



Child Maltreatment and Long-Term Physical and Mental Health Outcomes: An Exploration of Biopsychosocial Determinants and Implications for Prevention

Divya Mehta^{1,2,3} · Adrian B. Kelly^{2,4,5} · Kristin R. Laurens^{2,4,5} · Divna Haslam^{2,6} · Kate E. Williams^{2,7,8} · Kerryann Walsh^{2,7,8} · Philip R. A. Baker^{2,9} · Hannah E. Carter^{2,9} · Nigar G. Khawaja^{2,5} · Oksana Zelenko² · Ben Mathews^{2,10,11}

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Abstract

Child maltreatment rates remain unacceptably high and rates are likely to escalate as COVID-related economic problems continue. A comprehensive and evidence-building approach is needed to prevent, detect and intervene where child maltreatment occurs. This review identifies key challenges in definitions, overviews the latest data on prevalence rates, reviews risk and protective factors, and examines common long-term mental health outcomes for children who experience maltreatment. The review takes a systems approach to child maltreatment outcomes through its focus on the overall burden of disease, gene-environment interactions, neurobiological mechanisms and social ecologies linking maltreatment to mental ill-health. Five recommendations relating to the accurate measurement of trends, research on brain structures and processes, improving the reach and impact of teleservices for detecting, preventing and treating child maladjustment, community-based approaches, and building population-focused multidisciplinary alliances and think tanks are presented.

Keywords Child abuse and neglect · Child maltreatment · Outcomes · School-based prevention · Community-based prevention · Family-oriented prevention

Divya Mehta, Adrian B. Kelly, Kristin R. Laurens, Divna Haslam, Kate E. Williams, Kerryann Walsh, Philip Baker, Hannah E. Carter, Nigar Khawaja and Ben Mathews have contributed equally to this work.

Divya Mehta and Adrian B. Kelly are joint first authors.

✉ Adrian B. Kelly
a.kelly@qut.edu.au

¹ Centre for Genomics and Personalised Health, Queensland University of Technology (QUT), Brisbane, Australia

² Present Address: Child Adversity, Mental Health and Resilience Theme, Centre for Child Health and Well-being, Queensland University of Technology (QUT), Brisbane, Australia

³ School of Biomedical Sciences, Queensland University of Technology, Brisbane, Australia

⁴ Centre for Inclusive Education, Queensland University of Technology (QUT), Brisbane, Australia

⁵ School of Psychology and Counselling, Queensland University of Technology (QUT), Brisbane, Australia

Introduction

There is a major expansion in awareness of the prevalence and impact of adverse childhood experiences (ACEs) and child maltreatment in particular. The devastating impact of sexual, physical and emotional abuse on survivor well-being,

⁶ Parenting and Family Support Centre, The University of Queensland, Brisbane, Australia

⁷ School of Early Childhood and Inclusive Education, Queensland University of Technology (QUT), Brisbane, Australia

⁸ Centre for Child & Family Studies, Queensland University of Technology (QUT), Brisbane, Australia

⁹ School of Public Health and Social Work, Faculty of Health, Queensland University of Technology (QUT), Brisbane, Australia

¹⁰ School of Law, Queensland University of Technology (QUT), Brisbane, Australia

¹¹ Bloomberg School of Public Health, Johns Hopkins University, Baltimore, USA

the trusted institutions that failed to protect children, and the need for improving complaints mechanisms and institutional regulation/oversight has often been discussed [1]. The paper is organised into four parts: (1) Epidemiology, (2) systematic factors, (3) prevention, and (4) recommendations (Fig. 1). In this paper we overview definitions, heuristics for categorisation, prevalence rates, health and economic consequences of child maltreatment and school and family-oriented prevention and intervention approaches. We highlight the ongoing challenges of conducting high quality research into the development and prevention of child maltreatment, particularly in the age of COVID, when social isolation is high, and economic recession is uncovering structural inequalities, many of which are perpetuated by unequal distribution of resources, rights, and opportunities and are also known, in turn, to perpetuate child maltreatment. We argue that there are unique opportunities for the provision of evidence-based programs via recent e-health technology investments, but we will need reliable ways of measuring trends and investment in government and nongovernment coalitions to reach those most in need.

