The relationship between bullying behaviours in childhood and physician-diagnosed internalizing disorders

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Received: 4 October 2018 / Accepted: 14 January 2019 / Published online: 7 February 2019
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Abstract

Objective Bullying and its potential consequence for poor mental health constitutes a public health concern, yet there is a dearth of longitudinal studies examining the topic. This study examines the temporal relationship between childhood bullying behaviours (being a victim, being a bully, or being a bully and a victim) and physician-diagnosed internalizing disorders over a 7-year timespan.

Methods Data from the 2003 Children's Lifestyle and School performance Study (CLASS), a population-based health survey of grade 5 students in Nova Scotia, Canada were linked to administrative health-care records to examine the relationship between bullying behaviours and services where a physician diagnosis of an internalizing disorder (ID) was received. Negative binomial regression analyses were conducted to examine this relationship.

Results Of the 4694 participants, 33.3% reported being involved in some form of bullying behaviour and 24.1% had a service where a physician diagnosis of ID was given over a 7-year timespan. Compared with children who reported not being involved in bullying behaviours, children who reported being a victim of bullying had a higher rate of subsequent physician-diagnosed ID services (IRR = 1.38, 95% CI = 1.11, 1.70). Children who reported being a bully had a lower rate of ID services (IRR = 0.67, 95% CI = 0.46, 0.99), while there was no difference for those who reported between being a bully and a victim (bully-victim) with respect to ID services.

Conclusion Bullying behaviours should be considered a serious public health issue due to their high prevalence in school environments and detrimental effects on the mental health of adolescents.

Résumé

Objectif Le harcèlement entre enfants et ses répercussions possibles sur la santé mentale constituent un problème de santé publique, mais les études longitudinales sur la question font cruellement défaut. Nous avons examiné la relation dans le temps entre les brimades durant l'enfance (subies, exercées sur d'autres ou les deux à la fois) et les troubles d'intériorisation diagnostiqués par un médecin sur une période de sept ans.

Méthode Nous avons maillé les données de la Children's Lifestyle and School performance Study (CLASS) de 2003, une enquête de santé auprès de la population des élèves de 5^e année de la Nouvelle-Écosse, au Canada, avec les registres administratifs de prestation de soins de santé pour examiner le lien entre les brimades et les rendez-vous médicaux ayant donné lieu au diagnostic d'un trouble d'intériorisation (TI). Des analyses de régression binomiales négatives ont été effectuées pour examiner ce lien.

Résultats Sur les 4 694 participants, 33,3 % ont dit avoir subi ou exercé des brimades, et 24,1 % avaient eu un rendez-vous médical ayant donné lieu à un diagnostic de TI au cours d'une période de sept ans. Comparativement aux enfants qui ont dit

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n'avoir ni subi, ni exercé de brimades, les enfants qui ont dit avoir été victimes de harcèlement présentaient un taux plus élevé de diagnostic ultérieur de TI lors d'un rendez-vous médical (rapport de taux d'incidence [RTI] = 1,38, IC de 95 % = 1,11, 1,70). Les enfants qui ont dit avoir exercé des brimades présentaient un taux inférieur de diagnostic de TI (RTI = 0,67, IC de 95 % = 0,46, 0,99); le taux de diagnostic de TI chez les enfants ayant dit avoir à la fois subi et exercé des brimades était égal.

Conclusion Les brimades doivent être considérées comme un grave problème de santé publique en raison de leur forte prévalence en milieu scolaire et de leurs effets nuisibles sur la santé mentale des adolescents.

Keywords Bullying behaviours · Mental health · School health · Childhood · Internalizing disorders

Mots-clés Brimades · Santé mentale · Santé scolaire · Enfance · Troubles d'intériorisation

Introduction

With approximately one in five Canadians experiencing a mental health illness in their lifetime (Canadian Mental Health Association [n.d.](#)), research has acknowledged that the focus on mental health has to move away from the individual and towards understanding the social factors that influence mental health (Kindig and Stoddart 2003). It is important to understand what early social factors (such as bullying behaviours) are influencing a child's mental health development.

