



ELSEVIER

Contents lists available at [ScienceDirect](https://www.sciencedirect.com)

## Child Abuse &amp; Neglect

journal homepage: [www.elsevier.com/locate/chiabuneg](http://www.elsevier.com/locate/chiabuneg)

# Impact of child maltreatment on the costs of health service use and productivity loss: Findings from the Australian child maltreatment study

Dai Quy Le<sup>a,\*</sup>, Long Khanh-Dao Le<sup>a</sup>, Marie Bee Hui Yap<sup>b,c</sup>, Divna M. Haslam<sup>d,e</sup>,  
Daryl J. Higgins<sup>f</sup>, Eva Malacova<sup>g,h</sup>, James G. Scott<sup>h,i</sup>, David Lawrence<sup>j</sup>,  
Ben Mathews<sup>k,l</sup>, Cathrine Mihalopoulos<sup>a</sup>

<sup>a</sup> Health Economics Group, School of Public Health and Preventive Medicine, Monash University, Melbourne, Victoria, Australia

<sup>b</sup> Turner Institute for Brain and Mental Health, School of Psychological Sciences, Monash University, Melbourne, Victoria, Australia

<sup>c</sup> Centre for Mental Health, Melbourne School of Population and Global Health, University of Melbourne, Victoria, Australia

<sup>d</sup> School of Public Health, Faculty of Medicine, University of Queensland, Queensland, Australia

<sup>e</sup> Queensland Centre for Mental Health Research, Waco, Queensland, Australia

<sup>f</sup> Institute of Child Protection Studies, Australian Catholic University, Melbourne, VIC, Australia

<sup>g</sup> Child and Youth Mental Health Service, Children's Health Queensland, Brisbane, QLD, Australia

<sup>h</sup> QIMR Berghofer Medical Research Institute, Australia

<sup>i</sup> Child Health Research Centre, the University of Queensland, Brisbane, QLD, Australia

<sup>j</sup> Curtin University, Perth, WA, Australia

<sup>k</sup> Queensland University of Technology, Brisbane, QLD, Australia

<sup>l</sup> Bloomberg School of Public Health, Johns Hopkins University, Baltimore, MD, United States of America

## ARTICLE INFO

## Keywords:

Cost-of-illness  
Healthcare cost  
Productivity loss  
Child maltreatment  
Australia

## ABSTRACT

**Background:** Child maltreatment (CM) poses a substantial health burden, but its impact on healthcare costs and productivity loss in Australia remains unclear.

**Objective:** To estimate the costs of health service use and productivity loss associated with CM in Australia.

**Participants:** Cross-sectional data ( $N = 8503$ ) from the Australian Child Maltreatment Study were analyzed to identify people with CM, their health service use, and employment status.

**Methods:** Hurdle models estimated in two parts, comprising logistic regression and generalized linear models, were used to estimate differences in health service use and average costs between those with and without CM. Unit costs of health services were sourced from national databases (e. g., Medicare Benefits Schedule). Productivity losses were estimated using the human capital approach. Sensitivity analyses were conducted to examine the robustness of findings.

**Results:** Annual healthcare costs for each individual with CM was A\$1670 higher than those without CM. Incremental productivity losses due to unemployment averaged A\$2750 per labor force participant with CM annually. The point estimates of these costs increased with the number of CM subtypes experienced and remained highest among those with any neglect, sexual, and emotional abuse. A notable portion of health service use costs was attributed to mental health services. Subgroup analyses also revealed higher health service use costs for females and

\* Corresponding author at: Health Economics Group, School of Public Health and Preventive Medicine, Monash University, 553 St Kilda Road, Melbourne, VIC, 3004, Australia.

E-mail address: [dai.le@monash.edu](mailto:dai.le@monash.edu) (D.Q. Le).

<https://doi.org/10.1016/j.chiabu.2025.107818>

Received 31 March 2025; Received in revised form 20 November 2025; Accepted 23 November 2025

Available online 26 November 2025

0145-2134/© 2025 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

individuals with diverse gender identities. Findings mostly remained robust across sensitivity analyses. At a population level, CM was associated with annual health service use costs of A\$21.6 billion and productivity losses of A\$24.1 billion.

**Conclusion:** CM imposes substantial health service use and productivity costs in Australia. Targeted investment in prevention strategies is urgently needed.

## 1. Introduction

Child maltreatment (CM) involves physical abuse (PA), emotional abuse (EA), sexual abuse (SA), neglect, and exposure to domestic violence (EDV), resulting in actual or potential harm to the child's health, survival, development, or dignity (World Health Organization, 2006). CM is a major public health issue and often results in long-lasting impacts on children's physical and mental health (Carr et al., 2020; Gardner et al., 2019; Norman et al., 2012). Systematic reviews and meta-analyses have shown substantial prevalence of CM across the globe (Stoltenborgh et al., 2015). Recently, the Australian Child Maltreatment Study (ACMS) also found substantial proportions of a nationally representative random sample of Australians aged 16 years and older reported experiencing PA (32.0 %), SA (28.5 %), EA (30.9 %), neglect (8.9 %), and EDV (39.6 %) (Mathews, Pacella, et al., 2023). These estimates far exceed Child Protection Service (CPS) administrative data, which reported CM notification and substantiation rates of 5.1 % and 0.79 % in 2021–2022, respectively (Australian Institute of Health and Welfare, 2024). Such discrepancy is observed world-wide and reflects fundamental differences in the nature (e.g., definition, population sample) and purpose of these estimates (Baldwin et al., 2024; Bull et al., 2025; Everson et al., 2008). The CPS data often underestimates the true prevalence of CM, as they only capture a small fraction of actual cases that are reported to authorities, and many of these cases are not formally investigated or fail to meet the evidentiary threshold for substantiation (Mathews et al., 2015; Mehta et al., 2023). Thus, estimates from national prevalence studies like the ACMS is more preferred when estimating health and economic burden of CM in Australia (Grummitt et al., 2024; McCarthy et al., 2016; Moore et al., 2015).

Across Europe and North America, CM causes of an annual loss of 0.03 Quality-Adjusted Life-Years (QALYs) per person and 37.5 million Disability-Adjusted Life-Years (DALYs) – metrics of health burden – due to ill health (e.g. anxiety, cardiovascular disease) and health risk behaviors (e.g. smoking, alcohol abuse) (Bellis et al., 2019; Corso et al., 2008). In Australia, CM - including PA, EA, SA, and neglect, was also found to contribute to nearly 1.4 % of DALYs in men and 2.4 % of DALYs in women, mostly due to the development of depressive disorders, anxiety disorders, and self-harm (Moore et al., 2015). More recently, the ACMS data found that CM was responsible for more than 66,000 years of life lost and 184,000 DALYs due to mental ill health in Australia (Grummitt et al., 2024).

People who experienced CM were found to seek more healthcare services in the US (Bonomi et al., 2008) and Canada (Tang et al., 2006). Such increased health service utilization (HSU) has resulted in substantive lifetime healthcare costs of \$46,500 (2015 US Dollar - USD) per individual in the US (Peterson et al., 2018) and \$37,400 (2015 USD) in the UK (Conti et al., 2021). In Australia, the ACMS data also showed a significant association between CM and an increased likelihood of overnight hospital admission (OHA) for mental disorders and more health consultations (HCs) with various healthcare professionals, particularly for those who experienced 3–5 different CM subtypes (Pacella et al., 2023).

Estimating the healthcare costs associated with CM is crucial for informing public policy. However, significant methodological challenges have led to inconsistent and often incomplete estimates globally (Brown et al., 2011). Early attempts to quantify these costs predominantly adopted a 'top-down' approach using population-attributable fractions (PAFs) to determine the excess risk of several health conditions and their associated costs as the results of CM. However, as highlighted in the Brown et al. (2011) review, the quality of such studies was often inconsistent due to a heavy reliance on the limited available evidence for relevant health conditions, PAFs, and prevalence data associated with CM, which subsequently introduces considerable uncertainty into the final cost estimates.

In Australia, the cost-of-illness study by McCarthy et al. (2016) used a top-down approach, estimating an incremental healthcare cost of \$62,519 (2014–15 Australian Dollar – A\$) per person with CM over the lifetime (ages 0–65 years). While remaining a foundational study, this study was subject to the aforementioned limitations associated with the top-down costing method as it relied on PAFs adopted from the US context and only covered a narrow range of healthcare costs. Specifically, the estimates only included short-term injury-related hospital costs and long-term healthcare costs for four mental health conditions (e.g., anxiety, depression, substance abuse, and self-harm), while the costs of other physical and mental health conditions (e.g., diabetes, heart attack, personality disorder), primary healthcare, and counselling services were not considered (McCarthy et al., 2016).

To address the limitations of top-down approach, more recent research has shifted toward a 'bottom-up' approach to improve the accuracy and transparency of the cost estimates as individual level data became more available (e.g., Campbell et al., 2016; Gnanamanickam et al., 2023; Neil et al., 2020). The study by Gnanamanickam et al. (2023) is a recent Australian example of using this method to quantify the costs of public hospital costs associated with CM in South Australia. Using linked administrative data for a whole-of-population cohort in South Australia, this study found a significantly higher average annual public hospital cost for individuals aged 0–31 years old with any CPS contacts (\$762–\$2745 in 2017–18 A\$) compared to those without (\$282–\$1167 in 2017–18 A\$) (Gnanamanickam et al., 2023).

Despite their best efforts, Gnanamanickam et al.'s (2023) study has several limitations. Firstly, their analyses were restricted to the costs of public hospital services, excluding private hospital costs and outpatient visits. Secondly, the estimation of costs across the lifespan was based on observed data for individuals from birth to age 31, with costs for older age groups modelled up to age 65. This reliance on projection rather than actual data may introduce uncertainties and biases. Thirdly, as CM in their study was defined by CPS

contacts, which often overrepresent more vulnerable and marginalized populations (Cort et al., 2010; Fallon et al., 2010; Taylor et al., 2008), their findings may not be representative of the broader population affected by CM in South Australia or Australia as a whole.

Beyond the costs of HSU, CM was also found to affect productivity, measured through the employment rate (Bunting et al., 2018; Currie & Widom, 2010; Zielinski, 2009). For instance, a US-based study by Currie and Widom (2010) identified a significant employment gap of 14 percentage points for individuals with CM compared to those without. In the absence of equivalent Australian data, McCarthy et al. (2016) applied this US-based estimate to the Australian context and projected an incremental lifetime productivity loss of \$2.5 billion (2014–15 A\$) associated with CM using a human capital approach. More recently, a South Australian study by Gnanamanickam and Segal (2024) on income support payments reported an average annual unemployment benefit payment of \$1627 (2020-A\$) per CPS's confirmed CM case (substantiation and out-of-home care). However, the authors did not provide any updated estimates for the costs of productivity losses due to unemployment associated with CM in South Australia or Australia as a whole.

