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Early developmental vulnerabilities following exposure to domestic violence and abuse: Findings from an  
Australian population cohort record linkage study

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## ABSTRACT

Early life exposure to Domestic Violence and Abuse (DVA) is associated with poor psychosocial and cognitive development in childhood. However, most prior research uses mother-reported involvement in DVA as a proxy indicator of child exposure; studies using direct measures of child exposure to DVA are scarce, especially among representative population-based samples. We address this gap by using longitudinal, population-based data from an Australian record linkage study of children to examine the associations between early life exposure to DVA and early childhood developmental vulnerability. Exposure to DVA was measured using police contact records for children involved in a DVA incident either as a victim or witness. Developmental vulnerability at school entry was measured using the Australian Early Development Census, providing indices of five broad domains of function (physical, social, emotional, cognitive, and communication) and person-centred classes of developmental risk (referred to as ‘mild generalized risk’, ‘misconduct risk’, and ‘pervasive risk’, each compared to a group showing ‘no risk’). Children exposed to DVA showed significantly greater odds of developmental vulnerability on all five domains and were more likely to be members of the three developmental risk classes. Girls who were victims of DVA (OR = 1.65) had significantly poorer developmental outcomes than boys who were victims (OR = 1.26) within the domain of communication skills and general knowledge ( $d=0.29$  [SE=0.16],  $p=.04$ ). No other sex differences were found. These preliminary findings hold important implications for policy regarding the early intervention and implementation of support services for young children exposed to DVA.

Keywords: Domestic Violence Abuse, Child Development, Developmental Vulnerability, Police Contact

## INTRODUCTION

Early childhood exposure to Domestic Violence and Abuse (DVA) increases the risk of externalising and internalising behaviours in later childhood and adolescence (Artz et al., 2014; Evans et al., 2008; Hungerford et al., 2012; Vu et al., 2016; Wolfe et al., 2003). A recent Australian population-based record linkage study found that the pre-school-aged children of mothers who were the victim of DVA were more likely to demonstrate developmental vulnerability at school entry across a range of psychosocial, cognitive, and physical functions (Orr et al., 2021). These developmental difficulties are associated with a range of poor outcomes in later life, including mental and physical health problems, criminal justice contact, and socioeconomic adversity (Jones et al., 2015; Piotrowska et al., 2020). Early intervention targeting children exposed to DVA might help mitigate these outcomes.

The few studies that have examined the association between exposure to DVA before age six years and subsequent childhood outcomes have been limited by use of non-representative samples, cross-sectional data, overreliance on retrospective self-reports, and/or vague operational definitions (Artz et al., 2014; Evans et al., 2008; Hungerford et al., 2012; Wolfe et al., 2003). Mother reported involvement in DVA is also often used as a proxy indicator of child exposure and may exclude children who are the target of DVA and has the potential to increase the risk of response bias and underreporting (Carter et al., 2020; Fong et al., 2019). There is also inconsistent evidence regarding whether the effects of early childhood exposure to DVA are different for boys and girls, and nor is it clear if exposure to DVA as a witness or victim is differentially associated with particular developmental outcomes (Artz et al., 2014; Carter et al., 2020).

No study has yet examined the link between pre-school aged children's direct exposure to DVA and developmental difficulties at school entry using whole-of-population data sourced from governmental agencies, such as the police. Indeed, police are typically first responders to family violence incidents, and although not all DVA is reported to police, they are more likely to be notified of serious incidents involving child victims or witnesses (Dowling et al., 2018; Voce & Boxall 2018). Large, longitudinal, population-based projects using administrative police records may provide valuable information regarding the prevalence of children directly exposed to DVA at the population level while avoiding the limitations of prior research (AIHW, 2019; Jouriles et al., 2001; Howarth et al., 2016). This information is vital for the development and evaluation of governmental policies, such as the United Nations *Sustainable Development Goal 16* and the Australian *National Plan to Reduce Violence against Women and their Children 2010-2022*, which reflect concerted commitments to

reducing DVA as well as providing suitable services and early intervention to those who experience it (Department of Social Services, 2011; Lee et al., 2016).