Bullying, an intentional and repeated form of aggression over time against a less powerful person or group by a more powerful person or group (Bogart et al. 2014), is a social concern due to its high prevalence in schools (Jenson et al. 2013). Bullying behaviours are typically categorized into three groups (Sigurdson et al. 2014): being a victim—those who are the object of aggression; being a bully—those who are aggressive towards others; and being a bully-victim—those who bully others and are bullied themselves. Approximately 20–40% of children report being involved in some form of bullying in a school setting (Jenson et al. 2013). As school-based settings are recognized as an environment where health behaviours can be developed, learned, and reinforced (Hodgins 2008), the reported high percentage of bullying behaviours in schools is worthy of further investigation.

Bullying behaviours are associated with a number of negative outcomes, including poor school performance (Gini and Pozzoli 2013; Stassen Berger 2007), physical health problems (Annerback et al. 2014), and, most prominently, poor mental health (Hodgins 2008; Arseneault et al. 2010). More specifically, victims, bullies, and bully-victims are at a heightened risk of having common forms of internalizing disorders (ID), such as depression and anxiety (Gini and Pozzoli 2013; Wolke et al. 2013). However, as the majority of research has been cross-sectional in nature, the link between bullying behaviours and mental health is often viewed as bi-directional (Hawker and Boulton 2000). Without a long-term observation period, it is difficult to determine whether poor mental health is a consequence of these behaviours (Reijntjes et al. 2010).

An increasing number of longitudinal studies give support for a temporal relationship (Bogart et al. 2014; Reijntjes et al. 2010; Copeland et al. 2013; Sourander et al. 2009). The malicious behaviour that typically characterizes bullying can serve as an “agent” for the development of long-term mental health problems (Reijntjes et al. 2010), not only ID, but also externalizing disorders such as self-harm, violent behaviour, and suicidal ideation (Arseneault et al. 2010). The connections of peer victimization with internalizing behaviours, such as being anxious and insecure along with low self-esteem in the short term and with ID in the long term (Bogart et al. 2014; Takizawa et al. 2014; Zwierzyńska et al. 2013; Wolke et al. 2014) are more commonly reported.

An extensive 5-decade longitudinal study ($N = 7771$) from the British National Child Development Study found that children who were reported by their parents as exposed to bullying during childhood were also more likely to have mental health problems as an adult (Takizawa et al. 2014). Similar results were published by Zwierzyńska et al. (Zwierzyńska et al. 2013); this longitudinal study ($N = 3692$) examined the short- and long-term effects of peer victimization on internalizing problems.

Despite the emerging evidence suggesting a link between bullying behaviours and long-term mental health problems, there remain gaps that need to be addressed. Existing longitudinal studies are predominately short-term (Wolke et al. 2014) and primarily use self-report or interview assessment as a measure of mental health outcomes (Wolke et al. 2014; Sigurdson et al. 2015). These methods may give a biased representation of the severity of mental health issues due to response bias, the use of proxy measures of ID and shorter observation periods. Bullying behaviours affect children worldwide, but local research is essential to guide tailored prevention efforts.

The current study addresses gaps by determining the consequences of bullying behaviours (being a victim, being a bully, being a bully-victim) through prospectively tracking the number of services where a physician diagnosis of an ID was received over a 7-year timespan in a population-based sample.

Methods

Study design

Information on bullying behaviours was derived from grade 5 participants who completed the Children's Lifestyle and School performance Study (CLASS) survey in 2003 across Nova Scotia (NS), Canada (Veugelers and Fitzgerald 2005). Parents gave consent to have their children participate and to have their survey data linked to administrative health-care records, enabling access to ID information. NS provincial administrative health-care records are held by Health Data Nova Scotia (HDNS) and were accessed for this study after relevant ethical approvals were obtained from the University of Alberta Research Ethics Board, the Dalhousie University Research Ethics Board, and the HDNS Data Access Committee.

Children's Lifestyle and School performance Study

The CLASS was a province-wide, population-based health survey conducted in 2003 and completed by over 5000 grade 5 students (age 10–11 years) and their parents/guardians from across NS, Canada (Veugelers and Fitzgerald 2005). The CLASS included two survey books, titled the *School Survey* and the *Home Survey*. CLASS representatives administered the *School Survey* and it was completed by students. The *School Survey* included questions on children's physical health, friendships, behaviours, and nutrition. Socio-demographic information was gathered through the *Home Survey* completed by the parents/guardians, including the child's sex, place of birth, and residency, as well as the parents'/guardians' marital status, income, and educational attainment. Student's weight and height measurements were also taken by the CLASS representatives.

