

Original Article

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A longitudinal birth cohort study of child maltreatment and mental disorders using linked statewide child protection and administrative health data for 83,050 Queensland residents from 1983 to 2014

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Abstract

Aims. Most information about the association between childhood maltreatment (CM) and subsequent psychiatric morbidity is based on retrospective self-reports. Findings from longitudinal studies using prospective reports to statutory agencies may be subject to attrition. We therefore compared the prevalence to age 30 of inpatient psychiatric diagnoses in those who experienced agency-reported CM with those of the rest of the cohort using administrative data to minimise loss to follow-up.

Methods. We used linked administrative data for two birth cohorts of all individuals born in Queensland, Australia in 1983 and 1984 ($N = 83,050$) and followed to age 30 years. This was the entire cohort aside from 312 people who died. Information on CM came from statewide child protection data and psychiatric diagnoses from all public and private hospital admissions in Queensland.

Results. On adjusted analyses, the 4,703 participants (5.7%) who had been notified to the statewide child protection authority had three to eight times the odds of being admitted for any of the following psychiatric diagnoses by age 30 years old: schizophrenia-spectrum disorders, bipolar affective disorders, depression, anxiety and post-traumatic stress disorders (PTSD). There were similar findings for all the CM subtypes. Associations were especially strong for PTSD with between a seven – and nine-fold increase in the odds of admission.

Conclusions. This is one of the largest studies of the long-term effects of CM, covering an entire jurisdiction. All types of maltreatment are significantly related to a range of psychiatric disorders requiring hospitalisation. Early identification, intervention and providing appropriate support to individuals who have experienced CM may help mitigate the long-term consequences and reduce the risk of subsequent mental health problems.

Introduction

Between two-thirds and three-quarters of lifetime psychiatric disorders start by the mid-20s (Kessler *et al.*, 2007; Solmi *et al.*, 2022). Childhood adversities are firmly established as key risk factors for the later emergence of psychiatric disorders (Dragioti *et al.*, 2022). Child maltreatment (CM; i.e., neglect; or physical, emotional or sexual abuse) is a particularly severe form of childhood adversity with serious and often debilitating long-term consequences on physical and mental health, and psychosocial development (Hailes *et al.*, 2019; Li *et al.*, 2016; McKay *et al.*, 2021; Norman *et al.*, 2012; Scott *et al.*, 2023). Some of the long-term adverse effects include anxiety, depression, psychosis, post-traumatic stress disorder (PTSD), substance use disorder and other psychiatric conditions (Hailes *et al.*, 2019; Jaffee, 2017; Li *et al.*, 2016; McKay *et al.*, 2021; Norman *et al.*, 2012). There is also evidence of a dose–response relationship, with exposure to multiple CM types associated with greater odds of a subsequent psychiatric disorder or other adverse outcomes (McKay *et al.*, 2021, 2022).

However, much of the available literature on the consequences of CM is based on retrospective data and thus subject to recall bias, the use of clinical samples rather than population-based cohorts, and the possibility that CM and mental disorder might arise from common vulnerabilities (Widom *et al.*, 2004). Moreover, retrospective reports of life course adverse exposures

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can change over time depending on resilience, recovery and severity of the exposures (Jones, 2013). Where there are prospective studies, most data on CM come from individuals or other informants and subsequent mental health outcomes measured longitudinally. Studies based on medical records or reports to statutory bodies are less common. A 2016 meta-analysis of studies with externally documented CM only looked at the outcomes of depression and anxiety and only found eight studies (Li *et al.*, 2016). A more recent systematic review and meta-analysis of 23 longitudinal cohort studies assessing the relationship between childhood trauma and adult mental disorder was not able to differentiate the impact of different adversities on specific mental health outcomes because of the low numbers of studies ($k = 3-5$) for each meta-analysis of CM and individual mental disorder (McKay *et al.*, 2021).

Two of the authors of this paper (SK and DS) have previously collaborated on one of the very few research programmes that used a longitudinal birth cohort of over 7,000 participants to assess the psychosocial outcomes of agency-reported CM across the life course (Strathearn *et al.*, 2020; Kisely *et al.*, 2022). However, attrition is a major limitation of these studies, with less than 40% of children being retained in the study at the 30-year follow-up (Kisely *et al.*, 2023). Critically, those who were notified to child protection services were differentially lost to follow-up as they made up 10.9% of the baseline sample but only 5.8% at 30-year follow-up (Kisely *et al.*, 2023). Although the study found significant associations between psychosocial outcomes and most types of CM such as emotional abuse, physical abuse and neglect, it was under-powered to establish a link to sexual abuse, which was present in smaller numbers than the other forms of CM. The lack of an association between psychiatric outcomes and prospectively recorded sexual abuse, as opposed to other CM types, has been noted in other longitudinal studies (Mackay *et al.*, 2022). It is unclear whether this is due to insufficient data, barriers to disclosure or, conversely, prompt intervention. As a result, this is an area that has been identified as a priority for further study.