The current study provides an initial examination of the link between direct exposure to DVA and early childhood developmental outcomes using administrative records of children's contact with police for incidents involving DVA as a victim or witness. We specifically examined the association between pre-school-aged children's police-recorded exposure to DVA as a victim or witness, and vulnerability at school entry across five broad domains of development (physical, social, emotional, cognitive, and communication) and person-centred latent classes of developmental vulnerability reflecting 'mild generalized risk', 'misconduct risk', and 'pervasive risk' (each compared to a group showing ostensibly 'no risk'). We assessed these associations independent of socioeconomic disadvantage and Aboriginal and/or Torres Strait Islander status, both of which are associated with higher risk of DVA and developmental vulnerability (Segal et al., 2019; Williamson et al., 2019).

## METHODS

### *Participants*

Data were drawn from the New South Wales Child Development Study (NSW-CDS; <http://nsw-cds.com.au>), an Australian state-wide longitudinal population-based record linkage project (Carr et al., 2016; Green et al., 2018). The NSW-CDS includes a cohort of 87,037 children who were assessed with the 2009 Australian Early Development Census (AEDC) during their first year of formal schooling (kindergarten), at approximately age five years (Brinkman et al., 2014). Records from multiple government agencies (i.e., health, education, and justice) were linked for each child from their birth to around age 14 years (2016), and for their parents from as far back as 1994 through to 2016 (depending on the availability of record sets). The linkage of police contact data was conducted in 2018 for children born between 1<sup>st</sup> January 2002 and 31<sup>st</sup> December 2005. All data were de-identified and adherence to strict privacy protocols was required.

Record linkage was completed by the Centre for Health Record Linkage via probabilistic methods that used minimum matching variables of name, date of birth, residential address, and sex (Carr et al., 2016; Green et al., 2018). Demographic profiles indicate that the NSW-CDS cohort is comparable to the NSW population (Green et al., 2018). For this study examining the association between childhood exposure to police recorded DVA incidents and subsequent developmental difficulties, data were limited to the 82,501 children who were

linked to police contact records, completed the AEDC, did not have special needs, and had no missing data for the key relevant variables<sup>1</sup>.

### *Ethics*

This research was conducted with ethical approval from the NSW Population and Health Services Research Ethics Committee (PHSREC AU/1/289807 and PHSREC AU/1/1AFE112), and data custodian approvals granted by the relevant government departments. A waiver of consent was enacted according to the Australian National Health and Medical Research Council (NHMRC) National Statement of Ethical Conduct in Human Research, which states that consent is not required for the purpose of record linkage research if stringent privacy and anonymity procedures are followed and there is a perceived public good.

### *Measures*

*Childhood developmental vulnerabilities.* Developmental vulnerabilities were rated by teachers when children were aged approximately five years (in their first year of formal schooling) using the AEDC, a valid and reliable measure of childhood vulnerability across multiple domains of development (Janus and Offord, 2007). The AEDC was administered nationally between 1<sup>st</sup> May and 31<sup>st</sup> July 2009. The index comprises 104-item population measure of developmental competencies, of which 96 items assess functioning on 16 subdomains. These subdomains are encapsulated within the five broad domains of ‘physical health and well-being’, ‘social competence’, ‘emotional maturity’, ‘language and cognitive skills (school-based)’, and ‘communication and general knowledge’. Children who scored in the lowest 10% of each domain/subdomain of the national 2009 AEDC population distribution were classified as ‘vulnerable’ on that domain/subdomain.

In addition, previous latent class analysis (LCA) of the NSW-CDS cohort using the 16 subdomains of the AEDC has identified four profiles of risk for later health and social adversities, designated ‘*no risk*’, ‘*mild generalized risk*’, ‘*misconduct risk*’, and ‘*pervasive risk*’ (see Green et al., 2019). The LCA was conducted on 82,891 children with valid AEDC subdomain data in that prior study using SAS<sup>®</sup> 9.4 with the PROC LCA macro (Lanza et al., 2007; SAS, 2015). The *no risk* group, which showed virtually no probability of being vulnerable on any of the 16 subdomains, comprised 77.4% ( $n=63,847$ ) of children. The *mild generalized risk* group had a modestly increased likelihood of developmental vulnerability in most subdomains and included

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<sup>1</sup> Of the 4,536 children excluded from the study sample, 3,777 were removed because they had special needs (AEDC subdomain scores are not derived for these children) and 759 because of other missing data.