More detail on the methodology and procedures has been published elsewhere (Veugelers and Fitzgerald 2005; Wu et al. 2017).

Administrative health-care records

Canada's federally funded health-care system allows all Canadians to have universal health-care coverage and access to health services. In NS, administrative health-care records give access to the Medical Services Insurance (MSI) database and the Canadian Institute for Health Information Discharge Abstract Database (CIHI DAD). Specific to NS, Medavie Blue Cross administers the province record information for health-care services by physicians who are paid for by the NS provincial health-care system. The CIHI DAD includes administration records from each admission to NS hospitals and contains patient demographic information, physician visits, diagnoses, procedures performed, service transfers in

hospital, and speciality services. Physician services for ID (our outcome of interest) were extracted from this database.

Exposure of interest: bullying behaviours

The following two questions from the CLASS *School Survey* were used to measure bullying behaviours: (1) I am bullied by other kids, and (2) I bully other kids. Children were asked to choose the answer that best described them with the options of "never or almost never," "sometimes," or "often or almost always." Children were considered to be involved in a form of bullying behaviour if they answered "sometimes" or "often or almost always" to (1) I am bullied by other kids (being a victim), (2) I bully other kids (being a bully), or both (being a bully-victim). Bullying behaviours were broken down into four categories: being a victim, being a bully, being a bully and a victim (bully-victim), or not involved in bullying behaviours. Respondents who reported "never or almost never" to both response items were considered to be non-involved.

Outcome of interest: number of physician-diagnosed ID services

The outcome of interest was the number of services where a child received a physician-diagnosed ID between 2003 and 2010 fiscal year (April 1st to March 31st). The study considered children to have a physician-diagnosed ID service if they had at least one ID diagnostic code in the primary field by a physician claim or by the hospital discharge database listing using the International Classification of Disease (ICD), ninth revision (ICD-9) or tenth revision (ICD-10). An ID was defined as having a depressive episode, recurrent or persistent mood disorder, neurotic or anxiety disorder, an acute reaction to severe stress, or an emotional disorder with onset specific to childhood (McMartin et al. 2012). ICD codes included in the study are outlined in Table 1.

Confounding variables

Confounding variables that may impact the relationship were adjusted for in the study. Information about socio-economic factors, including parental/guardian household income, education level, and marital status were derived from the CLASS *Home Survey*. Income was categorized into 1 (Less than \$20,000), 2 (\$20,001 – \$60,000), and 3 (More than \$60,000). Education responses were categorized as 1 (Secondary or Less), 2 (College), and 3 (University), and marital status was dichotomized into 1 (Married/Common-Law) and 0 (Separated, Divorced, Widowed, Single/Never married/Prefer not to answer).

The analysis was also adjusted for baseline indicators of ID and number of ID services prior to CLASS data collection. Baseline indicators for ID included the following items from

Table 1 ICD 9/10 codes used to indicate if a child had a physician-diagnosed internalizing disorder*

ICD 9	
296	Affective psychoses
296.2	Manic-depressive psychosis, circular type but currently manic
296.3	Manic-depressive psychosis, circular type, but currently depressed
300	Neurotic disorders
308	Acute reaction to stress
309	Adjustment reaction
311	Depressive disorder, not elsewhere classified
313	Disturbance of emotions specific to childhood and adolescence
ICD 10	
F32	Depressive episode
F33	Recurrent depressive disorder
F34	Persistent mood [affective] disorders
F38	Other mood [affective] disorders
F39	Unspecified mood [affective] disorders
F40	Phobic anxiety disorders
F41	Other anxiety disorders
F42	Obsessive-compulsive disorder
F43	Reaction to severe stress, and adjustment disorders
F48	Dissociative [conversion] disorders

* Subcodes for each code were included in the analysis (ICD 9, <https://www2.gov.bc.ca/gov/content/health/practitioner-professional-resources/msp/physicians/diagnostic-code-descriptions-icd-9>; ICD 10, <http://apps.who.int/classifications/icd10/browse/2016/en#/IX>)

the CLASS *School Survey*: (1) I feel like I do not have any friends, (2) I like myself, (3) I like the way I look, (4) My future looks good to me, (5) I feel unhappy or sad, (6) I worry a lot, (7) I cry a lot, (8) I have trouble paying attention. Items 2, 3 and 4 were reverse scored. Total response choices ranged from 8 to 24. The inter-item reliability of the eight items was 0.64. Responses were dichotomized into High Internalizing Symptoms (<13) and Low Internalizing Symptoms.