Epidemiology of Childhood Maltreatment

Definitions

Child maltreatment is universally understood to include four main types: sexual abuse, physical abuse, emotional or

psychological abuse, and neglect [2]. Increasingly, epidemiological and other studies include exposure to intimate partner violence as a fifth form [3]. Child maltreatment are forms of adverse childhood experiences (ACEs), a broad term that also includes exposure to family mental health problems, incarceration, substance use, parental separation/divorce, as well as poverty, bullying, racial discrimination, and separation from immigrant parents [4]. Defining the nature of each form of child maltreatment is complex, but robust conceptual models have developed over time to establish growing consensus. Physical abuse is generally understood to involve intentional acts of physical force by a parent or caregiver [5]; it is normally seen as excluding lawful corporal punishment. Sexual abuse involves contact and non-contact sexual acts, inflicted by any adult or child in a position of power over the victim, to seek or obtain physical or mental sexual gratification, when the child does not have capacity to provide consent, or has capacity but does not provide consent [6]. Emotional or psychological abuse is inflicted by a parent or caregiver, and includes hostile interactions (such as belittling, degrading, shaming, denigrating or ridiculing a child, and rejection of the child), emotional unavailability (ignoring a child), developmentally inappropriate interactions, failure to acknowledge the child's individuality, and failure to integrate the child into the social world [7, 8]. Neglect involves parental or caregiver omissions to provide the necessities of life, as suited to the child's developmental stage, and as recognised by the child's cultural context. Neglect includes multiple dimensions, including physical,

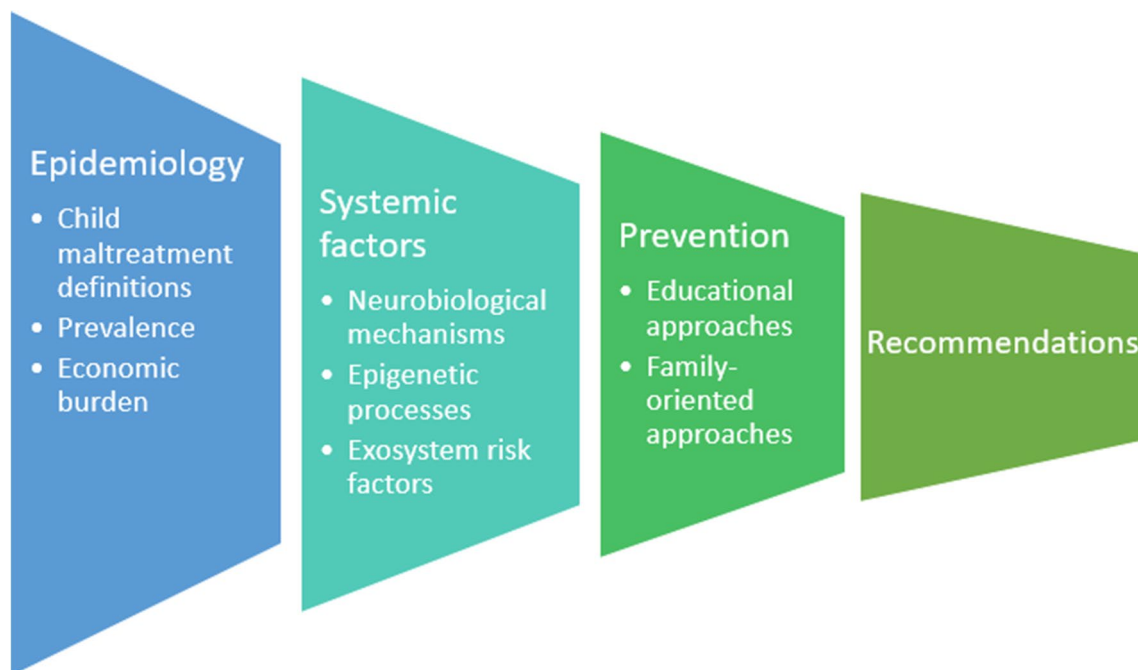


Fig. 1 Heuristic framework for this review of literature on child maltreatment

emotional, medical, environmental, supervisory, and educational neglect [9]. Exposure to domestic violence involves witnessing a family member being subjected to physical assaults, threats or property damage by another adult or teenager normally resident in the household. It extends to witnessing other forms of non-physical behaviour that is sexually, financially, or verbally coercive, or which isolates someone from their family or friends [10, 11].