11.5% ( $n=9,477$ ) of the present sample. The third group, called *misconduct risk*, encompassed 6.9% ( $n=5,729$ ) of the study sample, reflecting a high probability of being vulnerable on the subdomains of responsibility and respect, aggressive behaviour, and hyperactivity and inattentive behaviour. The final group, designated *pervasive risk*, comprised 4.2% ( $n=3,448$ ) of children, and was characterised by a high probability of being vulnerable on most subdomains.

*Police recorded incidents of DVA.* Data on children's involvement in police recorded incidents of DVA prior to the outcome measure were derived from NSW Police Computerised Operational Policing System (COPS). The COPS database includes all criminal and non-criminal 'incidents' reported to or detected by NSW police since January 1995 (see Whitten et al., 2020). Our two exposure variables included being the (i) victim or (ii) witness of DVA in early childhood, operationalised as police contact prior to 1<sup>st</sup> May 2009 for any criminal and non-criminal incident involving domestic violence as the associated factor and where the child was identified as the victim or witness. A combined (victim/witness) variable was also created to indicate if the child had *any exposure* to DVA.

*Covariates.* Aboriginal and/or Torres Strait Islander status (yes/no) was derived from all available information among the linked record sets (including both parent and child records in the case of allocating Indigenous status). The Socio-Economic Index for Areas (SEIFA) Index of Relative Socio-economic Disadvantage (IRSD) was determined from the mother's residential postcode recorded in the Perinatal Data Collection (i.e., at the time of the child's birth). The SEIFA indexes the average income and employment status for each residential postcode in Australia, with lower scores indicating greater socio-economic disadvantage (Pink, 2013). Quintiles were produced from the IRSD, ranging from the most disadvantaged (quintile 1) to the least disadvantaged (quintile 5), and were subsequently dichotomised (quintile 1 vs. quintile 2-5).

#### *Statistical analysis*

Descriptive statistics were first obtained to establish the prevalence of childhood developmental vulnerabilities and covariate factors among all children, and separately for those who were the victim or witness of DVA prior to the AEDC. Next, a series of univariate and multivariate binary logistic regression analyses examined the association between any DVA exposure, and separately as a victim or witness, and developmental vulnerability in each of the five AEDC domains. The comparison group were children not classified as



‘developmentally vulnerable’ for the respective domain. Univariate and multivariate multinomial logistic regression analyses also examined the association between the exposure variables and LCA-derived classes of developmental risk, with the *no risk* category as the reference group.

Multivariate regression analyses were reconducted separately for boys (n=41,914) and girls (n=40,587). Formal comparisons of effect sizes between males and females were conducted using the methodology outlined by Altman and Bland (2003). The covariates included in the multivariate models were either: (i) any exposure to DVA, Aboriginal and/or Torres Strait Islander status, and socioeconomic disadvantage; or (ii) exposure to DVA as a victim, exposure to DVA as a witness, Aboriginal and/or Torres Strait Islander status, and socioeconomic disadvantage. We report the odds ratios (OR) and the 95% confidence intervals (95% CIs) as measures of effect size and precision of the association between the exposure and outcome variables. The Bonferroni correction was applied to avoid potential type 1 errors associated with multiple comparisons, lowering the significance threshold from  $p < .05$  to  $p < .006$ . Analyses were conducted in IBM SPSS 26 (IBM, 2016).

## RESULTS

The descriptive statistics presented in Table 1 indicate that 1.3% (n=1,107) of children had any exposure to a DVA incident prior to around age five years, although more were identified as a victim (1.1%) than a witness (0.3%). A greater proportion of children who were the victim or witness of DVA were Aboriginal and/or Torres Strait Islander and resided in the most socioeconomic disadvantaged areas (lowest quintile nationally). A greater proportion of children who experienced DVA were also developmentally vulnerable across the five domains and three profiles of developmental vulnerability risk. Sex distribution was evenly split across those with no exposure to DVA, exposure as a victim, and exposure as a witness.