The number of previous ID services was determined by how many times a child had a service where they received a physician-diagnosed ID from when they were born until 2002 (prior to completion of the CLASS).

Number of participants

Grade 5 students were recruited into the study from 282 (96.9%) of the 291 elementary schools in NS, Canada (Veugelers and Fitzgerald 2005). A total of 5180 students completed the survey, resulting in a response rate of 51.1% per school (Veugelers and Fitzgerald 2005). Out of the 5180 students, there were 4736 parents who gave parental consent to have their child's survey information linked with administrative health-care records. Students were excluded from the sample if they had missing information for both the questions pertaining to bullying behaviours ($n = 42$). The final sample was comprised of 4694 respondents.

Statistical analysis

The relationship between bullying behaviours and number of physician-diagnosed ID services between 2003 and 2010 was examined using negative binomial regression that accommodated the clustering of student observations within schools. Both unadjusted and adjusted negative binomial regression models were conducted. In the adjusted models, the incidence rate ratios (IRR) were adjusted for whether a child received ID services before the 2003 CLASS data collection (i.e., from 1990 to 2002), self-reported internalizing symptoms at baseline, sex, parental/guardian household income, parental educational level, and marital status. Missing values for confounding variables were considered their own category in the analyses. Non-response weights were calculated based on household income and applied to provide estimates applicable to all grade 5 students in NS (Veugelers and Fitzgerald 2005). The level of significance was set at $p < 0.05$. Statistical analysis and linkage was conducted using STATA/SE 13.0. Data analysis was carried out at HDNS at Dalhousie University.

Results

Descriptive information on bullying behaviours by ID service is presented in Table 2. Of all grade 5 students in NS, 33.3% of

children reported being involved in some form of bullying behaviour and 24.1% had at least one ID service between 2003 and 2010, with victims having the highest percentage of ID services and girls receiving more ID services than boys (Table 2).

Unadjusted and adjusted IRRs of the association between bullying behaviours and number of physician-diagnosed ID services a child received between 2003 and 2010 are presented in Tables 3 and 4, respectively. The adjusted model indicates that children who were victims of bullying, compared with children who were not involved in any form of bullying behaviour, had a significantly higher rate of ID services between 2003 and 2010 (IRR = 1.38, 95% CI = 1.11, 1.70). Children who were bullies, compared with children who were not involved, had a significantly lower rate of ID services (IRR = 0.67, 95% CI = 0.46, 0.99), while there was no significant relationship between being a bully-victim and number of services, compared with children who reported not being involved in bullying behaviours (Table 4).

The relationship between bullying behaviours (being a victim, being a bully, being a bully-victim) and number of ID services between 2003 and 2010 is similar to the findings presented in Table 4 when excluding the 481 children who had a physician-diagnosed ID service prior to 2003 (being a victim—IRR = 1.30, 95% CI = 1.05, 1.61; being a bully—IRR = 0.56, 95% CI = 0.36, 0.89; and being a bully-victim—IRR = 1.18, 95% CI = 0.72, 1.91).

Discussion

The current study aimed to examine the temporal relationship between childhood bullying behaviours (being a victim, being a bully, and being a bully-victim) and number of physician-diagnosed ID services a child had over a 7-year timespan. Children who reported they were victims of bullying had a significantly higher rate of using health services related to ID over the succeeding 7-year timespan compared with peers

Table 2 Descriptive statistics for the population and having a physician-diagnosed internalizing disorder service between 2003 and 2010*