This study therefore used linked administrative data for birth cohorts from the Queensland Cross-sector Research Collaboration (QCRC) repository (Stewart *et al.*, 2015, 2021). Use of large birth cohorts for an entire jurisdiction meant it was possible to study less frequently occurring CM, such as sexual abuse, as well as rarer outcomes such as schizophrenia. Access to statewide administrative data allowed the inclusion of all potential individuals from an entire jurisdiction irrespective of socio-economic status or rurality. It also allowed the use of externally documented CM and psychiatric morbidity rather than reliance on questionnaires or interviews for either the exposure or outcome. To our knowledge, only one study has examined the association between agency-reported CM and treatment for a psychiatric condition across an entire jurisdiction (the state of Victoria in Australia) and this much smaller study ($N = 1,612$) was restricted to being exposed to childhood sexual abuse (Spataro *et al.*, 2004). We therefore hypothesised that agency-reported CM of all types would be associated with increased admissions for a wide range of psychiatric disorders.

Methods

Data sources and study design

This study used two longitudinal birth cohorts from the QCRC repository for all individuals registered as born in the Australian

state of Queensland in 1983 and 1984 ($N = 83,362$). The QCRC repository includes data across a range of government systems (spanning welfare, health and criminal justice systems). We used longitudinal administrative records across the following government agencies and systems: the Queensland Registry of Births, Deaths and Marriages; the child protection client management system and Queensland Health's Queensland Hospital Admitted Patient Data Collection (QHAPDC). The data are held in the Social Analytics Lab at Griffith University (Fig. 1).

Queensland Health linked the health-related datasets, while the Queensland Government Statistician's Office (QGSO) linked all other data with the pre-linked health data. They used probabilistic data linkage methods using the LinXmart linkage system created by Curtin University (Boyd *et al.*, 2019; Stewart *et al.*, 2015). Demographic information used for probabilistic linkage included first, middle and last names (and alias/alternate names), date of birth, sex, suburb, postcode and internal departmental/ jurisdictional identifiers. After linkage, each individual data source was then deidentified by removing the names, and a master link key created. The resulting data were released to Griffith University under the QGSO's Data Transfer and Use Agreement.

For this study we reported per the STrengthening the Reporting of OBServational Studies in Epidemiology (Vandenbroucke *et al.*, 2007) and the REporting of studies Conducted using Observational Routinely collected Data (Benchimol *et al.*, 2015) guidelines. We received ethics approval from Griffith University's Human Research Ethics Committee (2010/479), as well as a waiver of consent given the use of anonymised data.

Participants

The combined 1983 and 1984 cohorts contained 83,362 people. We excluded 312 children (0.37% of the cohort) who died before the age of 10 (Fig. 2), before any possible outcome could be recorded in hospital admissions data from July 1995 onwards. Of the remaining 83,050 persons, 40,294 were female (48%) and 4,817 (5.8%) were Aboriginal and/or Torres Strait Islander. In total, 640 people (0.77%) died during the 30-year follow-up.

Setting

The setting is Queensland in Australia. During the study period of 1983–2014, Queensland was the third most populous state in Australia, with a population at the study midpoint of 3,453,936 in June 1999 (Australian Bureau of Statistics, 2023). Queensland accounted for 16–20% of the Australian population from 1983 to 2014, with the figure being 18% for June 1999 (Australian Bureau of Statistics, 2023). Near the endpoint of the study period, 3.6% of the Queensland population identified as Aboriginal and/or Torres Strait Islander in the 2011 Census, the third-highest proportion of Aboriginal and/or Torres Strait Islander people in all states and territories in Australia (Australian Bureau of Statistics, 2012).

Variables

Psychiatric diagnoses

Psychiatric diagnoses were extracted from QHAPDC, which contained information for all public and private hospital admissions in Queensland. Diagnoses were coded according to the ICD-9 (International Classification of Diseases) or ICD-10AM (Australian Modification), with ICD-9 codes converted to corresponding ICD-10 codes. QHAPDC commenced on 1 July 1995,

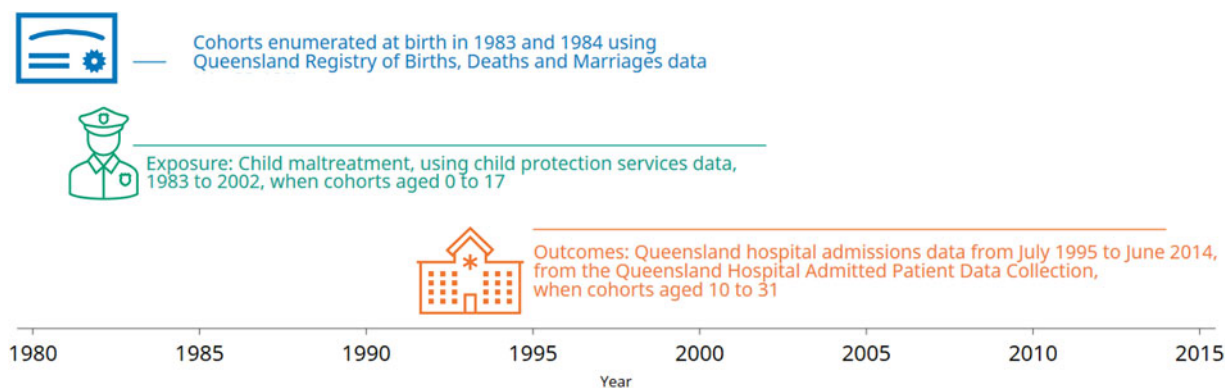


Figure 1. Timeline of birth cohort and data sources for exposures (child maltreatment) and outcomes (mental disorders).

