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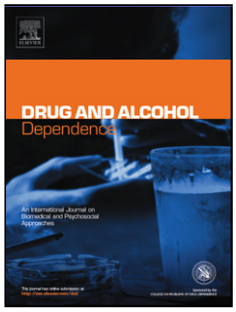

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Gender-based differences in injecting drug use by young adults who experienced maltreatment in childhood: Findings from an Australian birth cohort study*

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Highlights

- All forms of childhood maltreatment predisposed to injecting drug use in females.
- The only exception was sexual abuse.
- Emotional abuse was associated with injecting drug use by males.
- Reasons for the different risk in males and females are unclear.

Abstract

Background: Childhood maltreatment has been associated with a range of adverse mental and psychosocial outcomes, but its association with subsequent injecting drug use (IDU) is less clear. This study investigates the associations between specific and multiple forms of substantiated childhood maltreatment and IDU reported at 21 years.

Method: The Mater-University of Queensland Study of Pregnancy is a prospective birth cohort study. It recruited pregnant women at their first antenatal clinic visit and collected data on their children at 21 years. Data from 3750 participants (1769 males and 1981 females) were analysed using agency substantiated childhood maltreatment from birth to 14 years of age and self-reports of ever IDU at 21 years. We used multivariable logistic regression analyses to control for possible confounders.

Results: The sample's mean age was 20.6 years. Some 4.1% (n = 72) of males and 4.6% (n = 91) of females had experienced substantiated childhood maltreatment. The prevalence of IDU was 6.6% (n = 118) and 4.6% (n = 91) for males and females, respectively. In adjusted models, all forms of substantiated childhood maltreatment, with the exception of sexual abuse, were associated with IDU in females (adjusted odds ratios (AORs) = 2.69–3.02) but only emotional abuse (AOR = 2.51) was associated with IDU in males. Multiply occurring forms of childhood maltreatment were also associated with IDU in females (AORs = 2.36–3.41) but not in males.

Conclusions: Injecting drug use appears to be an adverse outcome of childhood maltreatment particularly in females. Additional research is needed to better understand why females appear to be more affected than males.

Key words: childhood maltreatment; injecting drug use; young adults; birth cohort.

Introduction

Childhood maltreatment has an association with a range of adverse mental and psychosocial outcomes over a person's life course. Sexual, physical, emotional abuse and neglect, or multiple types of maltreatment (Nguyen et al., 2010) have been linked to low self-esteem (Nguyen et al., 2010), depression, anxiety (Afifi et al., 2014; Chapman et al., 2004; Edwards et al., 2003; MacMillan et al., 2001; Mills et al., 2013; Nguyen et al., 2010; Spataro, et al., 2004; Springer et al., 2007), suicidal ideations and/or attempts (Afifi et al., 2014; Hadland et al., 2015; Marshall et al., 2013). Similarly, childhood maltreatment may lead to delinquent behaviour (Cudmore et al., 2015; Gao et al., 2016) or externalizing problems (Mills et al., 2013; Spataro et al., 2004) often involving problematic substance use (Markowitz et al., 2011; Ompad et al., 2005). Exposure to childhood maltreatment has also been associated with impaired cognitive development (Mills et al., 2011), a range of physical health disorders (Wegman and Stetler, 2009) as well as poor adherence to medications (Markowitz et al., 2011). However, there has been little explicit research on the association between childhood maltreatment and injecting drug use (Edlin and Carden, 2006).

There is some evidence that childhood maltreatment may lead to injecting drug use. This body of evidence, largely from cross-sectional studies, suggests that sexual abuse, physical abuse and neglect may be associated with injecting drug use (DeBeck et al., 2013; Kerr et al., 2009; Markowitz et al., 2011; Ompad et al., 2005; Wu et al., 2010). For instance, children exposed to sexual and physical abuse have been found to be earlier and persistent injecting

drug users (DeBeck et al., 2013; Ompad et al., 2005). However, these studies tend to rely on the self-reported recall of childhood maltreatment. By contrast, sexual and emotional abuse, and neglect have not been associated with injecting drug use in high risk youth (Kerr et al., 2009). In addition, the vast majority of these cross-sectional studies have focused on the effects of either sexual or physical abuse rather than emotional abuse and neglect.