Overall, while a few studies and official reports have examined the economic costs associated with CM in Australia (Australian Institute of Family Studies, 2018; Gnanamanickam et al., 2023; McCarthy et al., 2016), they either remained limited in scope, relied on non-Australian data, or lack national representativeness. Similar constraints are also evident internationally, where studies often use top-down costing approaches or administrative data limited to more severe CM cases (e.g., Fang et al., 2012; Peterson et al., 2018). To help advance the evidence base, this study provided new nationally representative estimates of the annual costs of HSU, including HCs and OHAs, as well as productivity losses associated with CM using individual-level data from the ACMS. Findings were further stratified by CM subtypes, number of CM subtypes, and different age groups and genders. While not addressing every methodological or data limitation identified in the literature, our findings offer an important step toward a more complete understanding of the economic burden of CM in Australia.

## 2. Methods

### 2.1. Participants

The ACMS is a cross-sectional study designed to examine the prevalence of five CM subtypes and their associations with mental disorders, health risk behaviors, and HSU among Australians above 16 years old (Mathews, Pacella, et al., 2023). Participants were recruited using a mobile phone sampling frame and random digit dialing methodology with interviews conducted via computer-assisted telephone interviewing technology (Haslam et al., 2023; Mathews et al., 2021). The ACMS was conducted between April 9 and October 11 in 2021 using a national representative sample of 8503 participants, including 3500 from the 16–24 years old group and about 1000 from each of the 25–34, 35–44, 45–54, 55–64, and above 65 years old groups (Haslam et al., 2023). Further details of the study have been provided elsewhere (Haslam et al., 2023; Mathews et al., 2021).

### 2.2. Research ethics and patient consent

The ACMS was approved by the Queensland University of Technology Human Research Ethics Committee (190000047), and the secondary analysis conducted in this study was approved as a low-risk ethics project by the Monash University Human Research Ethics Committee (Project ID: 40379). Participants in the ACMS have provided consent for the use of de-identified data in related projects.

### 2.3. Child maltreatment measurement and classification

The 16-item *Juvenile Victimization Questionnaire-R2 (JVQ-R2): Adapted Version (ACMS)* was utilized to assess five CM subtypes, including PA (two items), SA (four items), EA (three items), neglect (three items), and EDV (four items) at any time in childhood up to age 18 years. Details of the JVQ-R2 questionnaire are provided in Appendix 1. Adaptation and validity of this instrument have been published elsewhere (Mathews, Meinck, et al., 2023; Mathews, Pacella, et al., 2023).

### 2.4. Demographic data

Basic demographic, economic, and health-related information such as age, gender, residential postcode, current financial stress, height, and weight were self-reported by participants through a questionnaire described in Haslam et al. (2023). The ACMS used data on height and weight to calculate body mass index (BMI) and residential postcode as a proxy for socioeconomic status using the SEIFA Index of Relative Socio-economic Disadvantage (IRSD; by quintile) and geographic remoteness with the Australian Statistical Geography Standard Remoteness Structure (Haslam et al., 2023; Pacella et al., 2023).

### 2.5. Healthcare service use and cost

#### 2.5.1. Health service utilization

Self-reported HSU was measured using modified items from the 2007 National Survey of Mental Health and Well-Being HSU module (Australian Bureau of Statistics, 2008). The details of these measurement items in the ACMS have been described elsewhere (Haslam et al., 2023) and may be found in Appendix 2. Briefly, these items aimed to capture the overall frequency of past year OHAs, the total length of hospital stay, and the common reasons for OHAs from a list of nine mental health (e.g. anxiety, depression, suicide

risk) and eleven physical health (e.g., diabetes, heart disease, stroke) conditions (Pacella et al., 2023). Additionally, the frequency of HC with seven types of healthcare professionals, including general practitioners, psychologists, psychiatrists, mental health nurses, allied health professionals (e.g., social workers, counselors, physiotherapists, occupational therapists), specialists (e.g. specialist physicians, cardiologists), and complementary therapists, was also measured in the survey. However, the reasons for visiting these health professionals were not included in the ACMS.

The survey also did not include information on medications.

### 2.5.2. Costs of health service utilization

A bottom-up costing approach based on individual-level data was adopted to estimate the costs of HSU associated with CM. Specifically, the overall costs of HSU encompassed costs related to HCs with various health professionals and OHAs due to mental health and physical health problems. All the costs presented in this study were expressed in 2021–22 A\$. Costs not in 2021–22 A\$ were converted using the Total Health Price Index (Australian Institute of Health and Welfare, 2021). Costs were not discounted due to the one year time horizon.

Costing algorithm and price weights from the Independent Health and Aged Care Pricing Authority (IHACPA) was utilized to estimate the costs of OHAs reported by participants in the ACMS. Self-reported admission reasons by each participant were matched with the relevant Australian Refined Diagnosis Related Groups (AR-DRG) in the IHACPA (2021). The cost weights or the National Weighted Activity Unit (NWAU) for each AR-DRG varied across cases, depending on illness complexity, length of stay, and other factors including age groups (children vs adults) and geographical remoteness (IHACPA, 2021). IHACPA (2021) has assigned weights for these factors in each AR-DRG item. The resulting NWAU per case was then multiplied by the National Efficient Price (NEP) of \$5597 for the 2021–22 financial year calculated by the IHACPA (2021) to estimate the cost of each OHA. Similar to Lee et al. (2017), the same costing method was applied to both public and private OHAs in the ACMS, as private hospital unit costs often exclude costs of pathology, imaging, and pharmacy.

The ACMS collected data on the overall frequency, total length of stay, and common reasons for OHAs for the past 12 months. However, it lacked the detailed information necessary to calculate the cost of each OHA using the price weights and algorithm from the IHACPA, including the exact length of each OHA, the complexity of the illness, and specific reasons for each admission (Haslam et al., 2023; Pacella et al., 2023). To facilitate the calculation, this study assumed that the total number of hospital nights was evenly distributed across admission reasons. The number of nights stayed in the hospital for each admission reason then served as a proxy for illness complexity, assuming longer stays were associated with greater illness complexity. Paediatric adjustment was applied to participants aged under 18. Detailed calculation methods and examples are provided in Supplementary 1.

To calculate the cost of HCs for each participant in the ACMS, the frequency of visits to each category of health professional was multiplied by their respective unit costs. Most of the unit costs were derived from the Medicare Benefits Schedule (MBS), which contains a listing of Medicare services subsidized by the Australian Government (Medicare Benefits Schedule, 2024). However, not all services are fully reimbursed by the Australian Government at the full published cost. Service providers can charge fees above the MBS reimbursed amount, and the difference is paid by people as an out-of-pocket cost (Department of Health, 2021). Because the level of out of pocket costs was unknown for the services consumed by the participants in the ACMS, we assumed the MBS contributed 83 % of the total expenditure, and the remaining 17 % was out-of-pocket cost as estimated by prior research (Russell & Doggett, 2019). Russell and Doggett (2019) estimated this contribution ratio based on the actual data published by the Australian Institute of Health and Welfare (AIHW) on the people's out-of-pocket spending on Medicare services that were delivered outside hospitals and subsidized by Medicare (e.g. specialists, GP, diagnostic imaging, etc.) (AIHW, 2018). Since complementary therapy was not covered by the MBS, the unit costs of HCs with complementary therapists (e.g. acupuncturist, naturopath) were adopted from Malik et al. (2022). This study surveyed 409 Australian women with chronic pelvic pain from February to April 2017 regarding the usage and cost of complementary therapy two months prior to the study (Malik et al., 2022). Because these unit costs were measured in 2016–17 A\$, they were converted to 2021–22 A\$. All units cost used in this study are provided in Supplementary 2.

### 2.6. Productivity loss and cost

The human capital approach was utilized to estimate the productivity loss based on the current employment status (i.e., employed full-time, employed part-time, unemployed, and not in the labor force) reported by the participants in the ACMS (“What is your current work status?”). In line with definitions from the Australian Bureau of Statistics (ABS) and the Reserve Bank of Australia (RBA), the labour force comprises individuals who are employed (in a paid job for more than one hour in a week) and unemployed (not in a paid job, but actively looking for work), and the unemployment rate represents the proportion of unemployed individuals within the labor force (Australian Bureau of Statistics, 2024a, 2024b; Reserve Bank of Australia, 2024). Furthermore, following the working age population defined by the (AIHW, 2023) and common practices from previous studies on the cost of mental disorders (Lee et al., 2017; Marques et al., 2019), the costs of productivity losses in this study were restricted to participants aged 15–64 years. This exclusion of individuals aged 65 and over - who are typically retired or less economically active - produced more conservative unemployment estimates by avoiding distortions from naturally higher unemployment rates in older age groups.

The costs of productivity losses were calculated based on the difference in unemployment rates between individuals with and without CM. In the absence of CM, unemployed individuals due to CM were assumed to be employed at the same rate as those without CM. Given the uncertainty around employment statuses (full-time, part-time) for these individuals if they would have been employed, the weighted median weekly earnings for both full-time and part-time employment of \$1209, reported by the ABS in 2021, was used to estimate the annual cost of productivity loss (Australian Bureau of Statistics, 2022a, 2022b). Since Australian workers typically receive

four weeks of paid annual leave (Fair Work Ombudsman, 2024), annual productivity loss per person were estimated at \$58,032 (2021–22 A\$) based on 48 working weeks. This aligns with the human capital approach, which values only the time spent on productive work, and excludes non-working periods like paid leave (Zhang et al., 2011).

A similar approach, as used by McCarthy et al. (2016), to estimate the cost of productivity loss associated with the high unemployment rate due to CM was adopted. However, the median rather than the average weekly earnings were utilized in the present study as the median estimates offer a more representative measure of earnings and are less affected by the skewness of earnings data (Australian Bureau of Statistics, 2023). The formula used is as follows:

$$Y = (U_M - U_{NM}) * L_M * I$$

Where: Y = Cost of productivity loss associated with unemployment due to CM,

$U_M$  = Unemployment rate in population with CM,

$U_{NM}$  = Unemployment rate in population without CM,

$L_M$  = Labor force population with CM, and,

I = Median annual income per person in Australia in 2021–22.

The cost of productivity loss due to absenteeism (absence from the current work) and presenteeism (reduced productivity while being at work) was not estimated in this study, as this information was not available in the ACMS dataset.

## 2.7. Statistical analysis

Descriptive statistics, including means and standard deviations, were estimated to provide an initial overview of the access frequencies and associated costs of HCs, OHAs, and total HSU across different CM categories included in the subsequent analyses. A series of survey-weighted hurdle models estimated in two parts was utilized to examine differences in both the probabilities of healthcare service use and the associated costs across CM categories. Part 1 used a logistic regression model to estimate the probabilities of accessing the healthcare services or having any healthcare costs. Part 2 used a generalized linear model (GLM) to estimate the costs among service users (cost per user). Due to the high proportion of zero costs among non-users and the right-skewed distribution of cost data, the GLM specified a gamma error distribution with a logarithmic link function. This analysis approach aligned with the International Society for Pharmacoeconomics and Outcome Research guidelines (Ramsey et al., 2015). To derive the expected costs per person (including users and non-users), the predicted probability of service use from Part 1 was joined with the predicted cost per user from Part 2 in a hurdle model. All models were adjusted for a range of potential confounders, including age, gender, BMI, socio-economic status, geographic remoteness, and current financial stress.