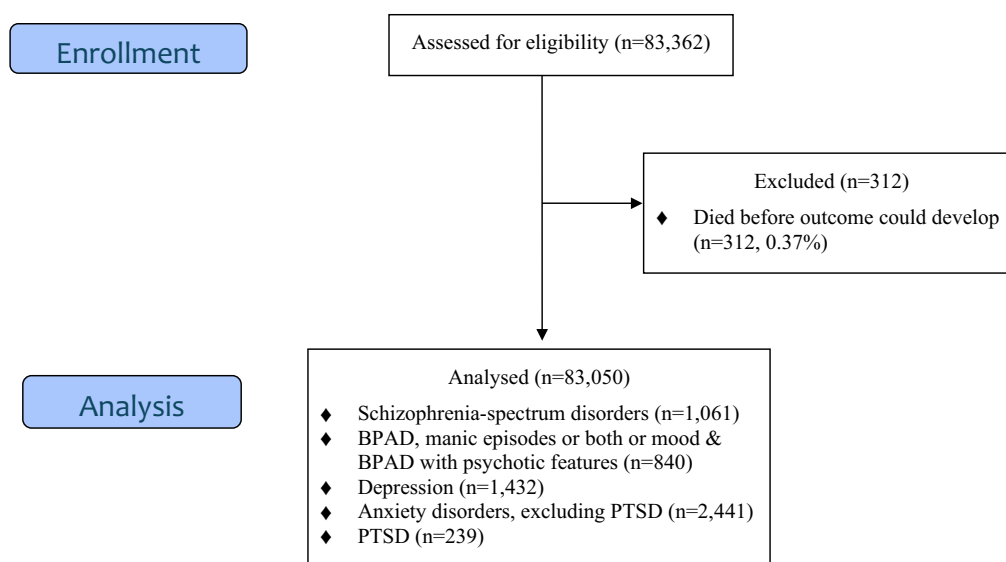


Figure 2. Flow diagram.

resulting in the data for hospital admissions only being available from age 11/12 onwards for the 1983 cohort and 10/11 years onwards for the 1984 cohort. QHAPDC admissions up until and including June 2014 were extracted and were therefore available from age 11/12 to age 30/31 for the 1983 cohort, and from age 10/11 to 29/30 for the 1984 cohort.

We coded psychiatric diagnoses associated with hospital admission covering ICD-10AM mental and behavioral disorders (codes F00 to F99), as either a primary or additional diagnosis. All diagnoses across all admission episodes were included for individuals up to the date of extraction, which therefore represented lifetime prevalence of diagnosed mental illness from hospital admissions between ages 10–12 and 29–31 years. Psychiatric diagnoses were classified into five categories; (1) schizophrenia, schizotypal, delusional disorders and other non-affective psychoses (including drug induced psychoses); (2) bipolar disorder, manic episodes or both, and mood or bipolar affective disorders with psychotic features; (3) single or recurrent major depressive disorder, other depressive disorder or dysthymic disorder; (4) anxiety disorders, excluding PTSD and (5) PTSD. These diagnostic categories contained mutually exclusive sets of ICD-10 codes and were coded as binary indicators (i.e., present/not present) for everyone in the cohort. Other diagnoses, such as personality disorder, were too

heterogeneous for meaningful analysis. Individuals could appear in more than one diagnostic category if they were diagnosed with more than one psychiatric diagnosis across different categories.

Child maltreatment

CM information was derived from the Queensland child protection Integrated Client Management System. The system records all contacts with child protection for children who had experienced CM from 0 to 17 years, with four subtypes of harm captured: physical abuse, emotional abuse, sexual abuse and neglect. We included both any harm notification and substantiated notifications for each harm subtype. It is important to note that these are indicators of harm, or risk of significant harm, relating to one of the four grounds for intervention within Queensland legislation. This means that some children may not have actually experienced maltreatment, but just were at high risk, resulting in an intervention to keep them safe.

Due to exposure variables being heavily skewed to the right, we dichotomised these variables into none or one or more notifications/substantiations. In addition, we summed the total of different types and severity of CM notifications to derive binary measures of (1) any child protection notifications, (2) any substantiated

notifications, (3) any notified or substantiated neglect, (4) any notified or substantiated physical abuse, (5) any notified or substantiated sexual abuse and (6) any notified or substantiated emotional abuse.

We also investigated associations with child protection reports for two or more instances irrespective of type (i.e., multiple child protection reports) and maltreatment types on one or more occasions i.e., (multi-type maltreatment), again dichotomised into absent or present.