Two longitudinal studies found that sexual abuse predicted the initiation of injecting drug use, with nearly one in ten abused youth injecting drugs at a 2.71 times greater rate than the non-maltreated group (Hadland et al., 2012; Roy et al., 2003). However, these studies did not consider the effects of other possible concurrent types of childhood maltreatment.

The association between childhood maltreatment and injecting drug use may also vary by gender. For example, longitudinal studies have shown that females are more likely to experience sexual abuse (Ompad et al., 2005; Wang et al., 2010), with many females experiencing multiple forms of maltreatment (Messina et al., 2008; Wang et al., 2010), whereas males experience physical abuse (Wang et al., 2010). In cross-sectional studies, there is also evidence of gender differences in the experience of specific (Kang et al., 2002; Lake et al., 2015; Markowitz et al., 2011; Shand et al., 2011) and multiple (Wu et al., 2010) forms of childhood maltreatment in injecting drug users. That means females are at a greater risk of injecting drug use (DeBeck et al., 2013). However, such a gender effect may be modified by other confounders or covariates (DeBeck et al., 2013), with a number of studies reporting no gender differences in the association between childhood maltreatment and injecting drug use (Hadland et al., 2012; Kerr et al., 2009; Ompad et al., 2005). These include younger age (Ompad et al., 2005; Roy et al., 2003), poverty, including homelessness (Roy et al., 2003), parental substance use and accompanying poor mental health (Hammersley et al., 2016; Kerr et al., 2009).

The current evidence is inconclusive and largely based on retrospective data that may be prone to report, selection, help-seeking, and rumination bias (DeBeck et al., 2013; Kerr et al., 2009; Markowitz et al., 2011; Ompad et al., 2005; Wu et al., 2010). Studies have also not examined the association between different types of substantiated childhood maltreatment (i.e., sexual, physical, emotional abuse and neglect (both physical and emotional)) and the extent to which they are associated with the injecting drug use in young adulthood while adjusting for potential confounders. Substantiation of childhood maltreatment refers to the independent confirmation by child protection services that a child has been exposed to maltreatment by a caregiver before the age of 18 (Strathearn et al., 2009).

This study therefore uses a prospective longitudinal study design to determine the association between substantiated childhood maltreatment and injecting drug use. We specifically addressed two questions: (1) to what extent are different and co-occurring forms of substantiated childhood maltreatment (0–14 years) associated with injecting drug use in young adulthood (at 21 years), and (2) are there gender differences in these associations?

1. Method

2.1 Study participants

The Mater-University of Queensland Study of Pregnancy (MUSP) is a prospective pre-birth cohort study of a sample of all women presenting at the Mater Misericordiae Hospital for their first obstetric visit in Brisbane, Australia from 1981 to 1983. A total of 8556 mothers were initially approached and 8458 accepted the invitation to participate. Of these women 7223 gave birth to a live, singleton baby at the study hospital (Najman et al., 2015; Najman et al., 2005). The current study consists of offspring with and without records of agency-substantiated cases of childhood maltreatment (ages 0-14 years) who reported on whether they had ever engaged in the injection of illicit drugs by the age of 21 years. The sample was restricted to 1769 and 1981 young males and females, respectively, for whom

there were complete data (Supplementary Figure 1). The protocol was approved by the Human Ethics Review Committee of the University of Queensland and the Mater Hospital. Family members provided consent up to the 14-year follow-up. Participants provided informed consent at the 21-year follow-up.

2.2 Substantiated childhood maltreatment

Notified cases of childhood maltreatment (including physical, sexual, and emotional abuse and neglect) 0–14 years of age were identified from state-wide child protection records. Notifications of childhood maltreatment come from mandatory reports by medical practitioners and referrals from the general public that were screened and investigated by Families, Youth and Community Care Queensland (FYCCQ). Substantiated cases of childhood maltreatment were those that were confirmed by FYCCQ because of "reasonable cause to believe that the child had been, was being, or was likely to be abused or neglected." The definition of sexual abuse included "exposing a child to or involving a child in inappropriate sexual activities." Physical abuse was defined as "any non-accidental physical injury inflicted by a person who had care of the child". Emotional abuse included "any act resulting in a child's suffering any kind of emotional deprivation or trauma". Finally, childhood neglect was defined as a "failure to provide conditions that were essential for the healthy physical and emotional development of a child." Childhood experiences of "neglect" were intended to incorporate both physical and emotional neglect by those who were taking care of a child (Steering Committee for the Review of Commonwealth/State Service Provision (SCRCSSP), 2000). Data were anonymously linked to the MUSP longitudinal database in September 2000. Details are presented elsewhere (Strathearn et al., 2009). Children in the current study cohort often experienced multiple forms of maltreatment