In this study, the costs of HCs, OHAs, and overall HSU were analyzed using three survey-weighted hurdle models estimated in two parts. The first model compared costs between individuals with and without any CM. In the second model, two methods were used to compare the costs of each CM subtype to no CM. In the main analysis, the five CM subtypes were fitted simultaneously as independent binary (yes/no) variables, enabling the impacts of each CM subtype on the costs of HSU to be adjusted for the other subtypes. Alternatively, in the supplementary analysis (Supplementary 3), costs of HSU by individuals with the sole experience of each CM subtype were examined using a categorical variable with seven levels: (1) no CM, (2) only PA, (3) only EA, (4) only SA, (5) only neglect, (6) only EDV, and (7) more than one CM subtype. This approach isolated the impacts of each CM subtype on the HSU costs, which is helpful for modeling economic evaluations where the cost linked to a particular CM subtype is needed. The third model compared costs based on the number of CM subtypes experienced (one, two, or three or more) against those without CM. The three hurdle models estimated in two parts were also repeated in the subgroup analyses (1) by age groups: adolescents (aged 10–19 (WHO, 2024)) and adults (aged >19); and (2) by genders: males, females, and individuals with diverse gender identities (henceforth 'DGI individuals').

Lastly, following the ABS reporting standard (Australian Bureau of Statistics, 2021), the minimum sample size for any subgroup analysis was 10. Listwise deletion was employed to ensure unbiased estimates since missing data were minimal (less than 1 %). To ensure the sample was representative of the Australian population and to maintain consistency with previous publications using ACMS data (Higgins et al., 2023; Pacella et al., 2023), the survey weights provided by the ACMS were applied in all analyses. These weights were adjusted for key demographic factors, including age group, gender, Indigenous status, country of birth (Australia or overseas), highest level of education, and residential socio-economic status (measured by the Relative Socio-economic Advantage and Disadvantage quintiles). All statistical analyses were conducted in R version 4.2.2 following the instruction for modeling the healthcare costs using hurdle model estimated in two parts by Zhou et al. (2024). Statistical significance was assessed using two-tailed hypothesis tests on the distribution of bootstrapped mean differences, with  $p$ -values less than 0.05 indicating a significant difference from zero.

## 2.8. Sensitivity analysis

Sensitivity analyses were conducted to examine the robustness of the total costs of HCs, OHAs, and overall HSU resulting from changes in the assumptions used to estimate these costs. Given the lack of data on the actual out-of-pocket costs for HC services, the current out-of-pocket costs in the base case (main analyses) were varied by  $\pm 10$  %. In the absence of detailed information on the length of each hospital stay, illness complexity, and the main reason for each admission, both the lower and upper bounds of the total costs of OHAs were estimated. To do this, the total number of nights stayed in the hospital throughout the year was assumed to be attributed to a single primary reason. The lower bound was calculated using the admission reason with the lowest cost, while the upper bound was determined using the reason with the highest cost. Sensitivity analysis was carried out for the combinations of lower (upper) bound HC

**Table 1**

Results of hurdle model estimated in two parts for the costs of health consultation with healthcare professionals during the preceding 12 months.

Child maltreatment classification	General practitioner			Psychologist			Psychiatrist			Mental health nurse		
	Probability of using services [95 % CI]	Average annual costs per user A\$ [95 % CI]	Average annual costs per person A\$ [95 % CI]	Probability of using services [95 % CI]	Average annual costs per user A\$ [95 % CI]	Average annual costs per person A\$ [95 % CI]	Probability of using services [95 % CI]	Average annual costs per user A\$ [95 % CI]	Average annual costs per person A\$ [95 % CI]	Probability of using services [95 % CI]	Average annual costs per user A\$ [95 % CI]	Average annual costs per person A\$ [95 % CI]
No maltreatment	0.84 [0.83, 0.86]	276 [262, 291]	233 [220, 246]	0.11 [0.09, 0.12]	998 [862, 1144]	109 [88, 131]	0.03 [0.02, 0.04]	728 [567, 918]	21 [14, 29]	0.02 [0.01, 0.03]	172 [99, 288]	3 [1, 6]
Any maltreatment	0.89** [0.88, 0.90]	388** [369, 410]	346** [327, 365]	0.26** [0.24, 0.27]	1411** [1296, 1543]	362** [324, 402]	0.10** [0.09, 0.11]	1557** [1295, 1830]	155** [124, 187]	0.06** [0.05, 0.07]	318* [229, 429]	19** [13, 25]
Any emotional abuse	0.90** [0.88, 0.91]	435** [408, 467]	391** [364, 419]	0.33** [0.31, 0.36]	1535** [1392, 1690]	511** [452, 573]	0.12** [0.11, 0.14]	1949** [1597, 2353]	239** [184, 297]	0.08** [0.06, 0.09]	361 [237, 505]	27** [17, 39]
Any physical abuse	0.90** [0.88, 0.91]	426** [399, 455]	381** [355, 407]	0.28** [0.26, 0.30]	1498** [1331, 1679]	423** [366, 485]	0.12** [0.11, 0.14]	1698** [1400, 2053]	205** [159, 254]	0.07** [0.05, 0.08]	349 [230, 490]	23** [14, 34]
Any sexual abuse	0.92** [0.90, 0.93]	444** [414, 475]	407** [378, 436]	0.31** [0.29, 0.33]	1552** [1383, 1731]	481** [416, 549]	0.12** [0.10, 0.14]	1622** [1281, 2022]	191** [141, 246]	0.07** [0.06, 0.09]	363 [247, 507]	27** [17, 39]
Any neglect	0.88* [0.85, 0.92]	535** [474, 598]	473** [415, 530]	0.38** [0.34, 0.43]	1637* [1353, 1941]	630** [499, 772]	0.16** [0.12, 0.19]	2065** [1383, 2950]	321** [186, 473]	0.10** [0.07, 0.13]	329 [189, 558]	32** [13, 53]
Any exposure to domestic violence	0.90** [0.88, 0.91]	396** [371, 424]	356** [332, 380]	0.28** [0.26, 0.30]	1454** [1312, 1604]	402** [353, 453]	0.10** [0.09, 0.12]	1702** [1353, 2071]	177** [135, 223]	0.07** [0.05, 0.08]	295 [215, 394]	19** [13, 26]
1 type of maltreatment	0.87* [0.85, 0.89]	324** [294, 357]	283** [255, 312]	0.16** [0.14, 0.18]	1214 [1008, 1464]	191** [148, 237]	0.07** [0.05, 0.08]	760 [582, 955]	50** [34, 67]	0.04* [0.02, 0.05]	264 [117, 502]	9 [2, 17]
2 types of maltreatment	0.90** [0.87, 0.92]	364** [331, 398]	326** [295, 358]	0.26** [0.23, 0.29]	1155 [995, 1333]	302** [247, 359]	0.10** [0.08, 0.12]	1396** [1103, 1748]	134** [94, 180]	0.06** [0.04, 0.07]	206 [134, 300]	11** [6, 18]
3 or more types of maltreatment	0.91** [0.89, 0.92]	465** [434, 501]	421** [389, 453]	0.35** [0.32, 0.38]	1620** [1448, 1805]	560** [486, 640]	0.13** [0.11, 0.15]	1913** [1512, 2360]	255** [191, 324]	0.08** [0.07, 0.10]	392* [266, 552]	33** [20, 47]

  

Child Maltreatment Classification	Specialist			Allied health professional			Complementary therapist			Total health consultation cost		
	Probability of using services [95 % CI]	Average annual costs per user A\$ [95 % CI]	Average annual costs per person A\$ [95 % CI]	Probability of using services [95 % CI]	Average annual costs per user A\$ [95 % CI]	Average annual costs per person A\$ [95 % CI]	Probability of using services [95 % CI]	Average annual costs per user A\$ [95 % CI]	Average annual costs per person A\$ [95 % CI]	Probability of using services [95 % CI]	Average annual costs per user A\$ [95 % CI]	Average annual costs per person A\$ [95 % CI]
No maltreatment	0.28 [0.26, 0.29]	437 [399, 475]	121 [107, 134]	0.24 [0.22, 0.26]	712 [641, 800]	168 [145, 192]	0.12 [0.10, 0.13]	811 [697, 949]	97 [78, 116]	0.87 [0.86, 0.89]	868 [810, 927]	759 [707, 812]
Any maltreatment	0.32** [0.30, 0.33]	554** [511, 603]	176** [160, 193]	0.32** [0.30, 0.33]	1012** [916, 1126]	323** [286, 360]	0.19** [0.17, 0.20]	828 [750, 909]	155** [137, 174]	0.93** [0.92, 0.94]	1568** [1483, 1665]	1459** [1373, 1545]
Any emotional abuse	0.31* [0.29, 0.34]	545** [497, 598]	171* [151, 191]	0.35** [0.32, 0.37]	1103** [973, 1249]	381** [328, 435]	0.21** [0.18, 0.23]	885 [781, 999]	182** [154, 212]	0.93** [0.92, 0.95]	1909** [1775, 2061]	1783** [1645, 1919]

(continued on next page)

Table 1 (continued)

Child Maltreatment Classification	Specialist			Allied health professional			Complementary therapist			Total health consultation cost		
	Probability of using services [95 % CI]	Average annual costs per user A\$ [95 % CI]	Average annual costs per person A\$ [95 % CI]	Probability of using services [95 % CI]	Average annual costs per user A\$ [95 % CI]	Average annual costs per person A\$ [95 % CI]	Probability of using services [95 % CI]	Average annual costs per user A\$ [95 % CI]	Average annual costs per person A\$ [95 % CI]	Probability of using services [95 % CI]	Average annual costs per user A\$ [95 % CI]	Average annual costs per person A\$ [95 % CI]
Any physical abuse	0.34** [0.32, 0.36]	549** [499, 607]	185** [163, 207]	0.34** [0.31, 0.36]	1036** [907, 1182]	352** [300, 406]	0.19** [0.17, 0.21]	844 [746, 949]	160** [135, 186]	0.93** [0.92, 0.95]	1750** [1629, 1885]	1629** [1505, 1752]
Any sexual abuse	0.36** [0.34, 0.39]	547** [499, 600]	197** [175, 221]	0.36** [0.33, 0.38]	1055** [933, 1198]	378** [325, 433]	0.21** [0.19, 0.23]	862 [757, 971]	180** [152, 209]	0.94** [0.93, 0.96]	1883** [1751, 2039]	1778** [1638, 1918]
Any neglect	0.30 [0.27, 0.34]	671** [541, 817]	203* [156, 254]	0.39** [0.35, 0.44]	1307** [1041, 1617]	515** [389, 650]	0.18** [0.14, 0.21]	960 [759, 1173]	169** [124, 220]	0.92* [0.89, 0.95]	2485** [2116, 2890]	2293** [1916, 2654]
Any exposure to domestic violence	0.31* [0.29, 0.33]	580** [519, 651]	179* [156, 203]	0.32** [0.30, 0.34]	1039** [918, 1167]	332** [289, 379]	0.19** [0.17, 0.21]	834 [740, 948]	156** [132, 180]	0.94** [0.92, 0.95]	1648** [1527, 1773]	1543** [1425, 1661]
1 type of maltreatment	0.31 [0.28, 0.33]	577** [496, 676]	176** [146, 209]	0.28** [0.25, 0.30]	871 [731, 1039]	242** [196, 293]	0.17** [0.15, 0.20]	759 [652, 886]	132* [107, 159]	0.92** [0.91, 0.94]	1160** [1049, 1273]	1069** [966, 1177]
2 types of maltreatment	0.31 [0.28, 0.34]	513 [445, 592]	157* [130, 185]	0.31** [0.28, 0.34]	952* [781, 1153]	295** [233, 361]	0.19** [0.16, 0.21]	850 [688, 1055]	158** [118, 200]	0.93** [0.91, 0.95]	1414** [1271, 1564]	1318** [1177, 1457]
3 or more types of maltreatment	0.34* [0.31, 0.36]	560** [495, 624]	188** [164, 215]	0.36** [0.34, 0.39]	1153** [996, 1336]	418** [350, 487]	0.20** [0.18, 0.22]	868 [755, 994]	176** [146, 207]	0.94** [0.92, 0.95]	2048** [1861, 2236]	1920** [1742, 2098]