	Population (%)	ID service between 2003 and 2010 (%)	
		Yes	No
Bullying behaviours			
Not involved	66.74	22.09	77.91
Being a victim	24.41	29.54	70.46
Being a bully	4.34	21.02	78.98
Being a bully-victim	4.51	27.93	72.07
Physician-diagnosed internalizing disorder service before 2003			
No	89.65	22.04	77.96
Yes	10.35	42.19	57.81
Sex			
Boys	48.99	20.20	79.80
Girls	51.01	27.89	72.11
Internalizing symptoms			
Low internalizing symptoms	60.54	21.78	78.22
High internalizing symptoms	36.96	29.76	70.24
Parent/guardian marital status			
Single/divorced/separated/widowed	17.43	29.81	70.19
Married/common-law	75.84	22.77	77.23
Parent/guardian education			
Secondary or less	35.08	27.29	72.71
College	21.62	22.28	77.72
University	36.56	21.97	78.03
Household income			
\$20,000 or less	9.07	34.13	65.87
\$20,001 to \$60,000	37.66	25.44	74.56
More than \$60,000	30.27	19.80	80.20

* Grade 5 students, Children's Lifestyle and School performance Study (CLASS), Nova Scotia, Canada. Missing category demographics were calculated, but not included in the table

who reported that they were not involved in bullying behaviours. By contrast, children who reported they were bullies had used less health services related to ID, while there was no relationship between being a bully-victim and having a subsequent ID service.

The current study's findings are consistent with the growing body of longitudinal research that examined the relationship between bullying behaviours and mental health (Bogart et al. 2014; Wolke et al. 2013; Takizawa et al. 2014; Zwierynska et al. 2013). Similar to Wolke et al. (2014) and Sourander et al. (2009), our prospective study supports the notion that there is an increased likelihood of psychological consequences that can arise from being a victim of bullying.

In contrast to the majority of studies that used self-report or interview methods to measure the outlined relationship (Takizawa et al. 2014; Geoffroy et al. 2018), the current study used physician-diagnosed ID services extracted from administrative health-care records. A comparable method was used by Sourander et al. (2009) that extracted psychiatric hospital treatments (ICD 9/10 disease codes) from the Finnish Hospital Discharge Register. Likewise to the current study, the register contains primary diagnoses that were based off clinical diagnoses made by the physician contact (Sourander et al. 2009), however the Finnish Hospital Discharge Register reported diagnoses at discharge, rather than number of health-care services related to ID (medical records).

Prior to the past five years (Copeland et al. 2013; Sourander et al. 2009; Takizawa et al. 2014; Sigurdson et al. 2015; Geoffroy et al. 2018), studies examining the relationship have had relatively short observation periods (as short as six months) with longer periods being a maximum of five years (Bogart et al. 2014; Arseneault et al. 2010). In addition, only a few of the mentioned studies have used a population-based sample (Sourander et al. 2009; Takizawa et al. 2014; Sigurdson et al. 2015). The current study adds to the body of knowledge by having a longer observation period, examining mental health outcomes objectively by using administrative health-care records, and using a population-based sample.

Further, the study found that the temporal relationship between being a victim of bullying and subsequent mental health problems was significant after controlling for sex and socioeconomic characteristics, suggesting that the relationship may be detrimental for children across various socio-economic groups. This finding echoes results of Geoffroy et al.'s study of Canadian children ($N = 1443$), which found that children who were victimized during adolescence (ages 6 to 13) had high odds of developing depression, anxiety, and suicidality at age 15 after controlling for various confounders (Geoffroy et al. 2018).

The current study added further information on the mental health consequences of being a bully, but could not conclude a relationship between being a bully-victim and mental health

consequences. The current study only examined physician-diagnosed ID services, while bullies and bully-victims may express their feelings through different emotional outlets, therefore being likely to be diagnosed with a subset of disease codes that exhibit indicators of externalizing disorders. Previous studies have indicated that there are increased odds of adopting externalizing behaviours, such as aggression and harmful acts (Kelly et al. 2015), among children who are bullies compared with victims and non-involved peers (Arseneault et al. 2010; Geoffroy et al. 2018; Kelly et al. 2015; Kumpulainen et al. 1999). Similarly, Sigurdson et al. proposed that psychological maladjustments in bully-victims may develop into externalizing behaviours over time (Sigurdson et al. 2015), however most studies have indicated that bully-victims report significantly higher levels of internalizing problems later in life (Gini and Pozzoli 2013; Copeland et al. 2013; Wolke et al. 2014; Kelly et al. 2015).

