Author/s:
Kavanagh, A;Priest, N;Emerson, E;Milner, A;King, T

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Gender, parental education, and experiences of bullying victimization by Australian adolescents with and without a disability

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King Tania (Orcid ID: 0000-0002-1201-2485)

LIST OF ABBREVIATIONS

BIF: borderline intellectual functioning

ID: intellectual disability

BIF/ID: borderline intellectual functioning or intellectual disability

EMM: effect measure modification

PRR: prevalence rate ratio

RERI: relative excess risk of interaction

95% CI: 95% confidence interval

LSAC: Longitudinal Study of Australian Children

LOI: Learning Outcomes Index

PPVT: Peabody Picture Vocabulary Test

ARS: Academic Rating Scale

WISC-IV: Wechsler Intelligence Scale for Children IV

IRSD: Index of Relative Socio-Economic Disadvantage

SEIFA: Socio-Economic Indices for Areas

POR: prevalence odds ratio

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ABSTRACT

Background

This study sought to compare the prevalence of bullying victimization between adolescents with and without a disability, and between adolescents with and without borderline intellectual functioning or intellectual disability (BIF/ID). We also sought to assess whether the relationships between either disability or BIF/ID, and bullying victimisation vary by gender and parental education.

Methods

The sample included 3956 12-13 year old adolescents who participated in Wave 5 of the Longitudinal Study of Australian Children. Three indicators of bullying were used: physical bullying victimisation, social bullying victimisation and 'any bullying victimisation'. We used Poisson regression to obtain the prevalence risk ratios (PRR) of bullying by disability status adjusting for potential confounders.

Results

In adjusted models we found evidence that social bullying victimisation was more prevalent among adolescents with a disability than those without a disability (PRR 1.29, 95%CI 1.06-1.42) and between adolescents with BIF/ID than those without (PRR 1.24, 95%CI 1.07-1.44). Adolescents with BIF/ID were also more likely to experience 'any bullying victimisation'(PRR 1.10, 95%CI 1.00-1.22). Having a disability and living in a family with low parental education were associated with an elevated risk of social bullying victimisation BIF/ID.

Conclusions

Adolescents with disabilities and BIF/ID are at elevated risk of social bullying victimisation. School-based anti-bullying initiatives should concentrate on enhancing the inclusion of

adolescents with disabilities, with an emphasis on adolescents from disadvantaged backgrounds.

INTRODUCTION

The experience of bullying victimisation in childhood and adolescence has far-reaching social, emotional, educational and health consequences (Bowes, Joinson et al. 2015, Wolke and Lereya 2015). There is now accumulating evidence that children and adolescents who experience bullying victimisation are at higher risk of mental illness, suicide, weaker social relationships and higher inflammatory markers (Klomek, Sourander et al. 2009, Wolke, Copeland et al. 2013, Stapinski, Bowes et al. 2014, Takizawa, Maughan et al. 2014).

Bullying is a common adverse experience of childhood and adolescence: internationally about one third of children and adolescents report experiencing bullying victimization and 10-14% report bullying victimisation lasting six months or more (World Health Organization 2012, Wolke, Lereya et al. 2014). While there is some variation in the ways that bullying is operationalised (Chatzitheochari, Parsons et al. 2014), it is commonly defined as a repeated, intentionally negative behaviour that causes distress to the victim, and that is carried out by one or more others on a weaker or less powerful other(Olweus 1994, Currie, Zanotti et al. 2009, Salmivalli 2010). There are multiple dimensions of bullying that are considered and measured in the scientific literature, however researchers frequently distinguish between physical bullying (such as hitting and kicking), and social/relational (such as name calling and exclusion from groups) (Chatzitheochari, Parsons et al. 2014, Yen, Liu et al. 2015).

Given the fact that bullying victimisation is potentially a substantial contributor to chronic disease, health, social employment outcomes, it is important to identify those most at risk. Children and adolescents with a disability are a marginalised and vulnerable and underserved (Groce 2004), and there is some evidence from population-based studies that the prevalence of bullying victimisation is higher among children and adolescents with a disability (Blake, Lund et al. 2012). In a multinational study of 11 Western countries using data from the World Health Organization's cross-national study "Health Behaviour in School

Aged Children" (aged 11, 13 and 15 years), adolescents who had a disability or chronic condition were more likely to experience bullying victimisation, with odds ratios ranging from 1.3 in Latvia to 2.0 in Germany (Sentenac, Gavin et al. 2013). Another paper using data from the same study found that Irish and French students with a disability or chronic health condition who reported a participation restriction in school had higher levels of bullying victimisation than students with disabilities who did not (Sentenac, Gavin et al. 2011). To our knowledge there are no population-based estimates of bullying victimisation among Australian children and adolescents with a disability.

There is no widely accepted and consistently applied classification of disability in childhood and adolescence (Groce 2004). While the International Classification of Functioning, Disability and Health – Children and Youth version (ICF-CY) has been formally adopted by WHO member states (World Health Organization 2007), it is not consistently applied, particularly in the scientific literature. Scientific definitions are often based on health conditions, diagnoses or aetiological factors, while eligibility definitions (i.e. for educational support) are commonly based on functional impairments that limit or restrict activity and participation(Simeonsson, Leonardi et al. 2003). Such variations in classification produce great differencess in estimates of the prevalence of disability(United Nations Children's Fund 2011), particularly among adolescents, who are the least researched and understood groups of all people with a disability(Groce 2004).