Notes: Models were adjusted for age, gender, BMI, socioeconomic status, geographic remoteness, and current financial stress; 'No maltreatment' is the reference group.

\*  $p < .05$ .

\*\*  $p < .01$ .

**Table 2**

Results of hurdle model estimated in two parts for the costs of overnight hospitalization (sections 1–3) and the total cost of health service use (section 4) during the preceding 12 months.

Child Maltreatment Classification	1. Admissions due to mental health			2. Admissions due to physical health			3. Total hospital admission cost			4. Total health service use cost		
	Probability of using services [95 % CI]	Average annual per user costs A\$ [95 % CI]	Average annual per person costs A\$ [95 % CI]	Probability of using services [95 % CI]	Average annual per user costs A\$ [95 % CI]	Average annual per person costs A\$ [95 % CI]	Probability of using services [95 % CI]	Average annual per user costs A\$ [95 % CI]	Average annual per person costs A\$ [95 % CI]	Probability of using services [95 % CI]	Average annual per user costs A\$ [95 % CI]	Average annual per person costs A\$ [95 % CI]
No maltreatment	0.01 [0.00, 0.01]	19,241 [5169, 39782]	151 [13, 336]	0.10 [0.09, 0.11]	10,872 [9597, 12311]	1081 [897, 1286]	0.11 [0.09, 0.12]	11,890 [10,401, 13564]	1255 [1036, 1488]	0.88 [0.86, 0.89]	2296 [2015, 2644]	2014 [1736, 2294]
Any maltreatment	0.02** [0.02, 0.03]	30,563 [19,455, 41100]	720** [444, 1031]	0.14** [0.12, 0.15]	11,491 [10,621, 12469]	1554** [1383, 1735]	0.15** [0.14, 0.16]	14583* [12,754, 16686]	2171** [1842, 2508]	0.93** [0.92, 0.94]	3946** [3574, 4361]	3684** [3315, 4057]
Any emotional abuse	0.03** [0.02, 0.04]	38,247 [25,187, 58618]	1187** [621, 1854]	0.14** [0.13, 0.16]	11,106 [10,195, 12132]	1568** [1355, 1792]	0.16** [0.14, 0.18]	15419* [13,116, 18250]	2471** [2008, 2970]	0.94** [0.92, 0.95]	4727** [4109, 5491]	4442** [3779, 5092]
Any physical abuse	0.03** [0.02, 0.04]	36,878 [23,354, 52236]	1138** [661, 1676]	0.15** [0.13, 0.16]	12,149 [10,918, 13666]	1800** [1525, 2096]	0.16** [0.15, 0.18]	15727* [13,520, 18253]	2589** [2132, 3083]	0.94** [0.92, 0.95]	4600** [4027, 5313]	4302** [3703, 4896]
Any sexual abuse	0.03** [0.02, 0.04]	32,818 [19,533, 48307]	891** [455, 1414]	0.16** [0.14, 0.17]	11,351 [10,418, 12467]	1772** [1519, 2043]	0.17** [0.15, 0.19]	14,300 [12,322, 16536]	2455** [2032, 2910]	0.95** [0.93, 0.96]	4684** [4093, 5371]	4443** [3836, 5051]
Any neglect	0.04** [0.03, 0.06]	42,876 [24,449, 86760]	1748** [434, 3386]	0.13* [0.11, 0.16]	12,212 [9949, 14659]	1607* [1181, 2079]	0.16** [0.13, 0.19]	18307** [13,657, 24471]	2862** [1880, 3942]	0.93** [0.90, 0.96]	6119** [4627, 7964]	5697** [4155, 7270]
Any exposure to domestic violence	0.02** [0.02, 0.03]	34,135 [21,438, 51207]	840** [447, 1279]	0.13* [0.12, 0.15]	11,530 [10,446, 12689]	1539** [1329, 1761]	0.15** [0.13, 0.16]	14922* [12,888, 17278]	2201** [1826, 2596]	0.94** [0.93, 0.95]	4023** [3587, 4548]	3780** [3318, 4236]
1 type of maltreatment	0.01 [0.01, 0.02]	11,383 [5603, 18842]	148 [40, 296]	0.12* [0.11, 0.14]	11,271 [9543, 13061]	1395 [1116, 1696]	0.13* [0.11, 0.15]	12,835 [10,706, 15493]	1651 [1281, 2056]	0.92** [0.91, 0.94]	2900* [2479, 3421]	2678* [2239, 3115]
2 types of maltreatment	0.03** [0.01, 0.04]	15,369 [9237, 25445]	400 [151, 727]	0.13* [0.11, 0.15]	11,833 [9914, 13990]	1546* [1184, 1942]	0.15** [0.13, 0.17]	13,445 [11,297, 16189]	1987** [1523, 2488]	0.93** [0.91, 0.95]	3428** [2914, 4028]	3201** [2678, 3716]
3 or more types of maltreatment	0.03** [0.02, 0.04]	51,400 [34,036, 90331]	1642** [685, 2751]	0.15** [0.13, 0.17]	11,442 [10,355, 12586]	1711** [1445, 1992]	0.17** [0.15, 0.19]	16421* [13,637, 20104]	2767** [2152, 3418]	0.94** [0.93, 0.96]	5300** [4496, 6232]	4997** [4176, 5825]

Notes: Models were adjusted for age, gender, BMI, socioeconomic status, geographic remoteness, and current financial stress; 'No maltreatment' is the reference group.

\* p &lt; .05.

\*\* p &lt; .01.

**Table 3**

Costs of productivity loss due to unemployment.

Child Maltreatment Classification	Working age population (N)	In the labor force (N)	Un-employed (N)	Unemployment rate			Weighted total annual productivity loss due to unemployment (2021-22 A\$)	Weighted average annual productivity cost due to unemployment per person in labor force (2021–22 A\$)
				%	Weighted %	Weighted % difference		
No maltreatment	2759	2411	211	8.75 %	7.41 %	–	–	–
Any maltreatment	4744	4113	502	12.21 %	12.12 %	4.71 %	10,213,632	2750
Any emotional abuse	2534	2198	305	13.88 %	13.92 %	6.51 %	7,254,000	3782
Any physical abuse	2353	2032	265	13.04 %	13.36 %	5.95 %	6,673,680	3469
Any sexual abuse	2076	1770	230	12.99 %	13.31 %	5.90 %	5,571,072	3450
Any neglect	696	599	119	19.87 %	21.06 %	13.65 %	4,178,304	7928
Any EDV	3232	2806	348	12.40 %	12.70 %	5.29 %	7,660,224	3078
1 type of CM	1651	1440	144	10.00 %	8.64 %	1.23 %	986,544	760
2 types of CM	1214	1054	118	11.20 %	12.39 %	4.98 %	2,901,600	2940
3 or more types of CM	1879	1619	240	14.82 %	15.10 %	7.69 %	6,383,520	4466

Notes: 'No maltreatment' is the reference group.

costs and lower (upper) bound OHA costs. Lastly, the lifetime CM prevalence estimate of 17.3 % - derived by McCarthy et al. (2016) using the pooled prevalence of PA, SA, EA, and neglect in Australia from Moore et al. (2015), was used in sensitivity analyses to examine the impacts of different CM prevalence measures on estimated population-level costs of annual HSU and productivity losses. As one of the most comprehensive syntheses of CM prevalence studies in Australia, this pooled estimate provides a reasonably accurate approximation of population prevalence in the absence of a national prevalence study (McCarthy et al., 2016).

### 3. Results

A total of 8503 Australians aged 16 and above completed the ACMS survey (49.33 % male, mean age = 38.1 years (SD = 18.71)). Among them, 5280 respondents (62.2 %; 95 %CI: 61.1–63.1 %) reported experiencing some form of CM, while 3223 (37.8 %; 95 %CI: 36.9–38.9 %) did not. Of those who experienced CM, 94.6 % (95 %CI: 93.8–95.4 %) accessed some form of healthcare services, 94.3 % (95 %CI: 93.5–95.1 %) had at least one HC with a healthcare professional, and 16.9 % (95 %CI: 15.6–18.3 %) were admitted to hospital overnight at least once in the 12 months preceding the survey. In contrast, among those who did not experience CM, 89.8 % (95 %CI: 88.4–91.1 %) accessed some form of healthcare services, 89.6 % (95 %CI: 88.2–91.0 %) had at least one HC with a healthcare professional, and 12.7 % (95 %CI: 11.3–14.3 %) had at least one OHA during the past year. Tables A1–A4 in Appendix 3 present descriptive statistics (mean and standard deviation) for the per-user and per-person access frequencies and costs of HCs and OHAs across the CM categories.

#### 3.1. Health consultation cost

Table 1 presents the probabilities of using HC services, the average costs of per users, and the average costs per person across different CM categories.

##### 3.1.1. Any child maltreatment compared to no child maltreatment

The total annual HC cost among individuals with CM was nearly double that of those without CM (\$1459 vs \$759). This substantial increase was driven by both significantly higher probabilities of service use and greater service use frequency per user – as indicated by higher per-user costs, across multiple providers. The largest contributors to the incremental cost were services from psychologists (\$362 vs \$109 per person), followed by allied health professionals (\$323 vs \$168), psychiatrists (\$155 vs \$21), and general practitioners (\$346 vs \$233). These higher costs reflected a combination of increased service utilization probabilities (e.g., psychologist from 11 % to 26 % and allied health professional from 24 % to 32 %) and more service use occasions per user, as indicated by higher per-user costs (e.g., \$1557 vs \$728 for psychiatrists and \$1441 vs \$998 for psychologists).