Prevalence

As of 2015, some 244 publications from across the globe were available on the prevalence of child maltreatment and 551 prevalence points were available across four forms of child maltreatment (excluding domestic violence) [12], but comparatively few of these are national prevalence studies that report on all or most domains of child maltreatment [13]. The challenges of estimating child maltreatment are well established and widely recognised [13].

A key challenge is reconciling the disparities between official child protection agency data, informant studies (where data relies on sentinel reports, for example reports from police and educational and welfare workers), and self-report studies. The available evidence is that only 5% of child physical abuse and 8% of child sexual abuse is reported to child protection authorities [14]. The core reason for low child abuse estimates in official child protection agency data is that most cases are not reported. Even for reported cases, abuse may not be officially confirmed despite being present, and therefore not included in child abuse estimates [15]. Nondisclosure rates are high for multiple reasons: maltreatment occurs in private; many cases involve infants who are not in regular contact with protective adults outside the home; parents do not self-report; children themselves do not report; maltreatment is difficult to detect; and even when detected by others, it is frequently not reported. For some types of abuse in particular, non-disclosure is typical. With sexual abuse, for example, the child may be preverbal, deceived into believing the abuse is normal, reticent to report because of shame and guilt, or fear reprisals [15]. Accordingly, prevalence rates drawn from agency data lead to underestimates of prevalence because the majority of childhood maltreatment does not come to the attention of such agencies. Combined (male and female) lifetime prevalence rates from informant studies range from 0.3% for physical abuse and emotional abuse to 0.4% for sexual abuse. Furthermore, agencies typically are under-resourced and therefore prioritise responses to children suspected of experiencing more severe maltreatment; many reported cases are screened out, or not investigated, or are investigated but do not lead to officially recorded maltreatment for technical reasons. Also, informant studies are typically based on one-year

temporal windows, whereas self-report studies tend to cover longer temporal windows, such as lifetime prevalence [12].

These data from informant studies stand in stark contrast to lifetime prevalence rates from self-report studies. Systematic reviews and meta-analyses of self-report studies indicate rates of 12.7% for sexual abuse; 22.6% for physical abuse; 36.3% for emotional abuse; 16.3% for physical neglect; and 18.4% for emotional neglect [12]. Based on international studies up to 2014, more recent systematic reviews of some 337 studies found higher prevalence rates for sexual abuse [16]. Median lifetime prevalence of sexual abuse was found to be 28.8% for Australian females and 20.4% for North American girls, and for males, these indices were 6.1% and 14.1% for Australians and North Americans respectively. Moody et al. (2018) also found that combined rates (females and males) for lifetime prevalence of physical abuse were 6.7% and 18.1% for Australia versus North America [17]. For child emotional/psychological abuse, combined rates for lifetime prevalence were 9.2% and 23.9% for Australia versus North America. For child neglect, combined rates (females and males) for lifetime prevalence were 14.4% and 30.1% for Australia versus North America. In a recent analysis of U.S. national survey data on exposure to violence (2011–2014) [18], it was found that 6.1% of children reported some form of neglect in the past year, and 15.1% reported neglect at some point in their lives. In the European Region, it has been estimated that 18 million children suffer from sexual abuse, 44 million from physical abuse and 55 million from mental abuse, with child maltreatment leading to the premature death of 852 children under 15 years old each year [17].

The above median prevalence rates bely great variability across studies, leading researchers in the field to recommend improvements in measurement of childhood maltreatment [13]. Due to the specific questions asked, it is likely that some studies underestimate the prevalence of maltreatment. Based on a systematic review of some 30 national prevalence studies crossing all or most forms of child abuse and neglect [13], Mathews et al. recommend “behaviourally specific questions grounded in sound constructs of maltreatment with representative samples of the population (p. 14)”. Many studies use measures for which psychometric data are unavailable or not reported or are based on vague operational categories.