The effects of disability are likely to vary across different subgroups, and for this reason it is important to investigate effects across different classifications and subgroups, such as those with intellectual disabilities (ID). Children and adolescents with intellectual disabilities (ID) may be more likely to experience bullying victimisation because of stigma associated with intellectual disability (Scior 2011, Morin, Rivard et al. 2013). A UK study of adults with ID found that 50% reported being bullied at school (Emerson 2010). Recent UK research found that adolescents with ID aged 11 and older were four times more likely to report bullying

victimisation (Public Health England 2015). Another UK study found 27% of 13-14 year old adolescents with mild to moderate ID attending mainstream school were bullied at least weekly, compared to 13% without ID (Emerson, Baines et al. 2011, Naylor, Dawson et al. 2012). A far greater, and largely under-researched proportion of the population can be classified as having 'borderline intellectual functioning'(BIF). BIF is classified according to standardized IQ tests, and is defined as being between 1 and 2 standard deviations below the mean (typically an IQ of 71-85)(Peltopuro, Ahonen et al. 2014). Most current approaches to defining BIF include a criteria of additional deficits in executive functioning or adaptive behaviour, however, the scientific literature on BIF is almost exclusively based on just IQ.

Bauer (2014) argues that population health researchers should pay greater attention to the intersections between multiple identities, social positions and processes of oppression and privilege, that may intensify experiences of marginalization (Bauer 2014). Bullying victimization is a social process that may produce and reinforce intersecting stigmatized identities and positions. Experiences of bullying victimisation vary by gender and socio-economic position. For example, in the Longitudinal Study of Australian Children (on which this study is based), among children aged 10-11 years, boys were more likely to report physical bullying victimisation (shoving, hitting, pushing) while girls reported higher levels of social bullying victimisation (being left out of games or chats) (Lodge and Baxter 2012). Levels of bullying victimisation were inversely related to family socio-economic position (Lodge and Baxter 2012). Bullying victimization among adolescents with a disability may vary by gender and socio-economic position. Identifying these intersections is not just of theoretical interest – they have implications for how to best target interventions.

The following objectives guided the research presented in this paper: 1) compare the prevalence of bullying victimization (physical, social, and 'any') between adolescents with and without disabilities and between adolescents with and without BIF/ID; and 2) assess

whether the relationships between disability and bullying victimisation and BIF/ID and bullying victimisation vary by gender and parental education. We used data from 3956 children aged 12-13 years from the fifth wave of the K-cohort of the Longitudinal Study of Australian Children.

We hypothesized a priori that the association between disability and physical bullying victimisation and 'any bullying victimisation' would be stronger among boys, and associations between disability and social bullying victimisation would be stronger among girls. We also hypothesized that the associations between disability and all bullying victimisation outcomes would be stronger in groups with low parental education.

METHODS

Ethics Statement

The Longitudinal Study of Australian Children (LSAC) is conducted in a partnership between the Department of Social Services (DSS), the Australian Institute of Family Studies (AIFS) and the Australian Bureau of Statistics (ABS). The study has ethics approval from the Australian Institute of Family Studies Ethics Committee. The Ethics Committee is registered with the Australian Health Ethics Committee, a subcommittee of the National Health and Medical Research Council (NHMRC). Written informed consent was obtained from the caregiver on behalf of each of the study children. The signed consent forms are retained by the field agency (ABS). Access and use of LSAC Data are publicly available. Researchers can apply to the Commonwealth Department of Social Services LSAC (https://www.dss.gov.au/our-responsibilities/families-and-children/programmes-services/access-to-dss-longitudinal-datasets. Accessed 15 June 2015).

Study setting and design

Data was from Wave 5 of the Longitudinal Study of Australian Children (LSAC) Kindergarten (K) cohort, a nationally representative longitudinal study of Australian children. LSAC

includes data on a range of domains including demographic, relationships, education, behaviour, development, social, health, housing and financial characteristics. Data has been collected biennially since 2003-2004. Cohort K was aged 4-5 years in the first wave and 12-13 years in Wave 5. Study informants included the child, parents/carers and teachers. A range of data collection methods were used (self-completed questionnaires; face-to-face interviews; computer assisted interviews) (Australian Institute of Family Studies 2014). The sampling frame was the Medicare Australia database which has near complete coverage of Australian residents (Soloff, Lawrence et al. 2005). Children aged four and five years of age were randomly sampled from 311 randomly selected postcodes in Wave 1 (Soloff, Lawrence et al. 2005). The response fraction was 59%, with 4983 children recruited; retention has been above 80% for subsequent waves (Australian Institute of Family Studies 2014).

Exposures

We chose to examine two disability exposure variables. The first variable 'disability status' was based on parental report that the child had a disability or medical condition that lasted six months or more. The second, variable 'borderline intellectual functioning/intellectual disability' is based on test scores obtained from each participant at the age of 8-9 years. Both of these variables are described further below.