XXX TABLE 1 HERE XXX

Table 2 presents the unadjusted and adjusted ORs (95% CI) between DVA exposure and developmental vulnerability outcomes. Univariate models indicated that any DVA exposure (and when examined separately as a victim or witness) was significantly associated with a 1.75 to 3.52 times greater odds of developmental vulnerability on each of the five developmental domains or membership of any of the three risk classes. Multivariate models demonstrated that any exposure to DVA conferred a 1.45 to 2.59 times

significantly greater odds of any developmental vulnerability or risk profile outcome. Comparable results were found for exposure as a victim, whereas exposure as a witness was significantly associated with vulnerability in three of five domains, excepting ‘emotional maturity’ and ‘communication and general knowledge’.

Stratification by sex produced a similar pattern of results. Effect size comparisons indicated that among those exposed to DVA as a victim, the likelihood of vulnerability in the domain of ‘communication skills and general knowledge’ was significantly greater for girls than boys ( $d=0.29$  [SE=0.16],  $p=.04$ ). There were no other significant differences in effect size by sex.

XXX TABLE 2 HERE XXX

## DISCUSSION

This is the first study to examine the association between pre-school-aged children’s police-recorded exposure to DVA as a victim or witness and developmental vulnerabilities identified at school entry. Our findings demonstrate that any exposure to DVA in early childhood was associated with vulnerability across all domains of early childhood development, and with membership in all three developmental risk classes. Exposure to DVA as a victim appeared to have a comparable effect to exposure as a witness, and there were few sex differences. Our overall findings are broadly consistent with prior research, including those based on mother-reported exposures (Artz et al., 2014; Evans et al., 2008; Hungerford et al., 2012; Orr et al., 2021; Wolfe et al., 2003), but extend previous research by demonstrating these associations using data from a large population-based record linkage study and a more direct measure of child involvement in DVA.

Given developmental vulnerability identifiable at school entry can portend a range of poor outcomes later in life (Jones et al., 2015; Piotrowska et al., 2020), those young children at increased risk of such vulnerability may benefit from early intervention. Ongoing programs that blend trauma and non-trauma specific treatments that are also tailored to the child’s specific needs appear to be an effective strategy at reducing externalising and internalising problems in later life among children exposed to DVA (Romano et al., 2021). Programs aimed at improving family and parental support may also be of benefit because of evidence indicating that maladaptive parenting practices may underlie the link between childhood exposure to DVA and developmental vulnerability (Carter et al., 2020).

Early contact with police may also present an opportunity to identify young children who experience DVA and refer them for appropriate interventions. Our findings suggest that these services should not

necessarily be prioritised based on the child's sex, given the equivalent proportion of girls and boys who experienced DVA in our sample, and the relative absence of a gendered effect of DVA on development. Furthermore, our finding that witnesses of DVA had comparable developmental vulnerabilities to victims highlights the importance of extending support services to young children indirectly involved in DVA. These are consistent with the recommendations of international directives aimed at reducing violence against children (Department of Social Services, 2011; Lee et al., 2016). Our findings should be interpreted within the context of several limitations. Foremost, administrative data, including police contact records, only capture instances of service contact, and underestimate the true number of young children exposed to DVA in the population. Likewise, many DVA incidents may not be reported to police for a variety of reasons, including threats of reprisal, economic dependence, and desire to protect the offender (Voce & Boxall, 2018). We also had no access to police records that identified children who were 'at risk of harm' or the subject of mandatory reporting to child protection services. Inclusion of this data may have lowered the average age of first police contact. Furthermore, we did not measure the severity or frequency of DVA involvement, nor did we adjust for the full range of potentially confounding variables. Finally, measures of developmental vulnerability and risk profiles were derived from a single assessment completed by teachers at school entry.

The proportion of pre-school aged children exposed to DVA (1.3%) in our study was lower than the 3% to 25% generally reported in other representative samples (Crouch et al., 2019; Finkelhor et al., 2015; Orr et al., 2021). This discrepancy is likely due to differences in how DVA is defined and measured, as well as the absence of other population-based cohort study findings which to compare our results. Nonetheless, this study builds on research to date by overcoming many of the limitations in previous studies. It draws data from a large, representative population sample convened via record-linkage of routinely collected administrative data, avoiding key sampling and information biases. Using police contact data to measure children's exposure DVA also avoids many of the problems with estimating children's exposure to DVA from mother reports (Artz et al., 2014; Evans et al., 2008; Hungerford et al., 2012; Wolfe et al., 2003). Future research should examine the relative effect of exposure to DVA in early childhood, middle childhood, and adolescence on subsequent developmental, socioeconomic, health, and criminal justice related outcomes, independent of a broad range of potential confounding factors.