##### 3.1.2. Each subtype of child maltreatment compared to no child maltreatment

Individuals with any of the five CM subtypes had substantially higher total annual HC costs compared to those without CM (\$1543–\$2293 vs \$759). Among the subtypes, experiencing any child neglect was associated with a higher point estimate of incremental per-person cost (\$1534) than the other CM subtypes, including EA (\$1024), SA (\$1019), PA (\$870), and EDV (\$784). All of these elevated total costs resulted from both higher probabilities of accessing HC services and increased service use frequency per user across nearly all provider types, especially for mental health related services. For instance, HCs with psychiatrists and psychologists were among the largest contributors to the incremental costs across all five CM subtypes. Specifically, per-person costs for these providers ranged from \$177 (psychiatrists) and \$402 (psychologists) for any EDV to \$321 (psychiatrists) and \$630 (psychologists) for any child neglect, significantly higher than the \$21 (psychiatrists) and \$109 (psychologists) observed in individuals without CM. This rise in per-person costs was driven by greater service utilization probabilities (e.g., 28–38 % vs 11 % for psychologists; 10–16 % vs 3 % for psychiatrists) and greater service use frequency per user (as indicated by higher per-user costs: \$1454–\$1637 vs \$998 for psychologists; \$1622–\$2065 vs \$728 for psychiatrists) among individuals with any of the five CM subtypes compared to those without. Similar patterns of probabilities of service utilization, per-user, and per-person costs were also observed for other main contributors (e.g., consultations with general practitioners and allied health professionals) to the increased total HC costs across all five CM subtypes.

##### 3.1.3. Multiple subtypes of child maltreatment compared to no child maltreatment

The total annual HC costs were significantly higher among individuals with multiple subtypes of CM compared to those without CM. A clear dose-response relationship was observed as the total per-person cost progressively rose from \$1069 for individuals with one CM subtype, to \$1318 for two subtypes, and \$1920 for three or more subtypes. Compared to individuals without CM (per-person costs: \$759), the total annual HC costs for those with multiple CM subtypes were 1.7 (two subtypes) to 2.5 (three or more subtypes) times higher.

This substantial increase in total HC costs was driven by both higher probabilities of service utilization and greater service use frequency per user – as indicated by higher per-user costs, across a wide range of provider types. Mental health-related services (e.g., consultations with psychologists and psychiatrists) contributed most significantly to the incremental costs, especially among those with three or more CM subtypes. For instance, per-person costs among those with three or more CM subtypes reached \$255 for psychiatrists and \$560 for psychologists, representing 5-time (psychologists) to 12-time (psychiatrists) increase compared to the corresponding costs among those without CM. These higher per-person costs stemmed from both higher probabilities of service utilization (e.g., psychologists: 35 % vs 11 %; psychiatrists: 13 % vs 3 %) and greater service frequency per user as indicated by higher per-user costs (e.g., \$1620 vs \$998 for psychologists; \$1913 vs \$728 for psychiatrists) among those with three or more CM subtypes

compared to those without CM. Beyond mental health services, other key contributors to increased total HC costs among those with multiple CM subtypes, such as general practitioners and allied health professionals, also exhibited similar patterns of probabilities of service utilization, per-user, and per-person costs. However, their magnitude, while still progressive with the number of CM subtypes, was comparatively smaller than that of mental health service providers.

### 3.2. Overnight hospital admission cost

Sections 1–3 in Table 2 presents the probabilities of OHA, the average costs of per users, and the average costs per person across different CM categories.

#### 3.2.1. Any child maltreatment compared to no child maltreatment

Individuals with any experience of CM had substantially higher total OHA costs compared to those without CM (\$2171 vs \$1255 per person). This increase was driven by a higher probability of admission (15 % vs 11 %) and more complex admissions – as indicated by greater average cost per user (\$14,583 vs \$11890) overall. Although mental health-related admissions were less common than the physical health-related admissions among those with CM (probabilities of using services: 2 % vs 14 %), they both contributed substantially to the increased total OHA costs per person. Specifically, the incremental per-person costs among those with CM, relative to those without CM, were \$569 for mental health admissions (\$720 vs \$151) and \$473 for physical health admissions (\$1554 vs \$1081), reflecting a 4.8-fold and 1.4-fold increase, respectively. For both physical and mental health admissions, the elevated per-person costs among those with CM were primarily driven by the increased service utilization probabilities (14 % vs 10 % for physical health; 2 % vs 1 % for mental health).

#### 3.2.2. Each subtype of child maltreatment compared to no child maltreatment

Individuals with any of the five CM subtypes had substantially higher total OHA costs compared to those without CM (\$2201–\$2862 vs \$1255 per person annually). Among the five subtypes, experiencing any child neglect was associated with the highest point estimate of incremental per-person cost (\$1607); however, this was not significantly different from other CM subtypes like PA (\$1334), EA (\$1216), SA (\$1200), and EDV (\$946). While the elevated total per-person costs among those with any SA were mainly driven by a higher probability of overnight admissions, the higher total per-person costs among those with any of the remaining CM subtypes resulted from both higher probabilities of overnight admissions and more complex admissions – as indicated by greater per-user costs than those without CM.

Both physical and mental health related admissions contributed significantly to the overall increase in the total OHA costs across all five CM subtypes. The point estimate of incremental cost per person for physical health-related admissions was \$719 among those with any PA, not significantly different from other CM subtypes, including SA (\$691), neglect (\$526), EA (\$487), and EDV (\$458). For mental health-related admissions, those with any neglect had the highest point estimate of incremental costs per person (\$1597), but this was also not statistically different from EA (\$1036), PA (\$987), SA (\$740), and EDV (\$689). Compared to those without CM, the elevated costs of both mental and physical health related admissions across all five CM subtypes were largely driven by increased admission probabilities (13–16 % vs 10 % for physical health; 2–4 % vs 1 % for mental health) rather than the differences in admission complexity, as reflected in similar per-user costs.

#### 3.2.3. Multiple subtypes of child maltreatment compared to no child maltreatment

Total annual OHA costs per person were significantly higher among individuals exposed to multiple subtypes of CM compared to those without CM, with a clear dose–response relationship observed. The total per-person costs increased progressively from \$1651 for individuals with one CM subtype, to \$1987 for those with two subtypes, and peaked at \$2767 among those with three or more subtypes. Among individuals with two CM subtypes, the total per-person cost increase was primarily driven by a higher probability of overnight admission. In contrast, for those with three or more CM subtypes, the elevated per-person costs reflected both increased admission probabilities and more complex admission – as indicated by substantially higher per-user costs relative to individuals without CM. Both physical and mental health-related admissions contributed significantly to the overall rise in the total OHA costs per person among those exposed to three or more CM subtypes. However, for individuals with two CM subtypes, the increase in the overall per-person costs was largely attributable to physical health-related admissions.

### 3.3. Total health service use cost

Section 4 in Table 2 displays the probabilities of accessing any healthcare services, the associated average total annual costs per user and per person across different CM categories. Individuals with any experience of CM had significantly higher total HSU costs compared to those without CM (\$3684 vs \$2014 per person annually). This increase was driven by both a higher probability of accessing any healthcare services (93 % vs 88 %) and more services per user – as indicated by greater average costs among users (\$3946 vs \$2296) overall.

Similarly, experiencing any of the five CM subtypes was also associated with higher total healthcare costs compared to those without CM. Specifically, the highest point estimate of incremental cost per-person was observed among those reporting neglect (\$3683), though it was not statistically different from SA (\$2429), EA (\$2428), PA (\$2288), and EDV (\$1766). Across all five subtypes, these elevated per-person costs were driven by both increased service utilization probabilities and greater service use frequency per user – as indicated by greater per-user costs relative to individuals without CM.

A clear dose–response relationship was observed between the number of CM subtypes experienced and healthcare utilization probabilities, as well as associated costs. Specifically, the total HSU costs per person progressively increased from \$2678 for individual with one CM subtype, to \$3201 for those with two subtypes, and peaked at \$4997 for those with three or more subtypes. These represent increases of approximately 1.6-time (two subtypes) to 2.5-time (three or more subtypes) compared to individuals without CM (\$2014 per-person). The rise in per-person costs among those with multiple CM exposures was driven by both higher probabilities of service use and more service frequency per user – as indicated by greater average costs per user relative to those without CM.

Given ~20.8 million Australians aged above 16 in 2021 (Australian Bureau of Statistics, 2024b), and 62.2 % of them experienced some form of CM, the estimated incremental HSU costs due to CM amounted to roughly \$21.6 (95 % CI: \$20.4, \$22.8) billion for the Australian healthcare system.

### 3.4. Productivity costs

Table 3 presents the cost of productivity loss due to higher unemployment associated with CM in Australia. Overall, those with any CM had a higher unemployment rate (12.12 % vs 7.41 %) than those without CM. This translated into an average annual cost of productivity loss of \$2750 per person in the labor force with any CM. Given ~13.8 million people in the Australian labor force in 2021 (Australian Bureau of Statistics, 2022a) and ~64 % of them experienced CM, the productivity loss due to CM cost the Australian economy about \$24.1 billion in 2021.

The cost of productivity loss due to unemployment remained highest among individuals with any child neglect, followed by those with any EA, PA, SA, or EDV. The cost of productivity loss also increased with the number of CM subtypes reported. Individuals in the labor force with one CM subtype had an average annual productivity loss of \$760 per person. This cost increased to \$2940 and \$4466 for those with two and three or more subtypes, respectively.

### 3.5. Sensitivity analysis

Results were generally robust across all sensitivity analyses (Supplementary 4), except for the total OHA costs per user among those with any CM, EA, PA, neglect, and EDV. Specifically, when the lower bound of OHA costs was used, these per-user costs shifted from being significantly different to not significantly different from those without CM. Lastly, when the lifetime CM prevalence of 17.3 % was used, the incremental costs of HSU and productivity losses due to CM at population level reduced to \$6 and \$6.5 billion, respectively.

### 3.6. Subgroup analysis

The costs of health care between those with and without CM across subgroup analyses by age (Supplementary 5) and gender (Supplementary 6) showed relatively consistent patterns as in the full sample analyses. While the costs of HCs, OHAs, and total HSU did not differ between adolescents and adults, the costs of HCs and total HSU were notably higher in females and DGI individuals than in males.

## 4. Discussion

### 4.1. Summary of results

Our findings demonstrate that CM is associated with significantly higher per-person costs of HSU (1.83-time), including HCs (1.92-time) and OHAs (1.72-time) compared to no CM. This resulted in an additional \$21.6 billion in total HSU costs annually in Australia. Such substantial increase was driven by both higher probabilities of service utilization and greater service use frequency per user – as indicated by elevated per-user costs, particularly for mental health-related services across most of CM categories compared to no CM.