Covariates

Covariates were limited to sex and Aboriginal and/or Torres Strait Islander status, as these were the only other variables available for the entire cohorts. We considered these variables to be proxy measures for other unmeasured confounding variables that would explain relations between these variables and mental disorders, like discrimination and racism. Aboriginal and/or Torres Strait Islander identity was coded as yes if an individual was ever identified as Indigenous (Aboriginal, Torres Strait Islander or both) in any of the QCRC databases, consistent with best-practice guidelines for linked Australian data (Australian Institute of Health and Welfare, 2012). Sex was assigned as the most commonly appearing across the QCRC databases. Other potential covariates (e.g., socioeconomic status, residential location, relationship status) were not included due to not being consistently available for the entire cohorts.

Data access and cleaning

Six of the researchers had full access to the database used to create the study population. All these investigators were on the ethical clearance for the current project from Griffith University's Human Research Ethics Committee (2010/479). The QGSO also had a Data Transfer and Usage Agreement that governs use of the data. JO wrote R code to extract CM and psychiatric diagnosis data, linking it via the master key generated by the QGSO, which were then cleaned by SL.

Analytical approach

Analyses were conducted in three stages. First, we examined descriptive details for the occurrence of CM and psychiatric disorders in the cohorts. Second, we detailed the prevalence of psychiatric disorders by exposure to CM. Third, we conducted a series of bivariate (unadjusted) and multivariable (adjusted) logistic regressions to calculate odds ratios (ORs) for associations between different types of CM and psychiatric diagnoses. Unadjusted bivariate models were used to examine the association between each individual form of maltreatment and psychiatric disorders. For bivariate comparisons, we excluded people with other mental disorders, meaning each group of mental disorders was compared against people with no mental disorders. This approach meant the study size was slightly different for each outcome of interest. For multivariable analyses, we controlled for sex and Aboriginal and/or Torres Strait Islander identity by entering these variables in a logistic regression model together with the CM exposure variables. We ran separate regression models for each CM category.

We included ORs and their 95% confidence intervals to permit readers to assess the magnitude, direction and precision of associations. We included *p* values to assist with understanding the association, although most *p* values were very small given the study

size and expected effect sizes. We manipulated data in R version 3.6 (R Core Team R, 2013), and analysed data in IBM SPSS version 28.01 (IBM Corp, 2021) and Stata version 17.0 (StataCorp, 2021).

Results

Descriptive information

Table 1 presents descriptive data for each subgroup of interest analysed in the logistic regressions. In terms of hospital admissions involving a psychiatric diagnosis, anxiety disorders, excluding PTSD, were the most common diagnoses, followed by depression and schizophrenia-spectrum disorders (SSD) (Table 1 and Fig. 2). Bipolar affective disorders and PTSD were the least common diagnostic categories (Table 1 and Fig. 2).

In terms of CM in the whole sample, 4,703 individuals (5.7%) had been notified to child protection, the first report being made, on average, between the ages of 7 and 8 years old. Notifications were most commonly for neglect ($n = 2,842$), followed by physical abuse ($n = 2,628$), emotional abuse ($n = 2,489$) and sexual abuse ($n = 1,334$). There had been notifications for two or more maltreatment types for 2,880 individuals and more than two reports for 3,235 individuals.

Of these notifications in the whole sample, 3,510 were substantiated (4.2%), neglect being the most frequent ($n = 1,877$). This was followed by physical abuse ($n = 1,845$), emotional abuse ($n = 1,813$) and sexual abuse ($n = 905$). Notifications were more common in females than males (53.4% vs 48.3%; OR = 1.23; 95% CI = 1.15–1.31) and for Aboriginal and/or Torres Strait Islander Australians rather than non-Indigenous Australians (25.2 vs 4.9%; OR = 6.48; 95% CI = 5.97–7.02).

Main results

Table 2 presents the prevalence of different psychiatric disorders by each form and type of maltreatment. Although only occurrence data, and not direct comparisons of a ratio between exposed and unexposed groups, the table does demonstrate that the estimated prevalence of mental disorders was higher across all diagnostic groups, as well as for each type and combination of maltreatment.

Tables 3 and 4 present the results of the unadjusted and adjusted binary logistic regression analyses. As with prevalence, the odds were higher for all types of psychiatric diagnoses and each type of maltreatment. Anxiety and depression disorders were generally the most prevalent psychiatric disorders among those who experienced maltreatment.

We focus here on the results of the adjusted models, as all OR decreased substantially after controlling for other types of maltreatment. In the models assessing associations between CM and admissions resulting in a diagnosis of any mental disorder, participants from an Indigenous background showed a 2–5-fold increase in the odds of admission for any of the psychiatric diagnoses by 30 years old ($p < 0.001$) (Tables 3 and 4). Females had reduced odds of an admission-related diagnosis of SSDs or drug-induced psychoses (DIP) (Table 3) but greater odds for all the other psychiatric diagnoses (Tables 3 and 4).