(Abajobir et al., 2017). As a result, the present study used hierarchical categories of substantiated childhood maltreatment (i.e., sexual, physical, emotional abuse, and neglect) (Lau et al., 2005). We used a "multi-type" childhood maltreatment model (Arata et al., 2007; Lau et al., 2005) to examine the associations between co-occurring multiple types of childhood maltreatment and the outcome. In this model, we created six distinct categories of the childhood maltreatment to examine their possible association with injecting drug use. This classification of childhood maltreatment is closer to the reality of the experiences of children who have been maltreated in multiple ways and helps assess the cumulative effects and severity of overlapping types of childhood maltreatment. Those children who had substantiated records of childhood maltreatment are grouped as cases and "not any maltreatment" was used as the reference group.

2.3 Injecting drug use

We asked respondents about whether they had ever injected illicit drugs at the 21-year follow-up interview. A binary (No/Yes) variable was created. Single items such as this binary variable have been used to assess injecting drug use in previous childhood maltreatment studies (Hadland et al., 2012; Kerr et al., 2009; Markowitz et al., 2011), and their predictive validity has been consistent.

2.4 Confounders and covariates

2.4.1 Maternal alcohol use and chronic depressive symptoms. Frequency and amount of maternal alcohol consumption at 3–6 months postpartum was assessed using two questions asking how often they consumed alcohol (never drink/daily/a few times a week/a few times a month/a few times a year/rarely) and how much alcohol they usually consumed at those times (never drink/less than one glass/one or two glasses/three or four glasses/five or six glasses/seven or more glasses) based on standard estimates of drinks. Because baseline analyses showed no difference between the different levels of maternal alcohol use with

respect to childhood maltreatment and injection drug use, this variable was dichotomised into abstainers (reference group) versus drinkers (light-to-very heavy drinkers). Data on depressive symptoms experienced by mothers were obtained at pregnancy, 3–5 days and 6 months postpartum by using the two seven-item (α_s = .79, .81 and .83, respectively) sub-scales of the Delusions-Symptoms-States Inventory (Bedford et al., 1976). The mean number of symptoms for the three follow-up periods was calculated. Women with 3 or more symptoms were classified as having had chronic depressive symptoms.

2.4.2 Socio-demographic characteristics in young adulthood. We included four dichotomised socio-demographic variables on whether young adults were receiving social security benefits (No/Yes), their educational level (incomplete secondary/secondary+), marital status at 21 years (ever married/never married), and paternal or maternal racial origin (white/Asian/Aboriginal-Torres Strait Islanders) as recorded at their mother's first antenatal clinic visit. The "ever married" group consisted of those living together and married, as well as separated, widowed and divorced.

2.5 Statistical analyses

We explored the bivariate association between different types of childhood maltreatment and variables of interest using chi-squared statistics. A series of binary logistic regression analyses was then carried out to examine the relationships between each single and co-occurring category of childhood maltreatment and injecting drug use. We then developed a set of multivariable logistic regression models including each predictor, the outcome and selected confounders. We used Nagelkerke R^2 to test for model fit. The estimates of the unadjusted and adjusted odds ratios with 95% CIs (OR; 95% CI) of injecting drug use in young adulthood were used to present the results with a reference level of "not any substantiated childhood maltreatment". Since the likelihood ratio test determined that there were gender differences between males and females, a series of binary and multiple logistic

regressions were carried out for males and females separately. These controlled for maternal alcohol use and chronic depressive symptoms, as well as participants' socio-demographic characteristics at the 21-year follow-up.

2.5.1 Sensitivity analyses. We examined the effect of expanding the definition of childhood maltreatment to any notified event rather than only substantiated cases.

2.5.2 Attrition. Binary and multivariable analyses of attrition were carried out to identify those variables associated with lost to follow-up. To account for attrition, we carried out weighted analysis using inverse probability weighting (Hogan et al., 2004) with the assumption of missing at random. We then repeated the multivariable logistic regression analysis to determine weights for each variable involved in the study. Finally, we repeated the fully adjusted models with weighted variable to determine whether loss to follow-up changed the findings. Statistical analyses were done using Stata version 13 STATA version 13 (StataCorp LP: College Station, Texas, 2015) and SPSS (IBM Corp: Armonk, NY, 2013) setting level of significance at p-value of *.05*.