Disability status

Primary household informants (94% were the study child's mother) responded to the following question: *"Does [the study child] have any medical conditions or disabilities that have lasted, or are likely to last, for six months or more?"* Prompt cards with the following conditions were presented:

a. Sight problems (not corrected by glasses or contact lenses)

b. Hearing problems (where communication is restricted, or an aid to assist with or substitute for hearing is used)

c. Speech problems

d. Blackouts, fits or loss of consciousness

e. Difficulty learning or understanding things

f. Limited use of arms or fingers

g. Difficulty gripping things

h. Limited use of legs or feet

i. Any condition that restricts physical activity or physical work

j. Any disfigurement or deformity

k. Mental illness

If they answered yes to any of these conditions, the child was categorised as having a disability. In Wave 5, 187 (5.1%) of the weighted sample were classified as having a disability.

Borderline Intellectual Functioning and Intellectual Disability (BIF/ID)

To define BIF/ID we used an approach adopted in other studies of LSAC (Emerson, Einfeld et al. 2010, Emerson, Einfeld et al. 2011). In Wave 3, LSAC included the Learning Outcomes Index (LOI) – a composite of direct measures of children and teacher rated assessments. Language and literacy skills were assessed directly with the Peabody Picture Vocabulary Test (PPVT) (Dunn, Dunn et al. 1997, Rothman 2004). The language and literacy subscale of the Academic Rating Scale (ARS) (which focusses on reading, writing and oral communication) was derived from 10 teacher-rated items assessing performance on a series of language tasks (Misson, Sanson et al. 2011). The Numeracy and Cognition subscale of the LOI was assessed directly using the Matrix Reasoning test, a subtest of the Wechsler Intelligence Scale for Children IV (WISC-IV) (Williams, Wieiss et al. 2003, Williams, Wieiss et al. 2003), and the ARS Mathematical Thinking subscale (completed by teachers) (National Center for Education Statistics 2004). The results of these four subscales were used to produce a continuous LOI score. BIF/ID was defined as one or more standard deviation below the

mean on the LOI. In Wave 5, 504 (13.6%) of the weighted sample were classified as having BIF/ID.

Outcome variables

Bullying victimization

In Wave 5 the target children self-completed questionnaires by means of audio computer assisted self-interviews. Among other items, they were asked about seven types of bullying victimisation. These items were based on items from the School Climate Bullying Scale (Cornell and Brockenbrough 2004), and the Edinburgh Study of Youth Transitions and Crime (Smith, McVie et al. 2001).

The introduction to these questions was "The next questions are about bullying". The stem question was: "During the past month (30 days) at school, kids..:

1. hit or kicked me on purpose
2. grabbed or shoved me on purpose
3. tried to keep others from being my friend
4. did not let me join in what they were doing
5. said mean things to me or called me names
6. sent me a mean text message/email; or posted mean things about me on the Internet (e.g. on Facebook, MySpace)
7. threatened to hurt me or take my things

Respondents had four response options: Never; Once or twice; About once a week; Several times a week. These responses were dichotomized: never vs once or twice or more. Following the precedent of earlier work on this dataset (Lodge and Baxter 2012, Priest, King et al. 2016, Ford, King et al. 2017), we derived three variables: physical, social and any bullying victimisation. For physical bullying victimisation, we combined items a and b with the reference category 'did not report either a or b' vs either or both. We adopted the same approach for social bullying victimisation, combining items c and d. For 'any bullying

victimisation' we combined all items. Each of these binary variables had high internal consistency (Chronbachs α >0.95). The principle reason for dichotomising these variables was to enable the calculation of multiplicative effect measure modification (EMM), described in the statistical analysis section below. We also note that the bullying victimisation variables were not normally distributed and did not meet the assumptions of linearity.

Covariates

Other variables included in models were: household composition (single parent, two parent); parental education (at least one parent has completed year 12, no parent completed year 12); annual household income ($1-$41,599; $41,600-$77,999; $78,000-$103,999; $104,000 or more); and gender (male, female). In the absence of self-reported race/ethnicity data, ethnicity was categorised based on parental country of birth into: Australian born; Anglo/European (Caucasian or white); Visible minority (non-Caucasian or non-white, but not Indigenous); Indigenous (self or parent reported Aboriginal or Torres Strait Islander)(Statistics Canada 2009).

The Index of Relative Socio-Economic Disadvantage (IRSD) was used to measure area-level disadvantage. IRSD is one of four indices of the Socio-Economic Indices for Areas (SEIFA) produced by the Australian Bureau of Statistics. IRSD was classified at the geographic level 'statistical area level 2' (population of about 10,000) (Australian Bureau of Statistics 2012), and was categorised in quintiles based on the distribution of the 2012 LSAC data.

Missing Data

Missing data on exposures, outcomes and covariates were: disability (1.1%, n=43); BIF/ID (2.6%, n=103); 'any', physical and social bullying victimisation (2.9%, n=116); household income (15.3%, n=607) and parental education (3.3%, n=129). Complete case analysis was conducted. We compared participants with 'missing on any variable' to complete case for

each exposure, outcome and covariate and found that participants with complete data were sightly more advantaged (at an individual and area level), and were less likely to have BIF/ID than those with missing data. Missingness on any variable did not vary according to parent-reported disability status, sex, or any of the bullying victimisation variables.