Health and Economic Burden

While child maltreatment has historically been perceived as a child protection matter, a criminal justice issue, and a broader social concern, there is increasing recognition of its status as a major public health concern with substantial economic impact [19]. Maltreated children may experience long term impacts on mental, physical and reproductive

health, with economic implications for health, welfare and justice systems as well as productivity losses from reduced labour force participation rates [20]. A comprehensive understanding of the health and economic burden associated with child maltreatment is essential in determining the potential benefits of preventive measures. However, there is limited evidence for this internationally. Childhood sexual abuse was the only form of maltreatment that was included in the Global Burden of Disease 2010 study. A paucity of literature on the burden of other forms of maltreatment has been noted [2, 21].

Childhood maltreatment is a known precursor to a range of mental health and high-risk behaviours that compound the risk of ill health [22]. Child sexual abuse frequently causes immediate and intractable negative physical, psychological, and social problems [23] and when sexual abuse co-occurs with other ACEs (as it often does), the risks of adverse medical and mental health problems are higher than for other combinations of ACEs [24]. Consequences commonly include post-traumatic stress disorder (PTSD) [25], obesity and eating disorders [26–28], alcohol and drug problems [29–33], poor school achievement [34], depression [35, 36], dissociation [37], social impairment [38], antisocial behaviour, anxiety [39], self-harm and suicide [40, 41], and increased chance of revictimization [42, 43]. In students from high-achieving schools, ACEs were associated with between two and five-fold increases in adult psychiatric diagnoses, depending on the extent of exposure to ACEs [44]. Reviews have highlighted the high rates of insecure disorganised and dissociative attachment styles in situations of severe and ongoing maltreatment [45]. Vanderminden et al. [18] found evidence that neglect has been associated with increased trauma, suicidality, and underage alcohol and drug use.

The economic burden of child maltreatment can be considered in the context of direct costs incurred by society for health service use, child welfare, criminal justice and education systems. Additionally, monetary costs may be assigned to the impacts on morbidity and mortality using measures such as DALYs or quality adjusted life years (QALYs). The types of costs assigned, and the valuation method adopted, mean that findings of different studies cannot be directly compared. Nonetheless, published evidence indicates the economic costs are substantial at both an individual and societal level.

In the USA, the total estimated per-victim cost of nonfatal child maltreatment was \$830,928 in 2018. This included direct costs of approximately \$70,000 for health, welfare, justice and education costs, and \$760,000 in monetised costs of QALYs lost due to child maltreatment. Fatal child maltreatment was valued at \$16.6 million per victim [46]. Together these estimates translated to a total US population burden of approximately \$2 trillion. The total annual cost of

child sexual abuse has been estimated at £3.2 billion in the United Kingdom in 2013 [47]. This included criminal justice system costs (£149 million), services for children (£124 million), child depression (£1.6 million), child suicide and self-harm (£1.9 million), adult mental and physical health care (£178 million), and loss of productivity (£2.7 million).

In China, Fang et al. estimated an economic burden of child maltreatment by converting DALY losses to a monetary value, assuming that one DALY was equivalent to the per capita Gross Domestic Product [21]. The burden of physical abuse of children was equivalent to 0.84% of China's Gross Domestic Product (GDP), or \$US 50 billion in 2010. Losses for emotional and sexual abuse in children were 0.47% and 0.39% of GDP respectively. Similar assumptions were applied in the Fang et al. analysis of the economic burden of child maltreatment in East Asia and Pacific regions [48]. This study estimated economic value of DALYs lost to child maltreatment accounted for 1.88% of the region's GDP, with higher proportions observed in low-income regions. This translated to an economic burden of \$194 billion in 2012 US dollars. In their recent systematic review and meta-analysis, Bellis et al. [49] found that the total annual costs attributable to adverse childhood experiences (ACEs) were estimated to be US\$581 billion in Europe and \$748 billion in North America, and that even a 10% reduction in the prevalence of ACEs could result in annual savings of 3 million DALYs or \$105 billion.