2. Results

A significant proportion of the participants was lost at the 21-year follow-up (Supplementary Figure 1[1]). In multivariate analysis for attrition, only female gender predicted attrition (Supplementary Table 1[1]). Adjusting for weighted data to account for attrition did not affect the strengths and directions of primary findings suggesting that the findings were unlikely to be affected by selection bias (data not shown).

The mean age of the sample was 20.6 years. The vast majority were Caucasian (92.4%), followed by Aboriginal or Torres Strait Islanders (3.9%) and Asians (3.7%). Nearly three-quarters of the mothers (74.8%) reported consuming alcohol and 4.2% of mothers met the criteria for symptoms of depression postpartum. More than one-third (35.7%) of young adults

[1] Supplementary material can be found by accessing the online version of this paper at http://dx.doi.org and by entering doi:...

were receiving social security benefits and 21.0% had incomplete secondary education, with the majority (78.2%) never having been married. Table 1 shows the distribution of these variables by gender.

Of the 1769 male and 1981 female participants at 21-year follow-up, 4.1% (n = 72) males and 4.6% (n = 91) females had experienced some form of substantiated maltreatment in childhood. The specific types included sexual abuse (n = 53 or 1.4%), physical abuse (n = 70 or 1.9%), emotional abuse (n = 86 or 2.3%) and neglect (n = 70 or 1.9%). There was no gender difference in experiencing any substantiated childhood maltreatment ($p = 0.849$), except for sexual abuse ($p < 0.0001$). Those males and females who reported receipt of social security benefits ($p < 0.0001$) and never married ($p = 0.002$) tended to more often experience any childhood maltreatment (data not shown).

The overall prevalence of injecting drug use was 6.6% (n = 118) and 4.6% (n = 91) for males and females, respectively. On bivariate analyses, males and females who had experienced any childhood maltreatment, physical and emotional abuse tended to experience higher rates of injecting drug use than their non-maltreated counterparts. For females, all forms of childhood maltreatment were associated with subsequent injecting drug use. For males, any childhood maltreatment, as well as physical and emotional abuse, was associated with injecting drug use in unadjusted models (Table 2). There were also associations between receipt of social security benefits, never being married and injecting drug use in both genders (Supplementary Table 2[2]).

Table 3 present results for binary and multivariable logistic regression analyses. In males, any substantiated childhood maltreatment, physical and emotional abuse were significantly and strongly associated with injecting drug use. The significant association persisted for emotional abuse and injecting drug use in the fully adjusted model. Unlike emotional abuse,

[2] Supplementary material can be found by accessing the online version of this paper at http://dx.doi.org and by entering doi:...

the associations of physical and emotional abuse and injecting drug use were attenuated when adjusted for confounders. On subsequent analyses of co-occurring forms of childhood maltreatment, physical abuse with or without emotional abuse or neglect was associated with injecting drug use in unadjusted analyses, although this was attenuated when adjusted for potential confounders.

In females, all types of substantiated childhood maltreatment were associated with the later injecting drug use in binary models. The associations remained stable and robust after adjusting for selected confounders. However, the association between sexual abuse and injecting drug use was attenuated in multivariable logistic regression models. In expanded models with multiple forms of maltreatment, any combinations of childhood maltreatment were associated with injecting drug use in unadjusted analyses. The association remained consistent for any combination of childhood maltreatment, physical abuse with or without emotional abuse or neglect, emotional abuse with or without any other combination, and neglect with or without any other combination of childhood maltreatment in fully adjusted models (Table 3).

In sensitivity analyses, any unsubstantiated notifications for childhood maltreatment were significantly and independently associated with injecting drug use in respective models that adjusted for all confounders in both males and females. The magnitude and strength of association was higher in maltreated females than their maltreated male counterparts (Supplementary Table 3[3]).