Missing data on the bullying victimisation variables was slightly higher for adolescents with BIF/ID (BIF/ID: 6.5% vs no BIF/ID: 2.5%), and those with a disability (10.6% vs. 1.8%).

Statistical analysis

Data was extracted from the LSAC dataset using the add-on package PanelWhiz (Hahn and Haisken-DeNew 2013). All analyses were conducted in Stata/SE 12 (StataCorp LP 2012) using the 'svy' commands to accommodate sample design characteristics including stratification and sampling weights. The default setting for the svy command is VCE (robust). Due to good retention of the original Wave 1 participants across the five waves of data collection, the number of adolescents participating in Wave 5 of the study was 3956. Complete case analysis was based on an analytic sample of 3077.

We first described the prevalence of bullying victimisation for all three outcomes according to disability status (disability vs. no disability) and BIF/ID (non-BIF/ID vs BIF/ID). We used Poisson regression to obtain prevalence rate ratios (PRR) for bullying victimisation. We used this approach, rather than estimating the prevalence odds ratio (POR) because we wanted to directly compare prevalence between groups, making it is possible to calculate EMM on the additive scale, which is not possible with the POR as it is not collapsible. The PRR is recommended for cross-sectional studies particularly when the outcome is not rare (Zocchetti, Consonni et al. 1997). The magnitude of associations are lower than the POR with estimates converging with decreasing prevalence of an outcome (Zocchetti, Consonni et al. 1997). We present results adjusted for potential confounders.

We take the approach recommended by Knol and VanderWeele and present estimates of the PRR and 95% CI within strata of gender and parental education with a single reference category of female/no disability and high parental education/no disability (Knol and VanderWeele 2012). We then present the PRR within strata of gender and parental education. Finally, we compute measures of EMM on the additive and multiplicative scale. We fitted cross-product terms in two sets of models: one with gender*disability and the other with parental education*disability. To generate estimates of the PRR we used the lincom command in Stata (StataCorp LP 2012). Evidence of a multiplicative EMM was based on the interpretation of the cross-product term in the models. If the PRR for this interaction is equal to 1 this indicates that there is no evidence of EMM on the multiplicative scale. Presence of an additive EMM was assessed using the relative excess risk of interaction (RERI) which was computed using the nlcom command in Stata (VanderWeele and Knol 2014). The RERI represents the prevalence that is in excess of that expected if the combination of the effect modifier (gender or parental education) and disability were entirely additive (Knol and VanderWeele 2012).

RESULTS

Descriptive analysis

Supplementary Table S1 shows characteristics of the analytic sample. The majority lived in households: with an income of $78,000 or more (67%); with two parents (83%); where one or more parent had completed year 12 (62%). The majority were also of Australian-born parents (65%). Just over 5% of the sample had a disability and 13.6% were classified as having BIF/ID.

Table 1 presents the prevalence of disability by demographic and socio-economic characteristics. Disability and BIF/ID were more common among boys, and those living in low income or one parent households. Disability was more common among adolescents of Australian or Anglo/European born parents while BIF/ID was more common among

Indigenous adolescents (34%). The prevalence of BIF/ID was higher among those whose parents had not completed year 12 and those living in more disadvantaged areas.

[INSERT Table 1 here]

Aim 1: Disability and bullying victimization (Tables 2 and 3)

Disability

Those with a disability were more likely to experience physical bullying victimisation (37% vs 30%, crude PRR 1.29 95% CI 1.02-1.63), social bullying victimisation (42% vs 33, crude PRR 1.36 95% CI 1.11-1.67) and 'any' bullying victimisation (61% vs 54%, crude PRR 1.19 95% CI 1.03-1.37); after adjusting for confounders, the relationship between disability and social bullying victimisation remained, but the estimates for physical bullying victimisation and 'any bullying victimisation' were attenuated.

[INSERT Table 2 here]

Borderline IF

Physical bullying victimisation (36% vs 29%, crude PRR 1.26 95% PRR 1.07-1.49), social bullying victimisation (40% vs 33%, crude PRR, 1.34 95% CI 1.16-1.54) and 'any bullying victimisation' (60% vs 53%, PRR 1.17 95% CI 1.06-1.29) were more common among adolescents with BIF/ID. In adjusted analyses, the estimates for social bullying victimisation and 'any bullying victimisation' remained similar in magnitude but the estimate for physical bullying victimisation was substantially attenuated.

[INSERT Table 3 here]

Aim 2: EMM of disability and bullying victimization by gender and parental education, and BIF/ID and bullying victimization by gender and parental education

Supplementary Table S2 presents the prevalence of bullying victimisation by disability and BIF/ID stratified by gender and parental education.

Tables 4 and 5 show the results of the adjusted analyses of EMM. In interpreting these tables, the final column in these tables 'PRR for having a disability within each strata' and 'PRR for having BIF/ID within strata'are the stratum-specific estimates and where relevant, these results are highlighted below.