Similar per-person cost patterns were observed across individual CM subtypes. Experiencing any neglect was consistently associated with the highest point estimates of incremental costs per person across all healthcare services while experiencing any EDV showed the lowest. However, when isolating the impact of each CM subtype, only the sole experience of SA was associated with significant increases in the total HSU costs per person. A clear dose–response relationship was evident as the costs of all healthcare services increased progressively with the number of CM subtypes reported, especially among those with three or more subtypes.

Results were mostly robust across sensitivity analyses, except the population-level incremental costs of HSU and productivity losses, which varied proportionately with CM prevalence. Subgroup analyses by age groups and genders generally showed consistent cost patterns with the full sample analyses. However, per-person OHA costs for adolescents and DGI individuals with CM were not significantly higher than their peers without CM. Inter-group comparisons only found significant differences in HCs and total HSU costs across gender subgroups (e.g., females and DGI individuals vs males), but not across age groups.

Lastly, the costs of productivity loss also showed similar patterns as those in healthcare across all CM categories. For instance, the costs of productivity loss also increased progressively with the number of CM subtypes experienced. Overall, CM was associated with an additional \$24.1 billion (2021–22 A\$) in productivity loss in Australia.

#### 4.2. Comparison with previous studies

Our findings closely align with existing epidemiological evidence on health and employment impacts of CM (Carr et al., 2020; Gardner et al., 2019; Norman et al., 2012). The increased healthcare access and costs, particularly for mental health issues, found in this study were consistent with evidence showing the impacts of CM on the development of mental health conditions (e.g., depression, anxiety, and self-harm) in Australia (Grummitt et al., 2024; Scott et al., 2023) and globally (Sahle et al., 2022). Notably, SA, the only CM subtype listed in the global burden of disease as a risk factor for depression, was consistently found to increase HSU costs in this study. Moreover, the dose-response effects of multiple CM subtypes on HSU costs, especially mental health, found in this study are also consistent with clinical evidence on the increased risk of developing mental health issues (Edwards et al., 2003; Moore et al., 2015) as the number of CM subtypes reported increases. Nevertheless, the higher costs of mental health services might also be attributable to the inherently higher unit costs compared to other services related to physical health.

Results from our subgroup analyses were largely supported by existing evidence. Firstly, both adolescents and adults with CM had significantly higher per-person healthcare costs than their respective peers without CM, reinforcing systematic-review findings that CM is linked to substantial medical expenditure across both age groups (Brown et al., 2011) and clinical evidence of the sustained long-term impacts of CM on mental and physical health (Ramos et al., 2022; Springer et al., 2007; Winter et al., 2022). Secondly, in our subgroup analyses by genders, DGI individuals who experienced CM exhibited the highest total per-person HSU costs, followed by females and then males with CM. This finding aligns with a recent meta-analysis that reported larger impacts of CM on mental health in women than in men (Gallo et al., 2018) and other evidence showing that DGIs with CM faced a greater risk of developing mental health issues than cisgender individuals with CM (Madzoska et al., 2024). Moreover, while the probabilities of accessing healthcare services and the associated per-person costs among DGIs with CM were numerically higher than DGIs without CM, these differences were not statistically significant. This lack of significance is potentially due to the small sample size of the DGI subgroup, leading to limited statistical power, as evidenced by wide confidence intervals. Nevertheless, all of these evidences serve as early indications of the worsening health impacts of CM within the DGI population, warranting further investigation.

Together with previous Australian research (e.g., Gnanamanickam et al., 2023; McCarthy et al., 2016), the present study reaffirms that the significant health burden associated with CM translates into substantial healthcare costs in Australia. However, our estimates of incremental HSU costs (\$1670 per person aged over 16 and \$1605 per adult aged over 19) were lower than those reported by McCarthy et al. (2016), who employed a top-down costing approach. Specifically, these authors estimated incremental healthcare costs attributable to CM at \$62,519 (2014–15 A\$) over the lifetime (ages 0–65) and \$62,483 (2014–15 A\$) over adulthood (ages 18–65). When annualised under the assumption of constant annual costs over their respective time horizons, these figures equate to \$5158 and \$5301 (2020–21 A\$) per year, respectively. This discrepancy is likely attributable to different cost components and costing methods (top-down vs bottom-up) as demonstrated in previous studies (Chapko et al., 2009; Cunnaman et al., 2016). Nonetheless, our estimates may offer greater contextual relevance for the Australian setting, as they are derived from Australian data, whereas McCarthy et al. (2016) relied on PAFs adopted from the US.

By contrast, our estimates of total OHA costs per person with CM are partially consistent with Gnanamanickam et al. (2023), who also applied a comparable bottom-up costing approach and IHACPA costing algorithm. Specifically, adults with substantiated CM in their study had an average annual OHA costs of \$2290 (2017–18 A\$) or \$2381 (2020–21 A\$) per-person, closely aligning with our estimates of \$2364 (2020–21 A\$) per adult with CM. However, among adolescents with CM, our estimated per-person cost (\$3534 in 2020–21 A\$) was substantially higher than theirs (\$1050 in 2017–18 A\$, or \$1090 in 2020–21 A\$). These differences likely reflect methodological distinctions between the two studies. While our cross-sectional analysis used self-reported data of CM and HSU from a nationally representative sample of individuals aged above 16, Gnanamanickam et al. (2023) conducted a longitudinal analysis using administrative data from South Australia, tracking the CPS contacts and hospital service use among individuals up to 32 years of age. Nevertheless, the cost patterns between the two studies may suggest the healthcare service use and costs might vary in the short-term after CM was experienced but became more stable in the long-term.

Lastly, although McCarthy et al. (2016) provided the first Australian estimate of the cost of productivity loss associated with CM, their calculations relied on a 14 % employment rate gap observed in 2003–04 between middle-aged individuals with and without substantiated CM in the US. This gap notably exceeds our Australian estimates, making our estimated costs of productivity loss due to CM more relevant to the Australian context and economy climate.

#### 4.3. Policy implications

Our findings demonstrated the substantial economic consequences of CM in Australia. The cost of HSU associated with CM was estimated at \$21.6 billion annually - nearly 9 % of the total healthcare expenditure in Australia during 2021–2022 (AIHW, 2023). The cost of productivity loss associated with CM was estimated at a further \$24.1 billion annually.

This significant burden underscores the need for policymakers to prioritize early preventive interventions to reduce health and economic impacts of CM in Australia. In 2021–22, \$8.2 billion was allocated to services (e.g., family support, out-of-home care) for children at risk or affected by CM (Productivity Commission, 2023). However, this amount is only about one-third of the HSU costs associated with CM (\$8.2 vs \$21.6 billion), emphasizing a considerable potential for cost-saving when reducing the prevalence of CM, especially multi-type maltreatment, which was strongly associated with higher service use and health costs. Existing evidence suggests that individualized intensive and population-based parenting programs and early childhood education may be clinically effective and cost-effective in preventing CM (Le et al., 2024; Sanders et al., 2025). Further research is needed to explore the economic and implementation of evidence-based prevention of CM in Australia.

#### 4.4. Strengths and limitations

This study reported the first national estimates of HSU costs, encompassing HCs and OHAs, and productivity losses associated with CM using self-reported data from a nationally representative study on CM in Australia. The detailed assessment of CM experiences in the ACMS enabled the disaggregation of these costs by CM subtypes, number of CM subtypes, different age groups and genders. The use of unit costs from the ABS, MBS, and IHACPA, combined with employment, HSU, and CM data from the ACMS, ensured relevance to the Australian context. Findings from the base-case analysis were robust in sensitivity testing.

However, our results should be viewed with caution, given the inherent limitations of the ACMS data and the assumptions applied during costing. First, the HSU and productivity costs were estimated based on the self-reported CM cases derived from the JVQ-R2 instrument, which might differ from other instruments or administrative data. The retrospective cross-sectional design of the ACMS may introduce recall bias - especially for older participants reporting on long-passed events, and restricts our ability to capture long-term trajectories of HSU and associated costs associated with CM. Furthermore, the one-year recall period may underestimate the cumulative burden of CM on HSU. Thus, lifetime costs were not estimated in this study. Future research linking longitudinal data with administrative health records would provide more robust estimates. Additionally, because the ACMS was conducted during the COVID-19 pandemic, healthcare access and utilization patterns were greatly disrupted by public health restrictions, likely influencing observed HSU levels and associated costs.

Second, our HC cost estimates might not fully reflect the true costs, as the ACMS did not collect OOP costs. Although a 17 % OOP contribution was assumed, this might still underestimate the true costs. Nonetheless, sensitivity analyses varying OOP assumptions showed minimal influence on the overall findings. Moreover, the absence of other relevant service use, especially medication costs, also led to an underestimation of the total HSU costs.

Third, the reliability of OHA cost estimates might be affected by the limited hospital data in the ACMS and several simplifying assumptions were required to enable the costings. Specifically, the lack of data on admission-specific duration, complexity, and diagnosis required us to assume that the total number of hospital nights was evenly distributed across admission reasons. This assumption did not perfectly capture cost variation for individuals with multiple, unrelated hospitalizations as length of stay was used as a proxy indicator for illness complexity, which in turn affected the reliability of estimated costs. However, such impact was likely minimal, as 87 % of participants reported only one reason for admission, while another 10 % reported two reasons. Further, the matching of self-reported reasons for admission to Australian Refined Diagnosis Related Group (AR-DRG) codes might introduce potential misclassification, as formal diagnostic criteria (e.g., DSM or ICD codes) were not used in the ACMS. Furthermore, the list of AR-DRG codes used in our costing might not capture all relevant DRGs, particularly for conditions that span multiple DRGs and exhibit wide variation in cost weights like injuries.

Lastly, the cost of productivity loss associated with CM in this study was estimated based on the current employment status using the human capital approach, assuming individuals' employment statuses remained constant throughout the period of study. Although employment status may fluctuate at the individual level, the unemployment rate is relatively stable throughout the year at the population level using data from a nationally representative sample (ABS, 2022a). Since all working hours of those employed were assumed to be economically productive, the costs of productivity loss due to presenteeism and absenteeism were not explored. Future research should investigate these costs to provide a more comprehensive assessment of the productivity loss associated with CM in Australia.

## 5. Conclusion

Our findings demonstrated the substantial economic burden of CM in Australia. For each individual in the labor force with CM, there was an annual productivity loss of \$2750. Additionally, individuals who reported any CM also had an extra HSU cost of approximately \$1670 annually compared to those without CM. At the national population level, the additional annual costs of HSU and productivity loss due to CM amounted to roughly \$21.6 billion and \$24.1 billion, respectively. Experiencing any of the five CM subtypes resulted in higher total HSU costs. Subgroup analyses also demonstrated sustained impacts of CM on the costs of HSU over the long-term, especially among females and DGI individuals. The costs of productivity loss and HSU also increased with the number of CM subtypes experienced, with a significant portion of HSU costs related to mental health services. These findings highlight the urgent need to invest in preventive interventions for CM in Australia and employment support for many Australians who have experienced CM.