It could also be hypothesized that bullies and bully-victims are less likely to seek help from a health-care provider, but this is not supported by past research (Kumpulainen et al. 1999). There are inconsistent results and a dearth of research on the relationship between being a bully or being a bully-victim and long-term internalizing and externalizing problems (Copeland et al. 2013; Sigurdson et al. 2015), suggesting that further research needs to be conducted.

Implications

Adding strength to the evidence that bullying behaviours are a social factor that contributes to the mental health of children has critical implications, as the unfortunate reality is that interest on the topic predominantly arises when there is a crisis situation, such as a death in a school (Tolan 2004). The sporadic interest in the topic strongly impacts the allocation of research funds and the amount of effort that is placed on prevention strategies, policy implementation, and program planning (Stassen Berger 2007; Tolan 2004).

Evidence on the consequential effects of bullying behaviours is vital to support advocacy for further effort, funds, and resources to be dedicated to prevention strategies. As the trajectory of victimization begins at early childhood (Geoffroy et al. 2018) and there is a high prevalence of bullying behaviours that take place in a school-based setting (Bogart et al. 2014; Annerback et al. 2014), prevention strategies should focus efforts on changing behaviours in the school environment. Current activities to reduce aggression and violence within the school are inconsistent with respect to implementation, and lack of monitoring makes it difficult to know what bully prevention strategies are being correctly utilized (Smith and Schneider 2004). Research shows that the most effective bullying prevention strategies take a multi-level approach, considering the school and community factors rather than

Table 3 Unadjusted incidence rate ratio (IRR) and 95% confidence intervals (CI) of the relationship between bullying behaviours and number of physician-diagnosed internalizing disorder services between 2003–2010

	IRR (95% CI)
Bullying behaviours	
Not involved	1.00
Being a victim	1.42 (1.14, 1.78)†
Being a bully	0.68 (0.46, 1.00)†
Being a bully-victim	1.52 (0.98, 2.36)

† $p \leq 0.05$

focusing on one specific intervention tactic (Espelage et al. 2014). Such an approach can help to change the school climate in which the bullying behaviours are occurring through

Table 4 Adjusted incidence rate ratio (IRR) and 95% confidence interval (CI) of the relationship between bullying behaviours and number of physician-diagnosed internalizing disorder services between 2003 and 2010*

	IRR (95% CI)
Bullying behaviours	
Not Involved	1.00
Being a victim	1.38 (1.11, 1.70) †
Being a bully	0.67 (0.46, 0.99) †
Being a bully-victim	1.35 (0.84, 2.14)
Physician-diagnosed internalizing disorder service before 2003	1.32 (1.05, 1.65) †
Internalizing symptoms	
Low internalizing symptoms	1.00
High internalizing symptoms	1.42 (1.16, 1.73) †
Sex	
Boys	1.00
Girls	1.59 (1.33, 1.91) †
Parent/guardian education	
Secondary or less	1.00
College	0.79 (0.60, 1.06)
University	0.79 (0.65, 0.97) †
Household income	
\$20,000 or less	1.00
\$20,001 to \$60,000	0.90 (0.67, 1.22)
More than \$60,000	0.73 (0.52, 1.03)
Parent/guardian marital status	
Single/divorced/separated/widowed	1.00
Married/common-law	0.91 (0.70, 1.19)

* Model adjusted for all confounding variables of grade 5 students, Children's Lifestyle and School performance Study (CLASS), Nova Scotia, Canada, 2003. Missing categories were considered in the model, but their estimates are not included in the table

† $p < 0.05$

the promotion of healthy relationships, safe environments, and youth development (Hodgins 2008; Espelage et al. 2014).

In Canada, multi-level approaches, commonly referred to as a health promotion schools approach, have been adopted in schools to support the health of children. However, the majority of resources and information associated with bullying behaviours focuses on reduction of violence and promotion of safety and there is a dearth of information emphasizing the detrimental effects of bullying behaviours on individuals' mental health. Hawker and Boulton highlighted that providing evidence on the association between bullying behaviours and mental health is fundamental to the interest of health professionals and policymakers in focusing efforts on effective strategies and initiatives to reduce bullying behaviours and distress in children (Hawker and Boulton 2000).