Disability

There was no statistical evidence of interactions between gender and disability for any of the bullying victimisation outcomes. There was weak evidence to support positive EMM of social bullying victimisation by parental education on the additive (RERI 0.49, 95% CI -0.01, 0.99) and multiplicative (PRR 1.41, 95% CI 0.96, 2.05) scales. These estimates indicate that the combined risk of having a disability and living in a household with low parental education produces a greater risk of social bullying victimisation than the independent risk of having a disability and being in households with low parental education. This is evident in the stratum-specific estimates; for adolescents from families with high parental education, adolescents with a disability did not experience a higher risk of social bullying victimisation (PRR 1.08, 95% CI 0.80-1.46) than adolescents without a disability, while for adolescents from families with low parental education there was relatively strong evidence that adolescents with a disability were at higher risk (PRR 1.51, 95% 1.18-1.93).

[INSERT Table 4 here]

Borderline Intellectual Functioning/Intellectual Disability

There was evidence of negative EMM by gender for 'any bullying victimisation' on the additive (RERI -0.29, 95% CI -0.53- -0.04) and multiplicative (PRR 0.78, 95% CI 0.64-0.95) scales. This was evident in the gender-specific estimates whereby girls with BIF/ID are at higher risk of 'any bullying victimisation' (PRR 1.28, 1.11-1.48) compared with girls without BIF/ID while the association for boys was null (PRR 0.99, 0.87-1.14). There was no statistical

evidence of EMM by gender for physical or social bullying victimisation. Parental education did not modify the association between BIF/ID and bullying victimisation for any outcomes.

[INSERT Table 5 here]

DISCUSSION

We found that 12-13 year old adolescents with disabilities were at higher risk of social bullying victimisation which included experiences such as peers trying to prevent others from being their friend and not letting them join in activities (adjusted PRR 1.29, 95% CI 1.06-1.58). A similar finding was also evident for adolescents with BIF/ID who had 29% increased risk of experiencing social bullying victimisation compared to adolescents without BIF/ID (95% CI 7%-44%). Among those from families with low parental education, adolescents with disabilities were 51% more likely to report experiencing social bullying victimisation than adolescents without disabilities (95% CI 18%-93%); there was no evidence to support this association for adolescents from families with high parental education. Finally, we found some evidence of EMM on both the additive and multiplicative scale by gender in relation to BIF/ID and 'any bullying victimisation'. Girls with BIF/ID were at 28% increased risk (95% CI 11%-48%) of experiencing 'any bullying victimisation' compared to girls without BIF/ID while there was no difference in the risk of 'any bullying victimisation' for boys with and without BIF/ID.

Our study is consistent with previous research showing higher levels of bullying victimisation among adolescents with a disability compared to their peers without a disability in other high-income countries (Sentenac, Gavin et al. 2013). Previous studies have used single questions about overall bullying – we included different types of bullying victimisation and showed that social bullying victimisation is of particular importance for adolescents with a disability and adolescents with BIF/ID. Further, for the first time that we are aware of, we have tested EMM by gender and parental education. This identified the elevated risk of

experiencing social bullying victimisation for adolescents with a disability from families with low parental education. This is concordant with research showing that the risk of exposure to disabillity-related violence is higher for adults with a disability living in more diadvantaged circumstances than for wealthy respondents with a disability (Emerson and Roulstone 2014).

We also found evidence of negative EMM by gender for the association between BIF/ID and 'any bullying victimisation' such that BIF/ID was associated with an increased risk of 'any bullying victimisation' among girls but not boys. This was contrary to what we anticipated, and needs further exploration. It is possible, however, that this reflects gender differences in types of bullying: while social and verbal forms of bullying (which rely more heavily on cognitive ability) are more common among girls, physical forms of victimization more common among males (Tippett and Wolke 2014). Thus, a girl with BIF/ID may be at greater risk of being victimized due to her lower cognitive aptitude, while a boy with BIF/ID may be protected from physical aggression due to other non-cognitive factors.

There are a number of limitations. First, although the survey has reasonable response and retention rates, it over-represents adolescents from more advantaged households (Gray and Sanson 2005). Second, we acknowledge that our measure of bullying was unable to capture all dimensions of bullying victimisation. Measurement error associatated with bullying victimisation measures may be further compounded by a reduced capacity of those classified as BIF/ID, or those having a disability, to comprehend the questions. Such comprehension difficulties may have introduced differential misclassification. In previous studies those with ID tended to report at the extremes of scales (Emerson, Felce et al. 2013), however there was limited evidence for this in this study; across the three outcomes, between 66% and 93% of adolescents with BIF/ID reported at the scale extremes ('never' and 'several times per week') compared to 71% to 93% of adolescents without BIF/ID.

Third, the survey did not include questions about the chronicity or severity of bullying victimisation. Fourth, disability was classified on the basis of parental-report raising the potential for measurement error which may be socially patterned (Emerson, Felce et al. 2013). It is also important to acknowledge that the measure of disability combines a number of different conditions, and does not distinguish between levels of severity. It is likely that experiences vary considerably depending on type of disability and level of severity, and this classification of disability may have introduced an information bias. Importantly however, disaggregation of the bullying measure would have severely underpowered our analytical models and limited our capacity to conduct EMM. Relatedly, statistical evidence of interaction requires larger sample sizes than needed to estimate average effects so this study may be underpowered to detect small to moderately sized EMM (VanderWeele and Knol 2014). Finally, overall 22% of participants had some missing data. Missing data was more likely among adolescents from more advantaged backgrounds. Missing data on the bullying victimisation variables was slightly higher for adolescents with either a disability or BIF/ID – it is therefore possible that the missingness may have introduced some selection bias.