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## **Conflict of interest**

We have no known conflicts of interest to disclose.

## **CRedit authorship contribution statement**

**Tyson Whitten:** Conceptualization, Methodology, Investigation, Data curation, Formal analysis, Visualization, Writing – Original Draft, Writing – Review & Editing. **Melissa J. Green:** Data curation, Formal analysis, Supervision, Writing – Review & Editing, Project administration, Funding acquisition. **Stacy Tzoumakis:** Investigation, Writing – Review & Editing, Funding acquisition. **Kristin R. Laurens:** Writing – Review & Editing, Funding acquisition. **Felicity Harris:** Writing – Review & Editing, Project administration. **Vaughan J. Carr:** Writing – Review & Editing, Funding acquisition. **Kimberlie Dean:** Conceptualization, Investigation, Supervision, Writing – Review & Editing, Funding acquisition.

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Table 1. Sample descriptive statistics (N=82,501)

	NO DVA (n=81,394)	DVA VICTIM (n=923)	DVA WITNESS (n=217)
<b>AEDC DEVELOPMENTAL VULNERABILITY (Domain)</b>			
Physical health and wellbeing	13,982 (17.2%)	273 (29.6%)	63 (29.0%)
Social competence	14,499 (17.8%)	300 (32.5%)	71 (32.7%)
Emotional maturity	17,171 (21.1%)	335 (36.3%)	66 (30.4%)
Language and cognitive skills (school-based)	12,286 (15.1%)	290 (31.4%)	65 (30.0%)
Communication skills and general knowledge	11,359 (14.0%)	204 (22.1%)	49 (22.6%)
<b>AEDC RISK PROFILE</b>			
No risk	63,205 (77.7%)	533 (57.7%)	125 (57.6%)
Mild generalised risk	9,273 (11.4%)	168 (18.2%)	44 (20.3%)
Misconduct risk	5,587 (6.9%)	124 (13.4%)	25 (11.5%)
Pervasive risk	3,329 (4.1%)	98 (10.6%)	23 (10.6%)
Aboriginal/Torres Strait Islander	5,766 (7.1%)	278 (30.1%)	69 (31.8%)
Male sex	41,359 (50.8%)	462 (50.1%)	106 (48.8%)
Socioeconomic disadvantage	16,312 (20.0%)	269 (29.1%)	66 (30.4%)

AEDC=Australian Early Development Census; DVA=Domestic Violence and Abuse

Table 2. Multivariate logistic and multinomial regression of association between covariates and AEDC developmental vulnerability and risk profile