Systemic Factors Associated with Child Maltreatment

Emphasising the pivotal roles of communities, families and schools in protecting children from maltreatment, we discuss systemic determinants of child maltreatment within Bronfenbrenner's social ecological framework [50, 51]. In this framework, child risk and protective factors are viewed as multi-systemic and often nested (e.g., risk and protective factors at the child, family, community level). We use this framework as a heuristic mechanism, rather than a theoretically driven mechanism, because empirical research favours a cumulative risk model of child abuse potential over a social ecological framework (i.e., risks significantly predict child abuse potential regardless of which level of social system they arise from) [52]. We begin with an overview of micro and mesosystems linked to trauma, including neurobiological and epigenetic mechanisms linked to trauma, then draw on attachment and trauma theories to highlight exosystemic influences, including coverage of the longstanding damage that arises from threats to safety and broken trust [45], and the importance of well-functioning, evidence-based and well-resourced support structures for maltreated children in their recovery journey [53].

Neurobiological Mechanisms

Childhood maltreatment elicits a cascade of neurodevelopmental alterations that increase vulnerability to poor health in adulthood [54, 55]. Core changes include sustained stress-related alterations in the neuroendocrine system and related brain structures, including the hypothalamic–pituitary–adrenal (HPA) axis and locus coeruleus/autonomic nervous system. Other neurobiological changes associated with early life stress are discussed in recent reviews of neuroimmune and inflammation pathways [56, 57], microbiome, oxidative stress, metabolic, and sleep/circadian system changes [56].

Influential recent proposals have reconceptualised the brain changes that follow early maltreatment exposure from non-specific stress-related *damage* to an *adaptive response* that may help the child cope in the maladaptive context, albeit potentially incurring increased risk of psychopathology or other poor health outcomes [54, 58]. Stress-induced changes elicited by abusive experiences commence with alterations of glucocorticoid, noradrenergic, and vasopressin-oxytocin stress systems and neurotransmitters. These affect basic neurodevelopmental processes (neurogenesis, synaptic pruning, and myelination) during sensitive periods in individuals with genetic vulnerability, inducing downstream effects on the structure and/or function of brain regions that have a high density of glucocorticoid receptors and undergo protracted postnatal development [54, 55]. The limbic structures of the hippocampus and amygdala, which support memory formation/organisation and emotional reactions, respectively, have been a particular focus of child maltreatment research. Volume reduction of the adult, but not child, hippocampus is a consistent finding, including in non-clinical samples unconfounded by the stress of experiencing mental health difficulties and the effect of receiving treatment [59]. These effects may be more pronounced in hippocampi of men relative to women [54], with age and gender constituting important moderators of brain changes following maltreatment. Structural alterations in the amygdala are inconsistent, with both reductions and increases in volume reported, perhaps relating to different psychopathologies across study samples [59, 60].

Other structural brain changes are reported in the prefrontal cortex (PFC) structures supporting higher-order executive functioning [anterior cingulate gyrus (ACC), orbitofrontal cortex, and dorsolateral PFC], the cerebellum and caudate, and in the corpus callosum and other white matter tracts supporting network connectivity [54, 56, 60]. The *type* of maltreatment may engender specific alternations in regions and pathways related to that aversive experience, such as genitosenory cortex thinning in adult women exposed to childhood sexual abuse [61], though few studies have directly compared brain changes across maltreatment subtypes [62].

Functional neuroimaging in maltreated individuals has identified changes in regions and pathways associated with four neurocognitive systems: threat and reward processing, emotion regulation, and executive control [58, 63]. The amygdala is hyperactive during threat processing and hypoactive during avoidance, and there is decreased activity in the striatum during anticipation and receipt of rewards [54, 58]. Whole-brain meta-analyses indicate hyperactivity of the amygdala and ACC during processing of socio-affective cues (e.g., facial emotions), with variable evidence for hyperresponsivity in dorsomedial PFC, superior/middle temporal gyri, parahippocampal gyrus and insula [64, 65]. ACC hyperactivity is also present in maltreated individuals during self-regulation and performance monitoring (executive control) tasks [58]. Many of these changes are evident even in the absence of overt psychopathology, but also confer vulnerability to future psychiatric disorder [58]. The degree to which these structural and functional brain alterations, as well as broader neurobiological consequences of childhood maltreatment, may be reversed is yet to be determined [54].