The study also has several strengths. We included a range of bullying victimisation outcomes and investigated EMM by gender and parental education adding to an emergent body of work taking an intersectional approach. In addition, we reported EMM on the additive and multiplicative scales; most studies report EMM on the multiplicative scale only, as this is the estimate generated from the cross-product term in log scale-regression models. From a public health perspective, it is the excess risk (e.g. RERI) on the additive scale (or risk difference scale) that is most relevant (VanderWeele and Knol 2014).

Our findings suggest that interventions should actively promote the inclusion of adolescents with a disability in relationships and furthermore, those from more disadvantaged families should be a particular focus. Adolescents with BIF/ID form a large minority of school-

students (14% in this sample). Most of these students are in mainstream education and may not be identified as having a disability; they are a potentially under-recognised vulnerable group and should be a focus of anti-bullying strategies.

CONCLUSION

In sum, we provide the first Australian population-based estimates of the prevalence of bullying victimisation by disability status in Australia. Importantly we find that adolescents with disability and BIF/ID are at elevated risk of social bullying victimisation or exclusion. We argue that school-based anti-bullying initiatives should pay greater attention to enhancing the inclusion of children with disabilities in school settings with a particular emphasis on adolescents from more disadvantaged backgrounds.

KEY MESSAGES

- This paper investigated bullying victimisation experiences of adolescents with and without disabilities and BIF/ID and found that adolescents with disabilities and BIF/ID are at elevated risk of social bullying victimisation.
- Further, recognising the complex intersections between social identities and positions, and growing evidence about the importance of intersectionality, we examined potential effect modifiers of the relationship between disability and BIF/ID and bullying victimization.
- School-based anti-bullying initiatives should concentrate on enhancing inclusion of adolescents with disabilities, with an emphasis on adolescents from disadvantaged backgrounds.

DISCLOSURES

The authors declare that they have no potential conflicts of interest.

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Table 1: Prevalence of disability and BIF/ID by covariates

		Disability % (95%CI)	Borderline % (95%CI)
Sex	Male	6.2 (5.0, 7.4)	15.3 (13.1, 17.4)
	Female	3.9 (2.9, 4.8)	11.7 (9.9, 13.5)
Household income per annum	$1-$41,599	6.9 (4.0, 9.9)	21.9 (16.6, 27.1)
	$41,600-$77,999	6.6 (4.4, 8.9)	15.0 (11.7, 18.2)
	$78,000-$103,999	5.1 (3.2, 7.0)	16.1 (12.5, 19.8)
	$104,000 or more	4.3 (3.3, 5.4)	9.3 (7.8, 10.8)
Parents in household	Two parents	4.3 (3.5, 5.0)	12.6 (11.1, 14.1)
	Single parent	6.9 (4.9, 8.9)	16.6 (13.0, 20.2)
Education of parents in home	1+ parent finished Yr 12	4.1 (3.3, 4.9)	9.4 (8.1, 10.8)
	No parent finished Yr 12	5.8 (4.3, 7.2)	19.5 (16.6, 22.3)
COB: biological parents	Australia	5.7 (4.6, 6.7)	13.4 (11.7, 15.1)
	Anglo/euro	5.2 (3.3, 7.1)	11.1 (8.4, 13.8)
	Visible other	2.6 (0.8, 4.4)	12.3(8.7, 16.0)
	Indigenous	2.5 (0.00, 5.1)	33.8 (23.4, 44.2)
Area disadvantage	1 – most disadvantaged	6.7 (4.2, 9.2)	19.3 (15.6, 22.9)
	2	6.0 (4.0, 8.0)	15.0 (11.9, 18.1)
	3	5.0 (3.3, 6.8)	13.8 (10.9, 16.6)
	4	3.4 (2.0, 4.8)	13.4 (10.6, 16.3)
	5 – least disadvantaged	4.5 (3.0, 6.0)	7.4 (5.6, 9.2)

Table 2: Prevalence of bullying victimization and Poisson regression of risk of bullying victimization by disability status, PRR (95%% CI)*

	Prevalence		Crude PRR	Adjusted PRR
	No Disability	Disability	(95% CI)	(95%CI)
Physical bullying victimisation	30.1	36.7	1.29 (1.02, 1.63)	1.13 (0.90,1.42)
Social bullying victimisation	33.3	41.9	1.36 (1.11,1.67)	1.29 (1.06,1.58)
'Any' bullying victimisation	54.0	61.1	1.19 (1.03,1.37)	1.12 (0.98,1.29)

* Models adjusted for: gender, household type, parental education, ethnicity, income, area SEP

Table 3: Prevalence of bullying victimization and Poisson regression of risk of bullying victimization by BIF/ID status, PRR (95%% CI)*

	Prevalence		Crude PRR	Adjusted PRR
	Non BIF/ID	BIF/ID	(95% CI)	(95%CI)
Physical bullying victimisation	29.4	36.1	1.26 (1.07,1.49)	1.08 (0.92,1.26)
Social bullying victimisation	32.7	40.2	1.34 (1.16,1.54)	1.24 (1.07,1.44)
'Any' bullying victimisation	53.4	60.2	1.17 (1.06,1.29)	1.10 (1.00,1.22)