3. Discussion

There is strong evidence that suggests childhood maltreatment experiences are associated with subsequent gender-based injecting drug use, particularly for maltreated females, despite some conflicting prior findings on whether maltreated males and females respond differently

[3] Supplementary material can be found by accessing the online version of this paper at http://dx.doi.org and by entering doi:...

to this later outcome. In this study, exposure to any substantiated childhood maltreatment was associated with later injecting drug use, especially in females. In particular, there were significant and strong associations between all forms of childhood maltreatment with the exception of sexual abuse. For males, somewhat surprisingly only emotional abuse was associated with later injecting drug use, after adjustment for confounders. As suggested by our data and other prior studies (Roy et al., 2003), social deprivations in adulthood including the receipt of social security benefits and lower levels of education may also be associated with injecting drug use in previously maltreated children, suggesting a continued impact of social disadvantage on later outcomes.

A number of psychosocial factors (Chambers, 2009) may contribute to the observed gender disparity in injecting drug use. For example, a dose-response relationship may account for the greater association between childhood maltreatment and injecting drug use in females, given they may be more exposed to multiple forms of childhood maltreatment (Arata et al., 2007). Maltreated females may also be more vulnerable than men to poor mental health outcomes which later manifest as injecting drug use (Shand et al., 2011). Males and females may also respond differently to their experiences of childhood maltreatment. In the case of males, the association may be through higher levels of antisocial behaviour (Shand et al., 2011), delinquency (Abajobir et al., 2017; Hammersley et al., 2016; Shand et al., 2011) and street crime (Ompad et al., 2005). By contrast, the pathway for females may be through commercial sex (Chambers, 2009; Ompad et al., 2005) or drug exchange (Ompad et al., 2005), as well as having different sexual orientations (e.g., more likely self-identified as lesbian or bisexual) or using so-called “gateway” drugs (non-injecting drug including cannabis) (Ompad et al., 2005). Moreover, females may have more exposure to a friend with injecting drug use disorder (Ompad et al., 2005), experience more violence victimization from their proximal partner (Hammersley et al., 2016; Shand et al., 2011) and have poorer

relationship with parents, especially when parents also have a substance use disorder (Shand et al., 2011). However, the temporal sequence of some of these experiences is unclear and the exact mechanisms require further research. For instance, it is possible a non-traditional sexual identity could place someone at greater risk of childhood maltreatment resulting in stressors that later manifest with injecting drug use as a coping mechanism in adulthood.

Sexual abuse was not associated with injecting drug use in both genders in contrast to prior studies that have shown significant association with sexual abuse (Hadland et al., 2012; Roy et al., 2003). Potential reasons for this study's divergence from previous findings include variations between studies in how sexual abuse was defined (Afifi et al., 2007), as well as the small number of sexual abuse cases in the present study, which, in turn, might have made it difficult to detect an association, even if one existed. In addition, when sexual abuse is reported, it may be more likely that is stopped before victims progress to longer term adverse outcomes such as injecting drug use (Kendall-Tackett and Becker-Blease, 2004). It is also possible that ongoing sexual abuse in adulthood may have more of an influence than childhood sexual abuse on concurrent injecting drug use. Although it is beyond the scope of our study, the effect of exposure to multiple forms of childhood maltreatment may have a cumulative impact on the developing brain affecting both responses to stress (Anda et al., 2006) and cognitive function (Mezzich et al., 2001). This may, in turn, lead to more propensities of self-harm including injecting illicit drug.

To our knowledge, this is the first prospective investigation of the association between substantiated differential and co-occurring types of childhood maltreatment and the risk of injecting drug use in young adulthood using a large birth cohort, with a focus on gender differences. The study determined the effects of each subtypes of maltreatment on injecting drug use. As well, co-occurring childhood maltreatment models demonstrated the association between different combinations of maltreatment and subsequent injecting drug use. The

longitudinal nature of the study allowed us to assess the impact of childhood maltreatment on subsequent injecting behaviour by minimizing the chance of recall and selection bias.

Our findings may have both empirical and research implications. Adult and paediatric healthcare providers need to understand the potential long-term risks of childhood maltreatment on later injecting drug use, particularly for females. Neuroscience research is shedding light on neuroendocrine mechanisms through which early exposure to childhood maltreatment may lead to an increased risk for substance abuse. This may include changes in glucocorticoid stress response systems, oxytocin systems relating to social impairment, and dopamine-related reward sensitivity, each of which may differ based on gender (Kim et al., 2016). Maltreated individuals who inject drugs may also have multiple other risk factors including poly-substance use (Markowitz et al., 2011; Ompad et al., 2005), being victim and perpetrator of violence experiences (Lake et al., 2015) and HIV risk behaviours (Kang et al., 2002; Lee et al., 2015; Markowitz et al., 2011; Ompad et al., 2005), as well as poor adherence to medications (Markowitz et al., 2011) and perceived abuse in healthcare settings (Palis et al., 2016). Prevention of childhood maltreatment and trauma informed care (Raja et al., 2015) may provide a venue for intervening to reduce the long-term impacts of injecting drug use in young adults. The latter involves understanding possible developmental pathways from childhood maltreatment victimization to neurobiological impairments and subsequent substance use disorders (Kim et al., 2016). Also, the findings may help provide appropriate treatment for injecting drug use among the maltreated people including social support (Murray et al., 2014) and cognitive-based psychotherapy (Gilbert et al., 2009; MacMillan et al., 2009).