Depending on the psychiatric diagnosis, any maltreatment notification was associated with three to eight times the odds of being admitted by 30 years old. There were similar findings for all the CM sub-categories, both notified and substantiated (Tables 3 and 4). Associations were especially strong for PTSD with between

Table 1. Descriptive data for each subgroup of interest

	SSD/ DIP	BPAD, manic episodes or both or mood & BPAD with psychotic features	Depression	Anxiety disorders, excluding PTSD	PTSD
<i>N</i>	1,061	840	1,432	2,441	239
Sex – female – <i>n</i> [%]	337 [32]	470 [56]	856 [60]	1,317 [54]	156 [65]
Indigenous – yes – <i>n</i> [%]	267 [25]	125 [15]	257 [18]	368 [15]	48 [20]
Death – yes – <i>n</i> [%]	43 [4]	31 [4]	43 [3]	70 [3]	13 [5]
Age at death – <i>M</i> [SD]	24.1 [3.90]	25.6 [3.38]	25.5 [3.96]	25.4 [3.73]	26.4 [3.25]
Age of subject when first notification of child maltreatment – <i>M</i> [SD]	7.6 [5.05]	8.4 [5.02]	8.0 [5.22]	8.1 [5.19]	8.1 [5.02]
Child maltreatment notifications – yes – <i>n</i> [%]					
Notified					
Any notification	246 [23]	150 [18]	302 [21]	490 [20]	77 [33]
Neglect	180 [17]	102 [12]	207 [15]	316 [13]	51 [22]
Physical abuse	144 [14]	89 [11]	198 [14]	300 [13]	47 [21]
Sexual abuse	75 [7]	37 [5]	91 [6]	161 [7]	30 [13]
Emotional abuse	142 [14]	88 [11]	190 [13]	298 [12]	51 [23]
Substantiated only					
Any substantiation	202 [19]	124 [15]	252 [18]	389 [16]	65 [29]
Neglect	138 [13]	73 [9]	149 [11]	220 [9]	33 [14]
Physical abuse	111 [11]	67 [8]	159 [11]	226 [9]	36 [16]
Sexual abuse	47 [5]	30 [4]	66 [5]	114 [5]	24 [10]
Emotional abuse	114 [11]	70 [9]	160 [11]	235 [10]	39 [17]
Multiple child maltreatment types or reports, Notified					
Multiple types	167 [16]	94 [12]	213 [15]	329 [14]	55 [25]
Multiple reports	187 [18]	108 [13]	236 [17]	365 [15]	58 [26]

Notes: BPAD: bipolar affective disorder; depression includes single depressive episodes, recurrent major depressive disorder, other depressive disorder or dysthymic disorder; PTSD: post-traumatic stress disorder; SSD: schizophrenia, schizotypal and delusional disorders; DIP: drug-induced psychoses

a seven- and nine-fold increase in the likelihood of diagnosis (Table 4).

Discussion

Understanding the distinctive long-term impact of different types and combinations of maltreatment may help clinicians better connect early childhood adversity with current health-related morbidities to both provide more holistic care as well as identify public health targets for primary prevention efforts. Most previous studies have relied on retrospective reports of CM. This paper is one of a limited number that have linked administrative health data to prospective reports of CM, including the four main subtypes. This approach helped to minimise attrition and reporting bias. Another advantage is the large number of participants. The sample size is several times greater than previous long-term cohort studies of CM and, to our knowledge, the only the second one to cover relevant individuals from an entire jurisdiction irrespective of socio-economic status or rurality (Spataro *et al.*, 2004). That study was restricted to childhood sexual abuse and therefore considerably smaller ($N = 1,612$) (Spataro *et al.*, 2004). The current

study provided sufficient numbers to examine all types of CM and how they were significantly related to a range of psychiatric disorders diagnosed during a hospital admission. It also increased the generalisability of findings. Additionally, the study followed the participants into early – to mid-adulthood, which gave a more complete understanding of the relationship between CM and psychiatric diagnoses. This is because the peak age of onset of many psychiatric disorders is between 25 and 30 years old (Solmi *et al.*, 2022).

Consistent with previous studies, the association with CM was especially evident for PTSD, illustrating that while less common than anxiety or depression, this diagnosis is a fairly specific outcome of CM (Kisely *et al.*, 2018, 2020). Although widely reported, particularly in the case of sexual abuse, most findings rely on cross-sectional self-reported events rather than on longitudinal follow-up of prospective agency-notified abuse (Hetzl and McCanne, 2005).