	DEVELOPMENTAL VULNERABILITY					RISK PROFILE			
	Physical health and wellbeing	Social competence	Emotional maturity	Language and cognitive skills	Communication skills and general knowledge	No risk (reference) vs.			
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	Mild generalised OR (95% CI)	Misconduct OR (95% CI)	Pervasive OR (95% CI)	
<b>ALL (n=82,501)</b>									
Any DVA	U:	2.04 (1.79-2.32)	2.20 (1.93-2.49)	2.03 (1.80-2.30)	2.57 (2.26-2.92)	1.78 (1.54-2.05)	2.17 (1.85-2.54)	2.50 (2.08-3.01)	3.52 (2.89-4.29)
	A <sup>1</sup> :	1.68 (1.47-1.92)	1.85 (1.63-2.11)	1.78 (1.57-2.01)	1.96 (1.71-2.24)	1.45 (1.25-1.68)	1.75 (1.49-2.06)	2.15 (1.78-2.59)	2.59 (2.11-3.17)
Victim	U:	2.02 (1.75-2.33)	2.22 (1.93-2.55)	2.13 (1.86-2.44)	2.57 (2.23-2.96)	1.75 (1.49-2.04)	2.14 (1.80-2.55)	2.63 (2.16-3.20)	3.48 (2.79-4.32)
	A <sup>2</sup> :	1.64 (1.42-1.90)	1.84 (1.59-2.12)	1.85 (1.61-2.12)	1.93 (1.67-2.23)	1.41 (1.20-1.65)	1.71 (1.43-2.04)	2.22 (1.82-2.72)	2.49 (1.99-3.12)
Witness	U:	1.95 (1.46-2.62)	2.22 (1.67-2.95)	1.62 (1.21-2.16)	2.37 (1.77-3.17)	1.79 (1.30-2.46)	2.38 (1.69-3.36)	2.23 (1.45-3.44)	3.42 (2.19-5.35)
	A <sup>2</sup> :	1.47 (1.09-1.99) <sup>+</sup>	1.69 (1.26-2.26)	1.27 (0.95-1.71)	1.59 (1.18-2.16)	1.36 (0.98-1.88)	1.77 (1.24-2.51)	1.69 (1.09-2.61) <sup>+</sup>	2.14 (1.35-3.39)
Aboriginal/ Torres Strait Islander	U:	2.10 (1.98-2.23)	1.97 (1.86-2.09)	1.76 (1.66-1.86)	2.86 (2.70-3.03)	2.04 (1.92-2.17)	2.37 (2.21-2.54)	2.03 (1.86-2.22)	3.30 (3.00-3.63)
Male sex	U:	1.54 (1.48-1.59)	1.76 (1.70-1.82)	2.11 (2.03-2.18)	1.54 (1.48-1.60)	1.76 (1.69-1.84)	1.50 (1.44-1.57)	3.27 (3.07-3.47)	2.52 (2.34-2.72)
Socioeconomic disadvantage	U:	1.50 (1.44-1.57)	1.43 (1.37-1.49)	1.23 (1.19-1.28)	1.83 (1.75-1.91)	1.77 (1.69-1.85)	1.78 (1.69-1.87)	1.28 (1.20-1.36)	1.99 (1.85-2.15)
<b>BOYS (n=41,914)</b>									
Any DVA	A <sup>1</sup> :	1.74 (1.45-2.09)	1.73 (1.45-2.07)	1.70 (1.43-2.02)	1.90 (1.58-2.28)	1.33 (1.09-1.62) <sup>+</sup>	1.72 (1.36-2.16)	2.14 (1.69-2.70)	2.52 (1.93-3.29)
Victim	A <sup>2</sup> :	1.75 (1.44-2.13)	1.74 (1.43-2.11)	1.75 (1.45-2.11)	1.94 (1.59-2.37)	1.26 (1.01-1.57) <sup>+</sup>	1.70 (1.32-2.19)	2.22 (1.72-2.86)	2.45 (1.83-3.30)
Witness	A <sup>2</sup> :	1.44 (0.95-2.19)	1.60 (1.07-2.40) <sup>+</sup>	1.35 (0.90-2.00)	1.59 (1.05-2.43) <sup>+</sup>	1.39 (0.90-2.15)	1.85 (1.12-3.05) <sup>+</sup>	1.79 (1.03-3.12) <sup>+</sup>	2.22 (1.21-4.08) <sup>+</sup>
<b>GIRLS (n=40,587)</b>									
Any DVA	A <sup>1</sup> :	1.63 (1.34-1.99)	2.06 (1.70-2.49)	1.96 (1.62-2.37)	2.06 (1.69-2.51)	1.65 (1.33-2.06)	1.85 (1.47-2.32)	2.41 (1.75-3.31)	2.88 (2.09-3.98)
Victim	A <sup>2</sup> :	1.54 (1.24-1.92)	2.01 (1.63-2.48)	2.07 (1.69-2.54)	1.95 (1.57-2.42)	1.65 (1.30-2.10)	1.76 (1.37-2.27)	2.50 (1.78-3.51)	2.74 (1.92-3.91)
Witness	A <sup>2</sup> :	1.55 (1.00-2.41) <sup>+</sup>	1.85 (1.21-2.82)	1.22 (0.78-1.93)	1.63 (1.05-2.54) <sup>+</sup>	1.34 (0.82-2.20)	1.76 (1.07-2.89) <sup>+</sup>	1.76 (0.83-3.70)	2.22 (1.08-4.56) <sup>+</sup>

U: unadjusted odds ratio; A<sup>1</sup>: adjusted odds ratio from models include Aboriginal and/or Torres Strait Islander and socioeconomic disadvantage; A<sup>2</sup>: adjusted odds ratio from models include exposure as a victim, exposure as a witness, Aboriginal and/or Torres Strait Islander, and socioeconomic disadvantage.

<sup>+</sup>p<.05 but greater than Bonferroni-corrected threshold of p<.004.