### CRedit authorship contribution statement

**Dai Quy Le:** Writing – review & editing, Writing – original draft, Methodology, Investigation, Formal analysis. **Long Khanh-Dao Le:** Writing – review & editing, Supervision, Project administration, Methodology, Investigation, Formal analysis, Conceptualization. **Marie Bee Hui Yap:** Writing – review & editing, Supervision, Methodology, Conceptualization. **Divna M. Haslam:** Writing – review & editing, Methodology, Data curation. **Daryl J. Higgins:** Writing – review & editing, Methodology, Data curation. **Eva Malacova:** Writing – review & editing, Data curation. **James G. Scott:** Writing – review & editing, Methodology, Data curation. **David Lawrence:** Writing – review & editing, Methodology, Data curation. **Ben Mathews:** Writing – review & editing, Methodology, Data curation, Conceptualization. **Cathrine Mihalopoulos:** Writing – review & editing, Validation, Supervision, Methodology, Investigation, Conceptualization.

## Funding

This work is supported by the Monash Graduate Scholarship and Monash International Tuition Scholarship awards from Monash University for Dai Quy Le.

## Declaration of competing interest

None.

## Acknowledgement

This research/work was supported by Dr. Tim Powers from the Monash Statistical Consulting Service, part of Monash eResearch.

## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.chiabu.2025.107818>.

## Data availability

Data are not available due to the agreement with the data owner – the Australian Child Maltreatment Study (ACMS). Information on accessing this data is available on the ACMS website (<https://www.acms.au/>).

## References

- AIHW. (2018). Patients' out-of-pocket spending on Medicare services 2016–17. <https://www.aihw.gov.au/reports/health-welfare-expenditure/patient-out-pocket-spending-medicare-2016-17/contents/summary>.
- AIHW. (2023). Health expenditure Australia 2021–22, summary. <https://www.aihw.gov.au/reports/health-welfare-expenditure/health-expenditure-australia-2021-22/contents/summary>.
- Australian Bureau of Statistics. (2008). National survey of mental health and wellbeing: Summary of results methodology, 2007. <https://www.abs.gov.au/methodologies/national-study-mental-health-and-wellbeing-methodology/2007>.
- Australian Bureau of Statistics. (2021). Data confidentiality guide. <https://www.abs.gov.au/book/export/28232/print>.
- Australian Bureau of Statistics. (2022a). Labour Force, Australia, December 2021. <https://www.abs.gov.au/statistics/labour/employment-and-unemployment/labour-force-australia/dec-2021>.
- Australian Bureau of Statistics. (2022b). Employee Earnings and Hours, Australia, May 2021. <https://www.abs.gov.au/statistics/labour/earnings-and-working-conditions/employee-earnings-and-hours-australia/may-2021>.
- Australian Bureau of Statistics. (2023). Earnings guide—Guide to labour statistics—Learn about our different earnings measures and how to use them. <https://www.abs.gov.au/statistics/understanding-statistics/guide-labour-statistics/earnings-guide>.
- Australian Bureau of Statistics. (2024a). Labour force, Australia methodology, May 2024. <https://www.abs.gov.au/methodologies/labour-force-australia-methodology/may-2024>.
- Australian Bureau of Statistics. (2024b). Historical population, 2021. <https://www.abs.gov.au/statistics/people/population/historical-population/latest-release>.
- Australian Institute of Family Studies. (2018). The economic costs of child abuse and neglect. <https://aifs.gov.au/resources/policy-and-practice-papers/economic-costs-child-abuse-and-neglect>.
- Australian Institute of Health and Welfare. (2021). *Health expenditure Australia 2019–20, The health sector relative to the economy*. Australian Institute of Health and Welfare. <https://www.aihw.gov.au/reports/health-welfare-expenditure/health-expenditure-australia-2019-20/contents/overview/the-health-sector-relative-to-the-economy>.
- Australian Institute of Health and Welfare. (2024). Child protection Australia 2021–22. <https://www.aihw.gov.au/reports/child-protection/child-protection-australia-2021-22/contents/about>.
- Baldwin, J. R., Coleman, O., Francis, E. R., & Danese, A. (2024). Prospective and retrospective measures of child maltreatment and their association with psychopathology: A systematic review and Meta-analysis. *JAMA Psychiatry*, 81(8), 769–781.
- Bellis, M. A., Hughes, K., Ford, K., Ramos Rodriguez, G., Sethi, D., & Passmore, J. (2019). Life course health consequences and associated annual costs of adverse childhood experiences across Europe and North America: A systematic review and meta-analysis. *The Lancet. Public Health*, 4(10), e517–e528. [https://doi.org/10.1016/S2468-2667\(19\)30145-8](https://doi.org/10.1016/S2468-2667(19)30145-8)
- Bonomi, A. E., Anderson, M. L., Rivara, F. P., Cannon, E. A., Fishman, P. A., Carrell, D., ... Thompson, R. S. (2008). Health care utilization and costs associated with childhood abuse. *Journal of General Internal Medicine*, 23(3), 294–299.
- Brown, D. S., Fang, X., & Florence, C. S. (2011). Medical costs attributable to child maltreatment: A systematic review of short- and long-term effects. *American Journal of Preventive Medicine*, 41(6), 627–635. <https://doi.org/10.1016/j.amepre.2011.08.013>
- Bull, C., Trott, M., & Kisely, S. (2025). Addressing the challenges of child maltreatment measurement: Examining the types of data we use and how we use them. *Australian & New Zealand Journal of Psychiatry*, 59(4), 301–303. <https://doi.org/10.1177/00048674251320308>
- Bunting, L., Davidson, G., McCartan, C., Hanratty, J., Bywaters, P., Mason, W., & Steils, N. (2018). The association between child maltreatment and adult poverty – A systematic review of longitudinal research. *Child Abuse & Neglect*, 77, 121–133.
- Campbell, K. A., Telford, S. R., Cook, L. J., Waitzman, N. J., & Keenan, H. T. (2016). Medicaid expenditures for children remaining at home after a first finding of child maltreatment. *Pediatrics*, 138(3), Article e20160439. <https://doi.org/10.1542/peds.2016-0439>
- Carr, A., Duff, H., & Craddock, F. (2020). A systematic review of reviews of the outcome of noninstitutional child maltreatment. *Trauma, Violence & Abuse*, 21(4), 828–843.
- Chapko, M. K., Liu, C.-F., Perkins, M., Li, Y.-F., Fortney, J. C., & Maciejewski, M. L. (2009). Equivalence of two healthcare costing methods: Bottom-up and top-down. *Health Economics*, 18(10), 1188–1201. <https://doi.org/10.1002/hec.1422>
- Conti, G., Pizzo, E., Morris, S., & Melnychuk, M. (2021). The economic costs of child maltreatment in UK. *Health Economics*, 30(12), 3087–3105. <https://doi.org/10.1002/hec.4409>