The mechanisms underlying the association between CM and psychiatric disorders include a range of biopsychosocial factors. Biologically, CM can disrupt the normal functioning of the stress response system, leading to long-term alterations in the regulation

Table 2. Prevalence of each outcome

Exposure	Exposure status	Prevalence of the outcome, as a percentage [95% Exact CI]				
		SSD/ DIP	BPAD, manic episodes or both + mood & BPAD with psychotic features	Depression	Anxiety disorders, excluding PTSD	PTSD
Notifications						
Any	Exposed	6.6 [5.8–7.5]	4.22 [3.61–4.91]	8.1 [7.27–9.0]	12.5 [11.5–13.6]	2.28 [1.83–2.81]
	Unexposed	1.11 [1.03–1.12]	0.94 [0.87–1.00]	1.53 [1.44–1.62]	2.60 [2.49–2.72]	0.22 [0.19–0.26]
Neglect	Exposed	8.4 [7.3–9.6]	5.0 [4.1–6.0]	9.5 [8.3–11]	14 [13–15]	2.6 [2.0–3.4]
	Unexposed	1.17 [1.1–1.25]	0.99 [0.92–1.1]	1.6 [1.5–1.7]	2.8 [2.7–2.9]	0.26 [0.22–0.29]
Physical abuse	Exposed	7.1 [6.0–8.3]	4.6 [3.7–5.6]	9.6 [8.4–11]	14 [13–15]	2.6 [1.9–3.4]
	Unexposed	1.2 [1.1–1.3]	1.0 [0.93–1.1]	1.63 [1.55–1.72]	2.8 [2.7–2.9]	0.26 [0.22–0.30]
Sexual abuse	Exposed	7.1 [5.6–8.8]	3.9 [2.8–5.2]	8.5 [6.9–10]	14 [12–16]	3.0 [2.0–4.2]
	Unexposed	1.3 [1.2–1.4]	1.06 [0.99–1.13]	1.8 [1.7–1.9]	2.9 [2.8–3.1]	0.28 [0.25–0.32]
Emotional abuse	Exposed	7.4 [6.3–8.7]	4.8 [3.9–5.9]	9.7 [8.5–11]	15 [13–16]	3.0 [2.2–3.9]
	Unexposed	1.22 [1.15–1.30]	1.0 [0.93–1.1]	1.65 [1.56–1.74]	2.8 [2.7–2.9]	0.25 [0.22–0.29]
Substantiated notifications						
Any	Exposed	7.44 [6.51–8.47]	4.79 [4.0–5.65]	9.18 [8.16–10.3]	13.6 [12.6–14.6]	2.66 [2.08–3.33]
	Unexposed	1.15 [1.07–1.23]	1.0 [0.89–1.03]	1.57 [1.49–1.67]	2.3 [2.0–2.7]	0.23 [0.21–0.27]
Neglect	Exposed	9.9 [8.4–11.5]	5.4 [4.3–6.8]	11 [9–12]	15 [13–17]	2.6 [1.8–3.6]
	Unexposed	1.2 [1.1–1.3]	1.0 [0.95–1.1]	1.7 [1.6–1.8]	2.9 [2.8–3.0]	0.28 [0.24–0.32]
Physical abuse	Exposed	8.0 [6.6–9.5]	5.0 [3.9–6.3]	11 [10–13]	15 [13–17]	2.9 [2.0–3.9]
	Unexposed	1.3 [1.2–1.4]	1.0 [0.96–1.1]	1.7 [1.6–1.8]	2.9 [2.8–3.0]	0.27 [0.24–0.31]
Sexual abuse	Exposed	6.6 [4.9–8.7]	4.7 [3.2–6.5]	9.1 [7.2–11]	15 [12–18]	3.6 [2.3–5.2]
	Unexposed	1.32 [1.25–1.41]	1.06 [0.99–1.14]	1.8 [1.7–1.9]	3.0 [2.9–3.1]	0.29 [0.25–0.33]
Emotional abuse	Exposed	8.4 [7.0–10]	5.4 [4.2–6.7]	11 [9.8–13]	16 [14–18]	3.2 [2.3–4.3]
	Unexposed	1.25 [1.17–1.33]	1.0 [0.95–1.1]	1.7 [1.6–1.8]	2.9 [2.8–3.0]	0.27 [0.23–0.31]
Multiple types or reports of abuse (notifications)						
Multiple types	Exposed	7.6 [6.5–8.7]	4.5 [3.7–5.4]	9.5 [8.3–11]	14 [13–15]	2.8 [2.1–3.6]
	Unexposed	1.2 [1.1–1.3]	1.0 [0.93–1.1]	1.6 [1.5–1.7]	2.8 [2.7–2.9]	0.25 [0.21–0.29]
Multiple reports	Exposed	7.5 [6.5–8.6]	4.5 [3.8–5.4]	9.3 [8.2–11]	14 [12–15]	2.6 [2.0–3.3]
	Unexposed	1.2 [1.1–1.3]	0.98 [0.91–1.1]	1.6 [1.5–1.7]	2.7 [2.6–2.9]	0.24 [0.21–0.28]

Notes: BPAD: Bipolar affective disorder; Depression includes single depressive episodes, recurrent major depressive disorder, other depressive disorder or dysthymic disorder; PTSD: Post-traumatic stress disorder; SSD: Schizophrenia, schizotypal and delusional disorders; DIP: Drug-induced psychoses

of stress hormones through dysregulation of the hypothalamic–pituitary–adrenal axis (Hailes *et al.*, 2019; McKay *et al.*, 2021). These biological changes can make individuals more vulnerable to developing psychiatric symptoms in response to subsequent stressors. Psychologically, CM can result in negative self-perceptions, low self-esteem, and distorted beliefs about oneself and the world, which can also increase the risk of mental health problems (Badr *et al.*, 2018; McKay *et al.*, 2021). Socially, CM often occurs in the presence of other adversities such as unstable family relationships, social isolation and lack of social support (Norman *et al.*, 2012). These vulnerabilities may be exacerbated by maladaptive coping mechanisms, such as substance use disorder or self-harm. Other factors, such as genetics, resilience and access to support systems may also play a role in determining subsequent mental health outcomes (Norman *et al.*, 2012).