Strengths and limitations

The study's relatively high response rate of 51.1% in a population-based sample supports a strong link between bullying behaviours and mental health problems. However, there are limitations to this study. As the CLASS is a self-administered survey, there is potential for self-report bias. Although past research has indicated that self-report is one of the most reliable methods for assessing bullying behaviours (Gini and Pozzoli 2013), it still relies heavily on self-analysis. The lack of terminology and definition of the variables pertaining to bullying behaviours left the questions open to interpretation. The measure used to determine if a child was involved in bullying behaviours only included two items and did not give insight into the frequency (i.e., number of times), type (i.e., face to face, cyber-bullying), and/or if it was a direct or indirect form of bullying behaviour.

Limitations of the use of administrative health-care records as a measure of mental health disorders were also considered (van Walraven and Austin 2012). Though the use of objective, physician-diagnosed ID services is a strength, administrative health-care record datasets are not primarily created for research purposes and this can impact the accuracy of the records. The likelihood of the disease code being properly diagnosed and recorded (i.e., the validity) decreases as the steps become more complex and/or numerous, such as recognition of a disease by a physician, and legible documentation by the physician and the health records abstractor (van Walraven and Austin 2012).

Further, it is also acknowledged that the findings are limited to only examining physician-diagnosed ID services, and did not examine externalizing disorders. This was primarily due to the scope of the study, complexity in ICD 9/10 codes, and to be consistent with previous research studies that linked CLASS with physician-diagnosed ID services using administrative health-care records (Wu et al. 2017; McMartin et al. 2012). As research suggests that externalizing disorders are

also more apparent in children who are involved in bullying, specifically bullies (Kelly et al. 2015) and bully-victims (Sigurdson et al. 2015), future research should focus on examining this long-term relationship as well.

Despite the restrictions of the datasets, the study has numerous strengths, including a high response rate in a population-based sample with a longer observation period of 7 years. This study design increases the external validity and generalizability of these findings to the wider population of NS, Canada.

In addition, the CLASS survey included a number of socio-demographic variables that were adjusted for in the study and controlled for indicators of ID in grade 5 when exploring the long-term effects of bullying behaviours on subsequent physician-diagnosed ID services. Internalizing symptoms during childhood can be early indicators for the development of a long-term ID (Copeland et al. 2013), and controlling for these markers is crucial to understand if bullying behaviour is an independent risk factor for ID. However, it is acknowledged that the list of confounding variables is not exhaustive and more exploratory research is needed to further understand other factors that could be related to the outcome variable.

Conclusion

The study offers further insight on the relationship between bullying behaviours and poor mental health. By analyzing longitudinal data on the detrimental effects of childhood bullying behaviours, the study found a relationship between being a victim of bullying behaviours and subsequent physician-diagnosed ID services. Adding to the growing body of evidence on the topic, this study will aid in informing effective policies and early prevention strategies designed to reduce the prevalence of bullying behaviours and mental health problems in the overall population.

Acknowledgements The authors would like to thank students, parents, and schools for their participation in the CLASS study. We thank Angela Fitzgerald for her role as project coordinator of the CLASS study, research assistants, and public health staff members who assisted in the data collection; Jason Liang and Connie Lu for data validation and management of the CLASS survey data; and Dr. Xiu Yun Wu for her help with the methodological approach and data analysis. We thank Dr. Yen Chu and Sarah Loehr for their roles as project coordinators for the ROI4Kids Collaborative Research and Innovation Opportunities (CRIO) team program. We also thank Dr. Leslie Anne Campbell, Craig Gorveatt, Sandra Pauls, and Yan Wang from Health Data Nova Scotia for their support and assistance and advice related to the methodological approach and data analysis.

Funding The CLASS study was funded through an operating grant by the Canadian Population Health Initiative to PJV. The current study was funded through the CRIO program from Alberta Innovates-Health Solutions awarded to PJV and AO. JK received a graduate student stipend through this CRIO program. Contributions by PJV were also funded

through a Canada Research Chair in Population Health and an Alberta Research Chair in Nutrition and Disease Prevention. SFLK held a Canada Research Chair in Health Services Research funded by CIHR.

Compliance with ethical standards

Disclaimer The data (or portions of the data) used in this report were made available by Health Data Nova Scotia of Dalhousie University. Although this research is based on data obtained from the Nova Scotia Department of Health and Wellness, the observations and opinions expressed are those of the authors and do not represent those of either Health Data Nova Scotia or the Department of Health and Wellness. All interpretations and opinions in the current study are those of the authors.

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