- Corso, P. S., Edwards, V. J., Fang, X., & Mercy, J. A. (2008). Health-related quality of life among adults who experienced maltreatment during childhood. *American Journal of Public Health*, 98(6), 1094–1100. <https://doi.org/10.2105/AJPH.2007.119826>
- Cort, N. A., Cerulli, C., & He, H. (2010). Investigating health disparities and disproportionality in child maltreatment reporting: 2002–2006. *Journal of Public Health Management and Practice: JPHMP*, 16(4), 329–336. <https://doi.org/10.1097/PHH.0b013e3181c4d933>
- Cunnama, L., Sinanovic, E., Ramma, L., Foster, N., Berrie, L., Stevens, W., ... Vassall, A. (2016). Using top-down and bottom-up costing approaches in LMCs: The case for using both to assess the incremental costs of new technologies at scale. *Health Economics*, 25(S1), 53–66. <https://doi.org/10.1002/hec.3295>
- Currie, J., & Widom, C. S. (2010). Long-term consequences of child abuse and neglect on adult economic well-being. *Child Maltreatment*, 15(2), 111–120.
- Department of Health. (2021). *Medicare benefits schedule book operating from 1 November 2021*. Australian Government Department of Health. [https://www.mbsonline.gov.au/internet/mbsonline/publishing.nsf/Content/5CED1C3BD91E21BCA25875700113FF4/\\$File/MBS-Book-2021111.pdf](https://www.mbsonline.gov.au/internet/mbsonline/publishing.nsf/Content/5CED1C3BD91E21BCA25875700113FF4/$File/MBS-Book-2021111.pdf).
- Edwards, V. J., Holden, G. W., Felitti, V. J., & Anda, R. F. (2003). Relationship between multiple forms of childhood maltreatment and adult mental health in community respondents: Results from the adverse childhood experiences study. *The American Journal of Psychiatry*, 160(8), 1453–1460. <https://doi.org/10.1176/appi.ajp.160.8.1453>
- Everson, M. D., Smith, J. B., Hussey, J. M., English, D., Litrownik, A. J., Dubowitz, H., ... Runyan, D. K. (2008). Concordance between adolescent reports of childhood abuse and Child Protective Service determinations in an at-risk sample of young adolescents. *Child Maltreatment*, 13(1), 14–26. <https://doi.org/10.1177/1077559507307837>
- Fair Work Ombudsman. (2024). Annual leave. <https://www.fairwork.gov.au/leave/annual-leave>.
- Fallon, B., Trocmé, N., Fluke, J., MacLaurin, B., Tonmyr, L., & Yuan, Y.-Y. (2010). Methodological challenges in measuring child maltreatment. *Child Abuse & Neglect*, 34(1), 70–79.
- Fang, X., Brown, D. S., Florence, C. S., & Mercy, J. A. (2012). The economic burden of child maltreatment in the United States and implications for prevention. *Child Abuse & Neglect*, 36(2), 156–165. <https://doi.org/10.1016/j.chiabu.2011.10.006>
- Gallo, E. A. G., Munhoz, T. N., Loret de Mola, C., & Murray, J. (2018). Gender differences in the effects of childhood maltreatment on adult depression and anxiety: A systematic review and meta-analysis. *Child Abuse & Neglect*, 79, 107–114. <https://doi.org/10.1016/j.chiabu.2018.01.003>
- Gardner, M. J., Thomas, H. J., & Erskine, H. E. (2019). The association between five forms of child maltreatment and depressive and anxiety disorders: A systematic review and meta-analysis. *Child Abuse & Neglect*, 96, Article 104082. <https://doi.org/10.1016/j.chiabu.2019.104082>
- Gnanamanickam, E. S., Brown, D. S., Armfield, J. M., & Segal, L. (2023). Excess hospital costs incurred by individuals with child abuse and neglect history in South Australia: A birth-cohort study. *Preventive Medicine*, 166, Article 107378. <https://doi.org/10.1016/j.ypmed.2022.107378>
- Gnanamanickam, E. S., & Segal, L. (2024). Receipt of parenting, disability, unemployment, and other income support payments in persons aged 16 to 33 years – The associations with child maltreatment. *Child Abuse & Neglect*, 154, Article 106925.
- Grummitt, L., Baldwin, J. R., Lafa'o'i, J., Keyes, K. M., & Barrett, E. L. (2024). Burden of mental disorders and suicide attributable to childhood maltreatment. *JAMA Psychiatry*, 81(8), 782–788. <https://doi.org/10.1001/jamapsychiatry.2024.0804>
- Haslam, D. M., Lawrence, D. M., Mathews, B., Higgins, D. J., Hunt, A., Scott, J. G., ... Malacova, E. (2023). The Australian Child Maltreatment Study (ACMS), a national survey of the prevalence of child maltreatment and its correlates: Methodology. *The Medical Journal of Australia*, 218 Suppl 6(Suppl 6), S5–S12. <https://doi.org/10.5694/mja2.51869>
- Higgins, D. J., Mathews, B., Pacella, R., Scott, J. G., Finkelhor, D., Meinck, F., ... Dunne, M. P. (2023). The prevalence and nature of multi-type child maltreatment in Australia. *Medical Journal of Australia*, 218(S6), S19–S25. <https://doi.org/10.5694/mja2.51868>
- Le, D. Q., Le, L. K.-D., Pe, P. H., Yap, M. B. H., & Mihalopoulos, C. (2024). Cost effectiveness of interventions to prevent the occurrence and the associated economic impacts of child maltreatment: A systematic review. *Child Abuse & Neglect*, 106863.
- Lee, Y.-C., Chatterton, M. L., Magnus, A., Mohebbi, M., Le, L. K.-D., & Mihalopoulos, C. (2017). Cost of high prevalence mental disorders: Findings from the 2007 Australian National Survey of Mental Health and Wellbeing. *Australian & New Zealand Journal of Psychiatry*, 51(12), 1198–1211. <https://doi.org/10.1177/0004867417710730>
- Madzosa, M., Lawrence, D., Higgins, D. J., Haslam, D. M., Mathews, B., Malacova, E., ... Scott, J. G. (2024). Child maltreatment, mental health disorders, and health risk behaviors in people with diverse gender identities. *Journal of Interpersonal Violence*, 40(9–10), 2281–2306.
- Malik, A., Sinclair, J., Ng, C. H. M., Smith, C. A., Abbott, J., & Armour, M. (2022). Allied health and complementary therapy usage in Australian women with chronic pelvic pain: A cross-sectional study. *BMC Women's Health*, 22(1), 37.
- Marques, A. P., Macedo, A. F., Lima Ramos, P., Moreno, L. H., Butt, T., Rubin, G., & Santana on behalf of the Portuguese visual impairment study group (PORVIS-group). (2019). Productivity losses and their explanatory factors amongst people with impaired vision. *Ophthalmic Epidemiology*, 26(6), 378–392. <https://doi.org/10.1080/09286586.2019.1632904>
- Mathews, B., Bromfield, L., Walsh, K., & Vimpani, G. (2015). *Child abuse and neglect: A socio-legal study of mandatory reporting in Australia - report for the Australian government*. Queensland University of Technology. [https://www.dss.gov.au/sites/default/files/documents/03\\_2016/child-abuse-and-neglect-v1-aust-gov.pdf](https://www.dss.gov.au/sites/default/files/documents/03_2016/child-abuse-and-neglect-v1-aust-gov.pdf).
- Mathews, B., Meinck, F., Erskine, H. E., Tran, N., Lee, H., Kellard, K., ... Haslam, D. M. (2023). Adaptation and validation of the Juvenile Victimization Questionnaire-R2 for a national study of child maltreatment in Australia. *Child Abuse & Neglect*, 139, Article 106093. <https://doi.org/10.1016/j.chiabu.2023.106093>
- Mathews, B., Pacella, R., Dunne, M., Scott, J., Finkelhor, D., Meinck, F., ... Lawrence, D. (2021). The Australian Child Maltreatment Study (ACMS): Protocol for a national survey of the prevalence of child abuse and neglect, associated mental disorders and physical health problems, and burden of disease. *BMJ Open*, 11(5), Article e047074.
- Mathews, B., Pacella, R., Scott, J. G., Finkelhor, D., Meinck, F., Higgins, D. J., ... Dunne, M. P. (2023). The prevalence of child maltreatment in Australia: Findings from a national survey. *Medical Journal of Australia*, 218(S6), S13–S18. <https://doi.org/10.5694/mja2.51873>
- McCarthy, M. M., Taylor, P., Norman, R. E., Pezzullo, L., Tucci, J., & Goddard, C. (2016). The lifetime economic and social costs of child maltreatment in Australia. *Children and Youth Services Review*, 71, 217–226. <https://doi.org/10.1016/j.childyouth.2016.11.014>
- Medicare Benefits Schedule. (2024). *MBS online*. Australian Government Department of Health and Ageing. <http://www.mbsonline.gov.au>.
- Mehta, D., Kelly, A. B., Laurens, K. R., Haslam, D., Williams, K. E., Walsh, K., ... Mathews, B. (2023). Child maltreatment and long-term physical and mental health outcomes: An exploration of biopsychosocial determinants and implications for prevention. *Child Psychiatry & Human Development*, 54(2), 421–435.
- Moore, S. E., Scott, J. G., Ferrari, A. J., Mills, R., Dunne, M. P., Erskine, H. E., ... Norman, R. E. (2015). Burden attributable to child maltreatment in Australia. *Child Abuse & Neglect*, 48, 208–220.
- Neil, A. L., Islam, F., Kariuki, M., Laurens, K. R., Katz, I., Harris, F., ... Green, M. J. (2020). Costs for physical and mental health hospitalizations in the first 13 years of life among children engaged with Child Protection Services. *Child Abuse & Neglect*, 99, Article 104280.
- Norman, R. E., Byambaa, M., De, R., Butchart, A., Scott, J., & Vos, T. (2012). The long-term health consequences of child physical abuse, emotional abuse, and neglect: A systematic review and meta-analysis. *PLoS Medicine*, 9(11), Article e1001349.
- Pacella, R., Nation, A., Mathews, B., Scott, J. G., Higgins, D. J., Haslam, D. M., ... Monks, C. (2023). Child maltreatment and health service use: Findings of the Australian Child Maltreatment Study. *Medical Journal of Australia*, 218(S6), S40–S46.
- Peterson, C., Florence, C., & Kleven, J. (2018). The economic burden of child maltreatment in the United States, 2015. *Child Abuse & Neglect*, 86, 178–183.
- Productivity Commission. (2023). *16 child protection services—Report on government services 2023*. <https://www.pc.gov.au/ongoing/report-on-government-services/2023/community-services/child-protection>.
- Ramos, B., Dion, J., Böthe, B., Girouard, A., Hébert, M., Wong, E., & Bergeron, S. (2022). Cumulative interpersonal childhood adversity and post-traumatic stress symptoms across heterosexual, cisgender and gender and sexually diverse adolescents: The mediating role of emotion regulation. *Child Abuse & Neglect*, 124, Article 105454.
- Ramsey, S. D., Willke, R. J., Glick, H., Reed, S. D., Augustovski, F., Jonsson, B., ... Sullivan, S. D. (2015). Cost-effectiveness analysis alongside clinical trials II—An ISPOR good research practices task force report. *Value in Health*, 18(2), 161–172.
- Reserve Bank of Australia. (2024). *Unemployment: Its measurement and types (Australia)*. Reserve Bank of Australia. <https://www.rba.gov.au/education/resources/explainers/unemployment-its-measurement-and-types.html>.

- Russell, L., & Doggett, J. (2019). *A road map for tackling out-of-pocket health care costs* (Australia). <https://apo.org.au/node/219221>.
- Sahle, B. W., Reavley, N. J., Li, W., Morgan, A. J., Yap, M. B. H., Reupert, A., & Jorm, A. F. (2022). The association between adverse childhood experiences and common mental disorders and suicidality: An umbrella review of systematic reviews and meta-analyses. *European Child & Adolescent Psychiatry*, 31(10), 1489–1499. <https://doi.org/10.1007/s00787-021-01745-2>
- Sanders, M. R., Clague, D., Zając, T., Baxter, J., Western, M., Chainey, C., ... Burke, K. (2025). Parenting, child maltreatment, and social disadvantage: A population-based implementation and evaluation of the triple P system of evidence-based parenting support. *Child Maltreatment*, 30(1), 177–191.
- Scott, J. G., Malacova, E., Mathews, B., Haslam, D. M., Pacella, R., Higgins, D. J., ... Thomas, H. J. (2023). The association between child maltreatment and mental disorders in the Australian Child Maltreatment Study. *The Medical Journal of Australia*, 218 Suppl 6(Suppl 6), S26–S33.
- Springer, K. W., Sheridan, J., Kuo, D., & Carnes, M. (2007). Long-term physical and mental health consequences of childhood physical abuse: Results from a large population-based sample of men and women. *Child Abuse & Neglect*, 31(5), 517–530.
- Stoltenborgh, M., Bakermans-Kranenburg, M. J., Alink, L. R. A., & van IJzendoorn, M. H. (2015). The prevalence of child maltreatment across the globe: Review of a series of meta-analyses. *Child Abuse Review*, 24(1), 37–50. <https://doi.org/10.1002/car.2353>
- Tang, B., Jamieson, E., Boyle, M., Libby, A., Gafni, A., & MacMillan, H. (2006). The influence of child abuse on the pattern of expenditures in women's adult health service utilization in Ontario, Canada. *Social Science & Medicine*, 63(7), 1711–1719.
- Taylor, P., Moore, P., Pezzullo, L., Tucci, J., Goddard, C., & De Bortoli, L. (2008). *The cost of child abuse in Australia*. Access Economics.
- The Independent Hospital Pricing Authority. (2021). National efficient price determination 2021–22. <https://www.ihacpa.gov.au/sites/default/files/2022-02/National%20Efficient%20Price%20Determination%202021%E2%80%9322.pdf>.
- WHO. (2024). Adolescent health. <https://www.who.int/health-topics/adolescent-health>.
- Winter, S. M., Dittrich, K., Dörr, P., Overfeld, J., Moebus, I., Murray, E., ... Heim, C. (2022). Immediate impact of child maltreatment on mental, developmental, and physical health trajectories. *Journal of Child Psychology and Psychiatry*, 63(9), 1027–1045.
- World Health Organization. (2006). *Preventing child maltreatment : a guide to taking action and generating evidence / World Health Organization and International Society for Prevention of Child Abuse and Neglect*. World Health Organization. World Health Organization. <https://iris.who.int/handle/10665/43499>.
- Zhang, W., Bansback, N., & Anis, A. H. (2011). Measuring and valuing productivity loss due to poor health: A critical review. *Social Science & Medicine*, 72(2), 185–192.
- Zhou, J., Williams, C., Keng, M. J., Wu, R., & Mihaylova, B. (2024). Estimating costs associated with disease model states using generalized linear models: A tutorial. *Pharmacoeconomics*, 42(3), 261–273. <https://doi.org/10.1007/s40273-023-01319-x>
- Zielinski, D. S. (2009). Child maltreatment and adult socioeconomic well-being. *Child Abuse & Neglect*, 33(10), 666–678. <https://doi.org/10.1016/j.chiabu.2009.09.001>