructed for the type of experience with bullying and physical violence were limited to those questions included in the questionnaire. The Spearman correlation coefficients for constructed variables demonstrated low correlations and therefore limited latent construct. The current analysis assesses experience with bullying and physical violence as defined and measured with the OSDUHS questions described. Future research should more fully assess the development of more effective construct variables for victimization and perpetration of bullying and physical violence.

This cross-sectional study design is not able to discern whether the risk factor variables assessed place individuals at higher risk of perpetration and victimization of bullying and violence, or whether they are consequences of these experiences. Furthermore, future research should assess whether public health interventions targeting risk factors reduce youth violence and bullying and improve health outcomes.

As we have dichotomized variables for victimization and perpetration, we are therefore not able to differentiate risk factor variables for individuals reporting high rates of bullying and violence from those with lower rates. Future research should differentiate risk factor presence for different levels of violence and bullying. Many factors that have been identified at the community and population levels as important to violence from an ecological perspective were not considered in OSDUHS and therefore this study.

Conclusion

Bullying and violence have significant short- and long-term health consequences and are prevalent issues affecting youth. This study presents new findings for a youth group with a high burden of violence and other health risk factors: those reporting both victimization and perpetration of violence. This group may warrant further public health attention, including the targeting of interventions addressing violence prevention in tandem with the prevention of other health risk behaviours. In particular, the data suggest that both victims and perpetrators of violence have higher rates of harmful substance and alcohol use. Where public health programming already addresses these health risk behaviours, the incorporation of a violence prevention lens may improve our capacity to respond to this public health issue. Further research into the effectiveness of public health interventions for this group of high-risk youth is needed, as we work to advance violence prevention.

Compliance with ethical standards

The study was approved by the Public Health Ontario's Ethics Review Board.

Conflict of interest The authors declare that they have no conflict of interest.

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