4.1 Limitations

Some limitations should also be considered when interpreting the findings. The use of substantiated childhood maltreatment may have contributed to the observed weak association

with injecting drug use, especially for sexual abuse and male participants by underestimating actual rates of maltreatment. This is why we undertook sensitivity analyses of expanding the definition to include unsubstantiated childhood maltreatment where we found a similar association with injecting drug use. Specific characteristics of childhood maltreatment experiences including age at the scene or types of perpetrator(s) were not included in the analyses although these may be relevant to understanding the findings (Gold et al., 1999; Singer et al., 1989). Although childhood maltreatment is associated with an increased risk of injecting drug use, there is a possibility of concomitant use of other drugs by maltreated children (Roy et al., 2003). Finally, the use of a single item to assess lifetime injecting drug use may affect the validity of our findings, although prior studies have documented this outcome in maltreatment children (Hadland et al., 2012; Kerr et al., 2009; Markowitz et al., 2011).

4.2 Conclusions

In summary, injecting drug use appears to be an adverse outcome of childhood maltreatment particularly in females. Additional research is needed to better understand why females appear to be more affected than males.

Contributors

Each author has the following contributions to this study: AAA conceived the study, designed analyses strategies, performed initial statistical analyses, interpreted data and drafted the manuscript; SK carried out final statistical analyses and provided comments to the manuscript; GW and AC provided comments to the manuscript; LS conducted the initial linking of the MUSP dataset with child maltreatment reports and provided comments to the manuscript; JMN has been a principal investigator of the Mater Hospital-University of Queensland Study of Pregnancy, provided comments and supervised the overall progress of the current manuscript. All authors read and approved the final submission.

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Conflicts of Interest: None.

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Table 1: Distributions of confounders and/or covariates by gender, Brisbane, Australia.

Variables	**n**	**Males (n = 1769)**	**Females (n = 1981)**	**χ^2 (df = 1), p-value**
		%	**%**	
Maternal or paternal ethnicity at birth				
White	3394	92.3	92.5	
Aboriginal-Torres Strait Islander	142	4.0	3.4	
Asian	136	3.7	4.1	1.21, 0.546 *
Maternal alcohol use at postpartum				
Abstainers	889	24.3	25.0	
Drinkers	2742	75.7	75.0	0.24, 0.623
Maternal chronic depressive symptoms				
No	3562	95.8	95.8	
Yes	157	4.2	4.2	0.003, 0.955
Receipt of social security benefit at 21 years				
No	2398	72.7	56.7	103.4,
Yes	1332	27.3	43.3	*< 0.0001*
Education at 21 years				
Secondary and above	786	75.5	82.2	25.72,
Incomplete secondary	2964	24.5	17.8	*< 0.0001*
Marital status at 21 years				
Ever married	820	13.7	29.1	130.08,
Never married	2944	86.3	70.9	*< 0.0001*

* degree of freedom (df = 2).

Table 2: Substantiated childhood maltreatment and injecting drug use at the 21-year follow-up, Brisbane, Australia.