* Models adjusted for: gender, household type, parental education, ethnicity, income, area SEP

Table 4: EMM of disability and bullying victimization by gender and parental education*

		Non-disabled PRR (95% CI)	Disabled PRR (95%CI)	PRR for being disabled within each strata
Physical bullying victimisation	Female	1.00	1.29(0.78, 2.13) p=0.322	1.29(0.78, 2.13) p=0.322
	Male	2.09(1.84, 2.38) p<0.001	2.26(1.71, 2.98) p<0.001	1.08(0.84, 1.39) p=0.535
	EMM on multiplicative scale: 0.84 (0.48, 1.47); p=0.539			
	EMM on additive scale: -0.12(-0.96, 0.73); p=0.788			
Social bullying victimisation	Female	1.00	1.41(1.05, 1.90) p=0.021	1.41(1.05, 1.90) p=0.021
	Male	0.95(0.85, 1.06) p=0.385	1.15(0.88, 1.51) p=0.304	1.21(0.91, 1.60) p=0.186
	EMM on multiplicative scale: 0.86(0.56, 1.30); p=0.467			
	EMM on additive scale: -0.21(-0.75, 0.32); p=0.435			
Any bullying victimisation	Female	1.00	1.24(0.99, 1.55) p=0.066	1.24(0.99, 1.55) p=0.066
	Male	1.16(1.07, 1.24) p<0.001	1.23(1.02, 1.48) p=0.034	1.06(0.89, 1.27) p=0.542
	EMM on multiplicative scale: 0.86(0.64, 1.15); p=0.306			
	EMM on additive scale: -0.17(-0.53, 0.20); p=0.366			
Physical bullying victimisation	1+ parent educated to at least Yr 12	1.00	1.18 (0.89, 1.59) p=0.254	1.18 (0.89, 1.59) p=0.254
	No parent educated to Yr12	1.21(1.07, 1.38) p=0.003	1.31 (0.91, 1.89) p=0.142	1.08 (0.76, 1.55) p=0.667
	EMM on multiplicative scale: 0.91 (0.58, 1.45) p=0.699			
	EMM on additive scale: 0 (-0.67, 0.50) p=0.773			
Social bullying victimisation	1+ parent educated to at least Yr 12	1.00	1.08(0.80, 1.46) p=0.632	1.08(0.80, 1.46) p=0.632
	No parent educated to Yr12	1.10 (0.98, 1.24) p=0.119	1.67(1.30, 2.14) p<0.001	1.51(1.18, 1.93) p=0.001
	EMM on multiplicative scale: 1.41(0.96, 2.05); p=0.076			
	EMM on additive scale: 0.49(-0.01, 0.99); p=0.053			
Any bullying victimisation	1+ parent educated to at least Yr 12	1.00	1.13(0.95, 1.34) p=0.180	1.13(0.95, 1.34) p=0.180
	No parent educated to Yr12	1.04(0.96, 1.14) p=0.315	1.17 (0.94, 1.46) p=0.156	1.12(0.91, 1.39) p=0.287
	EMM on multiplicative scale: 0.99(0.76, 1.31); p=0.989			

		EMM on additive scale: 0.00(-0.31, 0.31); p=0.984		

*Note: we have not included numbers in the cells because we used weighted sample estimates

Models adjusted for: gender, household type, parental education, ethnicity, income, area SEP

Table 5: EMM of BIF/ID and bullying victimization by gender and parental education*

			Non BIF/ID PRR (95% CI)	BIF/ID PRR (95% CI)	PRR for having BIF within each strata
Physical bullying victimization	Female		1.00	1.29(0.94, 1.78) p=0.115	1.29(0.94, 1.78) p=0.115
	Male		2.15(1.86, 2.47) p<0.001	2.14(1.74, 2.64) p<0.001	1.00(0.84, 1.19) p=0.994
		EMM on multiplicative scale: 0.77(0.55, 1.10); p=0.148			
		EMM on additive scale: -0.29(-0.82, 0.24); p=0.276			
Social bullying victimization	Female		1.00	1.31(1.06, 1.61) p=0.011	1.31(1.06, 1.61) p=0.011
	Male		0.96(0.85, 1.07) p=0.44	1.14(0.93, 1.39) p=0.198	1.19(0.97, 1.47) p=0.097
		EMM on multiplicative scale: 0.91(0.68, 1.22); p=0.521			
		EMM on additive scale: -0.13(-0.48, 0.22); p=0.474			
'Any' bullying victimization	Female		1.00	1.28(1.11, 1.48) p=0.001	1.28(1.11, 1.48) p=0.001
	Male		1.19(1.10, 1.29) p<0.001	1.18(1.03, 1.35) p=0.020	0.99(0.87, 1.14) p=0.907
		EMM on multiplicative scale: 0.78(0.64, 0.95); p=0.013			
		EMM on additive scale: -0.29(-0.53, -0.04); p=0.022			
Physical bullying victimization	1+ parent educated to at least Yr 12		1.00	1.06(0.82, 1.37) p=0.653	1.06(0.82, 1.37) p=0.653
	No parent educated to Yr12		1.20(1.05, 1.37) p=0.01	1.31(1.06, 1.61) p=0.013	1.09(0.88, 1.36) p=0.443
		EMM on multiplicative scale: 1.03(0.73, 1.45); p=0.877			
		EMM on additive scale: 0.05(-0.35, 0.45); p=0.817			
Social bullying victimization	1+ parent educated to at least Yr 12		1.00	1.18(0.94, 1.48) p=0.154	1.18(0.94, 1.48) p=0.154
	No parent educated to Yr12		1.09(0.96, 1.25) p=0.181	1.42(1.18, 1.71) p<0.001	1.30(1.07, 1.57) p=0.008
		EMM on multiplicative scale: 1.10(0.82, 1.47); p=0.531			
		EMM on additive scale: 0.14(-0.22, 0.51); p=0.435			
'Any' bullying victimization	1+ parent educated to at least Yr 12		1.00	1.04(0.89, 1.21) p=0.611	1.04(0.89, 1.21) p=0.611