Findings should be interpreted in context of the study limitations. We used administrative health data of hospital admissions that might be subject to recording bias. Such psychiatric diagnoses are biased to the more severe or urgent cases and so the reported rates of mental illness in this study should be considered underestimates of the actual numbers. The use of agency-notified or substantiated CM may underestimate true maltreatment and may represent the most extreme cases where there was physical evidence. We were only able to investigate the effect of single reports, multiple reports and multiple CM types. Cell numbers for some of the psychiatric outcomes were too small to allow for meaningful analyses of the substantiated equivalents. As noted previously, notified or substantiated reports are proxies for actual CM. Both data sources only cover Queensland residents, not those who may have moved elsewhere.

Table 3. Association of different types of childhood maltreatment (CM) with admissions for SSD and BPAD, manic episodes or both + mood & BPAD with psychotic features by 30-year follow-up (all $p < 0.001$)

Models	Variable	SSD/ DIP		Bipolar Affective Disorder	
		OR	95% CI	OR	95% CI
Bivariate (unadjusted)	Sex - female	0.49	0.43–0.56	1.33	1.16–1.53
	Indigenous - yes	6.97	6.04–8.04	3.62	2.99–4.40
	Any CM notification	6.38	5.51–7.39	4.59	3.84–5.50
	Any substantiated CM report	6.93	5.91–8.11	5.10	4.20–6.20
	Notified neglect	7.65	6.48–9.03	5.18	4.19–6.40
	Substantiated neglect	8.84	7.33–10.67	5.63	4.40–7.20
	Notified physical abuse	6.22	5.20–7.48	4.70	3.75–5.88
	Substantiated physical abuse	6.93	5.65–8.50	5.14	3.98–6.64
	Notified sexual abuse	5.82	4.56–7.42	3.52	2.52–4.93
	Substantiated sexual abuse	5.67	3.89–7.11	4.20	2.90–6.10
	Notified emotional abuse	6.50	5.41–7.81	4.92	3.93–6.17
	Substantiated emotional abuse	7.25	5.93–8.88	5.48	4.26–7.04
	Multiple abuse types, Notified	6.74	5.68–7.99	4.54	3.65–5.66
	Multiple reports of abuse, Notified	6.82	5.79–8.02	4.70	3.82–5.78
Multivariate (adjusted)	Sex - female	0.47	0.41–0.54	1.31	1.14–1.51
	Indigenous - yes	4.93	4.23–5.74	2.71	2.21–3.32
	Any CM notification	4.54	3.88–5.31	3.69	3.06–4.46
	Any substantiated CM report	4.81	4.06–5.71	4.01	3.28–4.92
	Notified neglect	4.87	4.07–5.84	3.94	3.15–4.92
	Substantiated neglect	5.25	4.28–6.43	4.07	3.14–5.27
	Notified physical abuse	4.18	3.45–5.07	3.70	2.94–4.67
	Substantiated physical abuse	4.57	3.68–5.67	4.00	3.07–5.21
	Notified sexual abuse	4.96	3.83–6.42	2.64	1.87–3.72
	Substantiated sexual abuse	4.57	3.32–6.29	3.11	2.13–4.54
	Notified emotional abuse	4.69	3.87–5.69	4.01	3.17–5.05
	Substantiated emotional abuse	5.21	4.21–6.44	4.41	3.41–5.70
	Multiple abuse types, Notified	4.73	3.94–5.68	3.57	2.85–4.48
	Multiple reports of abuse, Notified	4.75	3.99–5.66	3.70	2.98–4.59

Adjusted data for sex and Aboriginal and/or Torres Strait Islander identity come from the model for any CM notification with similar findings in all the other models. Notes: BPAD: Bipolar affective disorder; SSD: Schizophrenia, schizotypal and delusional disorders; DIP: Drug-induced psychoses

In addition, the numbers of CM notifications are lower compared to those in more recent surveys of reports to statutory authorities (Afifi *et al.*, 2014). This may be attributable to the data reflecting the policies, practices and societal awareness of 20–30 years ago (Afifi *et al.*, 2014). For instance, our definition did not include exposure to domestic violence, which is increasingly recognised as a type of CM. We could only adjust for sex and Aboriginal and/or Torres Strait Islander identity in the logistic regressions. As the data were extracted in 2014, an updated analysis would provide a longer period to investigate the connection between CM and subsequent mental health issues. Furthermore, this analysis could not examine the chronological order between diagnoses made during psychiatric admissions

and associated CM notifications occurring when participants were aged between 11 and 17 years old. However, this should be the minority in the dataset, as a nationwide analysis in Australia found that residents aged from 12 to 17 years made up only 15% of psychiatric admissions occurring before people reached their early thirties (Australian Institute of Health and Welfare, 2024).