Childhood maltreatment	**Males (n = 1769)**			**Females (n = 1981)**			***p-value*** [b]
	Injecting drug use, n (%)		**χ^2 (df = 1) (p-value)**	**Injecting drug use, n (%)**		**χ^2 (df = 1) *(p-value)***	
	No (%)	**Yes (%)**		**No (%)**	**Yes (%)**		
Any maltreatment [a]							
No	1590 (93.6)	108 (6.4)	**6.29 *(0.012)***	1811 (95.8)	79 (4.2)	**16.07 *(< 0.0001)***	***< 0.0001***
Yes	62 (85.1)	10 (13.9)		79 (85.8)	12 (13.2)		
Sexual abuse							
No	1641 (93.3)	117 (6.7)	0.10 *(0.75)*	1854 (95.6)	85 (4.4)	**9.12 *(0.002)***	***0.036***
Yes	10 (90.9)	1 (9.1)		36 (85.7)	6 (14.3)		
Physical abuse							
No	1624 (93.3)	112 (6.7)	**7.16 *(0.007)***	1859 (95.6)	85 (4.4)	**11.62 *(0.001)***	***< 0.0001***
Yes	27 (81.8)	6 (18.2)		31 (83.8)	6 (16.2)		
Emotional abuse							
No	1618 (93.6)	111 (6.4)	**7.71 *(0.005)***	1852 (95.7)	83 (4.3)	**17.59 *(< 0.0001)***	***< 0.0001***
Yes	33 (81.5)	7 (17.5)		38 (82.6)	8 (17.4)		
Neglect							
No	1621 (93.4)	114 (6.6)	1.45 *(0.23)*	1860 (95.6)	85 (4.4)	**12.19 *(< 0.0001)***	***0.007***
Yes	30 (88.2)	4 (11.8)		30 (82.3)	6 (16.7)		

[a] Any combination of childhood maltreatment included neglect, sexual, physical or emotional abuse.
[b] Likelihood ratio test of the interaction term with gender.

Table 3: Binary and multivariable logistic regression associations of single and multiple types of substantiated childhood maltreatment and injecting drug use by males and females at 21-year follow-up, Brisbane, Australia.

Childhood maltreatment	Group	Males (n = 1769)		Females (n = 1981)	
		Crude OR	Adjusted OR[†]	Crude OR	Adjusted OR[†]
Single types					
No childhood maltreatment	No	1	1	1	1
Sexual abuse only	Yes	1.40 (0.18–11.05)	1.45 (0.18–11.96)	**3.64 (1.49–8.86)** **	2.41 (0.96–6.07)
Physical abuse only	Yes	**3.22 (1.30–7.97)** **	2.56 (0.99–6.58)	**4.23 (1.72–10.42)** **	**2.69 (1.06–6.87)** *
Emotional abuse only	Yes	**3.09 (1.34–7.15)** **	**2.51 (1.05–5.98)** *	**4.69 (2.13–10.39)** ****	**3.02 (1.30–6.97)** **
Neglect only	Yes	1.89 (0.66–5.48)	1.43 (0.48–4.23)	**4.38 (1.77–10.79)** ***	**2.70 (1.05–6.93)** *
Multiple forms					
Any combination of childhood maltreatment [a]	Yes	**2.38 (1.18–4.76)** **	2.01 (0.98–4.11)	**3.48 (1.82–6.66)** ****	**2.36 (1.19–4.67)** *
Sexual abuse + any other combination [b]	Yes	4.69 (0.49–45.52)	3.33 (0.32–35.18)	**3.99 (1.14–13-96)** *	2.03 (0.56–7.45)
Physical abuse + emotional abuse or neglect	Yes	**3.00 (1.12–8.01)** **	2.22 (0.79–6.19)	**5.17 (1.91–14.05)** ***	**3.36 (1.17–9.63)** *
Emotional abuse or neglect + any other combination [c]	Yes	2.60 (0.88–7.67)	1.97 (0.64–6.08)	**4.23 (1.72–10.42)** ***	2.50 (0.96–6.49)
Emotional abuse + any other combination [d]	Yes	2.57 (0.97–6.77)	1.97 (0.72–5.40)	**5.42 (2.43–12.11)** ****	**3.33 (1.42–7.81)** **
Neglect + any other combination [e]	Yes	3.05 (0.87–10.77)	2.18 (0.59–8.12)	**5.73 (2.27–14.44)** ****	**3.41 (1.29–8.97)** *

[a] Any combination of childhood maltreatment included neglect, sexual, physical or emotional abuse. Any other combination refers to: [b] neglect, physical or emotional abuse; [c] sexual or physical abuse; [d] neglect, sexual or physical abuse; and [e] sexual, physical or emotional abuse.

[†] adjusted for receiving social security benefits, educational level, marital status at 21 years and paternal or maternal racial origin at pregnancy, maternal alcohol use at 3–6 months and chronic depressive symptoms from pregnancy to 3–6 months postpartum.

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$; ****$p < 0.0001$.