No parent educated to Yr12	1.02(0.93, 1.12) p=0.665	1.19(1.05, 1.34) p=0.007	1.16(1.02, 1.33) p=0.028
EMM on multiplicative scale: 1.12(0.91, 1.37); p=0.293			
EMM on additive scale: 0.13(-0.10, 0.35); p=0.269			

Note: we have not included numbers in the cells because we used weighted sample estimates

*Models adjusted for: gender, household type, parental education, ethnicity, income, area SEP

Supplementary Table S1: Descriptive table of analytical sample (weighted %)

Analytic variable	Response categories	%
Sex	Male	51.9
	Female	48.1
Household income per annum	$1-$41,599	11.5
	$41,600-$77,999	22.0
	$78,000-$103,999	17.3
	$104,000 or more	49.2
Household	Two parents in household	82.5
	Single parent in household	17.6
Education of parents in home	1+ parent finished Yr 12	62.4
	No parent finished Yr 12	37.6
Ethnicity of biological parents	Australia	65.4
	Anglo/European ancestry	16.2
	Visible other	15.7
	Indigenous	2.8
Area disadvantage	1 – most disadvantaged	18.1
	2	19.1
	3	20.9
	4	19.7
	5-most advantaged	22.3
Disability	No disability	94.9
	Disability	5.1
BIF/ID	Non BIF/ID	86.5
	BIF/ID	13.6

Supplementary Table S2: Prevalence of bullying victimization by disability status, gender and parental education (%, 95% CI)

	Physical	Social exclusion	'Any bullying victimisation' experience
Prevalence by overall disability	**%, 95% CI**	**%, 95% CI**	**%, 95% CI**
Total sample			
No disability	30.1(28.4, 31.7)	33.3(31.4, 35.2)	54.0(52.2, 55.8)
Disability	36.7(27.9, 45.5)	41.9(33.7, 50.1)	61.1(52.6, 69.6)
Gender			
Female			
No disability	19.5(17.4, 21.5)	35.1(32.6, 37.7)	50.7(48.1, 53.3)
Disability	26(12.9, 39.1)	49.9(34.9, 64.8)	62.6(47.5, 77.6)
Male			
No disability	40.2(37.7, 42.6)	31.6(29.1, 34.1)	57.1(54.7, 59.5)
Disability	42.9(32.0, 53.8)	37.2(27.2, 47.2)	60.2(49.4, 71.0)
Parental education			
At least one parent finished year 12			
No disability	26.6(24.6, 28.5)	30.4(28.4, 32.4)	51.2(49.1, 53.4)
Disability	34.5(23.8, 45.2)	33.1(23.6, 42.6)	59.0(48.5, 69.4)
No parent finished year 12			
No disability	36.0(33.0, 39.0)	38.2(34.7, 41.7)	58.5(55.3, 61.8)
Disability	39.2(25.0, 53.4)	52.0(38.6, 65.5)	63.5(49.6, 77.4)
Prevalence by BIF/ID			
Total sample			
No BIF/ID	29.4(27.6, 31.1)	32.7(30.8, 34.6)	53.4(51.5, 55.2)
BIF/ID	36.1(31.0, 41.2)	40.2(35.0, 45.4)	60.2(55.3, 65.1)
Gender			
Female			
No BIF/ID	18.7(16.6, 20.9)	34.1(31.5, 36.7)	49.4(46.7 ,52.1)
BIF/ID	26.6(19.8, 33.4)	47.2(39.2, 55.2)	64.5(56.8, 72.2)
Male			
No BIF/ID	39.8(37.3, 42.3)	31.2(28.7, 33.8)	57.3(54.8, 59.8)
BIF/ID	42.7(36.1, 49.3)	35.4(28.8, 41.9)	57.3(50.9, 63.4)
Parental education			
At least one parent finished year 12			
No BIF/ID	26.4(24.4, 28.4)	30.1(28.2, 32.1)	51.2(49.0, 53.3)
BIF/ID	31.9(24.8, 38.9)	34.2(26.6, 41.8)	54.0(47.7, 62.2)
No parent finished year 12			

No BIF/ID	35.0(31.6, 38.4)	37.3(33.6, 41.1)	57.2(53.5, 60.9)
BIF/ID	40.3(32.4, 48.1)	45.6(37.9, 53.2)	65.2(58.1, 72.4)