In conclusion, recognising the association between CM and mental disorders is crucial for mental health professionals, policymakers, service planners and society as a whole. Early identification, intervention and providing appropriate support to individuals who have experienced CM may help mitigate the long-term consequences and reduce the risk of subsequent mental health problems.

Table 4. Association between different types of childhood maltreatment (CM) and admissions for depression, anxiety disorders and PTSD at 30-year follow up (all $p < 0.001$)

Models	Variable	Depression		Anxiety excluding PTSD		PTSD	
		OR	95% CI	OR	95% CI	OR	95% CI
Bivariate (unadjusted)	Sex - female	1.56	1.40–1.73	1.23	1.13–1.33	1.97	1.51–2.57
	Indigenous - yes	4.54	3.95–5.21	3.68	3.28–4.13	5.21	3.79–7.16
	Any CM notification	5.65	4.95–6.44	5.31	4.78–5.89	10.04	7.64–13.20
	Any substantiated CM report	6.29	5.46–7.25	5.58	4.97–6.27	11.00	8.25–14.67
	Notified neglect	6.33	5.42–7.38	5.57	4.91–6.32	10.16	7.43–13.88
	Substantiated neglect	6.87	5.74–8.21	5.86	5.05–6.80	9.48	6.53–13.74
	Notified physical abuse	6.36	5.44–7.44	5.55	4.88–6.32	9.70	7.03–13.39
	Substantiated physical abuse	7.41	6.22–8.81	6.05	5.22–7.01	10.52	7.35–15.05
	Notified sexual abuse	5.19	4.16–6.48	5.40	4.55–6.41	10.98	7.45–16.20
	Substantiated sexual abuse	5.48	4.24–7.10	5.56	4.54–6.81	12.67	8.25–19.45
	Notified emotional abuse	6.44	5.49–7.55	5.85	5.14–6.66	11.41	8.35–15.61
	Substantiated emotional abuse	7.58	6.37–9.02	6.42	5.55–7.43	11.75	8.30–16.64
	Multiple abuse types, Notified	6.30	5.41–7.33	5.62	4.96–6.36	10.78	7.95–14.61
Multiple reports of abuse, Notified	6.28	5.43–7.27	5.60	4.97–6.31	10.21	7.57–13.76	
Multivariate (adjusted)	Sex - female	1.54	1.38–1.71	1.21	1.11–1.31	1.90	1.45–2.48
	Indigenous - yes	3.27	2.82–3.79	2.63	2.32–2.97	2.99	2.13–4.21
	Any CM notification	4.31	3.76–4.96	4.34	3.89–4.84	7.73	5.78–10.34
	Any substantiated CM report	4.69	4.04–5.45	4.45	3.94–5.03	8.18	6.02–11.12
	Notified neglect	4.55	3.86–5.35	4.29	3.76–4.90	7.25	5.18–10.14
	Substantiated neglect	4.67	3.87–5.65	4.28	3.66–5.01	6.17	4.14–9.18
	Notified physical abuse	4.80	4.07–5.66	4.43	3.88–5.07	7.17	5.10–10.01
	Substantiated physical abuse	5.53	4.61–6.64	4.76	4.08–5.55	7.55	5.18–11.01
	Notified sexual abuse	3.66	2.91–4.60	4.25	3.56–5.07	7.20	4.80–10.79
	Substantiated sexual abuse	3.80	2.91–4.96	4.32	3.51–5.33	8.08	5.13–12.54
	Notified emotional abuse	5.05	4.28–5.96	4.82	4.21–5.52	8.81	6.36–12.819
	Substantiated emotional abuse	5.91	4.93–7.07	5.24	4.51–6.08	8.82	6.15–12.65
	Multiple abuse types, Notified	4.75	4.05–5.57	4.51	3.96–5.13	8.02	5.81–11.04
Multiple reports of abuse, Notified	4.74	4.07–5.52	4.50	3.97–5.09	7.58	5.52–10.41	

Adjusted data for sex and Aboriginal and/or Torres Strait Islander identity come from the model for any CM notification with similar findings in all the other models. Depression includes single depressive episodes, recurrent major depressive disorder, other depressive disorder or dysthymic disorder; PTSD: Post-traumatic stress disorder

Availability of data and materials. There was no formal study protocol published for this paper. The data for the study are held in Social Analytics Lab (SAL) at Griffith University. Due to privacy, ethical and legal considerations, the QCRC data cannot be shared without direct approval from relevant data custodians and QGSO. Any researcher interested in accessing the data can submit an application to the SAL management committee (socialanalyticslab@griffith.edu.au) with the relevant support and approvals. The programming code used to analyse the data is available on request.

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Ethical standards. The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008. Ethics approval from was obtained from Griffith University's Human Research Ethics Committee (2010/479), as well as a waiver of consent given the use of anonymised data

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