Epigenetic Processes

It is become increasingly clear that child maltreatment interacts with genetic factors to drive the risk for chronic psychiatric and physical disorders [20, 66]. The first paper reporting a gene-environment interaction (GxE) [67] demonstrated an interaction of the monoamine oxidase. A gene with child maltreatment in the development of antisocial behaviours. Since then, many studies have replicated the GxE successfully while other researchers were unable to replicate these findings, questioning the robustness of GxE studies [68]. Two common biological explanations of how child maltreatment can influence health include the biological embedding theory [57] and the toxic stress theory [69]. Both theories suggest that child maltreatment triggers a cascade of biological events, resulting in abnormal brain functioning and psychopathology [70].

One way in which child maltreatment could influence the genome is via epigenetic mechanisms. In contrast to inherited genetic variants, epigenetic mechanisms reflect the effect of environmental factors that alter gene activity via chemical modifications. Among the epigenetic mechanisms, the major focus has been on DNA methylation given its high prevalence and measurement ease. DNA methylation involves the addition of methyl groups to the DNA cytosine base [71] often resulting in altered gene expression [71].

Amongst DNA methylation studies of child maltreatment, the most commonly studied genes have been those that regulate glucocorticoid signalling [72–74]. Genetic variants in the glucocorticoid receptor (NR3C1/GR) co-chaperone gene FK506 binding protein 51 (FKBP5) interact with child maltreatment via DNA methylation changes, altering the risk of

developing post-traumatic stress disorder (PTSD) in adulthood [75, 76]. Binding of the FKBP5 to the GR complex reduces the affinity for cortisol, resulting in a less active GR. Individuals carrying the FKBP5 risk allele with a history of child maltreatment show demethylation of glucocorticoid response elements within the FKBP5, resulting in enhanced FKBP5 transcription and consequently GR resistance and HPA-axis dysregulation [74, 77, 78].

Genome-wide studies have further demonstrated the influence of child maltreatment on epigenetic changes. Labonté et al. [79] compared post-mortem hippocampal brain tissues of individuals with and without a history of child maltreatment and found global, orchestrated DNA methylation differences and alteration of biological pathways. We and others demonstrated that depending on the history of child abuse, there were distinct gene expression and biological pathways associated with PTSD [75]. Interestingly, DNA methylation drove a greater proportion of observed gene expression changes in PTSD with child abuse, suggesting that early maltreatment has long-lasting biological effects.

Recent research involves using DNA methylation marks as a measure of molecular or epigenetic age [80]. Few studies have looked at the role of child maltreatment in accelerated epigenetic aging and shown that childhood sexual abuse was associated with DNA methylation age acceleration [81, 82] in some studies but others have failed to find an association between child adversity and DNA methylation age acceleration [83].

Taken together, DNA methylation changes caused by child maltreatment affect the stress response and result in adverse health outcomes. With regards to the effects of child maltreatment on DNA methylation and other biological mechanisms, the timing, type and duration of adversity is important. Additionally, studies have demonstrated that psychosocial interventions such as service utilisation [84] and treatment for PTSD [85] can alter child maltreatment-associated DNA methylation patterns. Future longitudinal studies will provide a deeper understanding of the dynamicity and endurance of child maltreatment on the genome.

Exosystemic Risk Factors

A large body of literature now identifies individual risk factors for child maltreatment. Social ecological frameworks typically focus on family and macro-level risks in children. We summarise research by grouping studies according to the type of child maltreatment and by social ecological level (parent/family, macro-systems).

Parent/Family Risk Profiles

Sociodemographic predictors of child maltreatment include low education and socioeconomic disadvantage [52, 86–88],

although some mixed findings make the association unclear [89]. Consistent findings of child emotional neglect are more difficult to establish, in part because the definition of neglect is time-oriented, and varies across developmental stages [90]. Emotional neglect is associated with parental stress relating to the child's temperament, reconciling work and family, depression, alcohol and other drug use, poverty and low social support (the latter for older children) [90]. Children referred to child protection agencies report having fathers who were 21 years of age or less at their birth and have little involvement with extended families [91]. Using general population survey data from the Netherlands, Bussemakers et al. [92] examined clustered problems in child adversity (eight domains covering maltreatment but also broader problems including family dysfunction, financial and health problems). They found that about 11.6% of the sample reported collateral physical and emotional maltreatment and financial problems, and 4% of the sample also reported high levels of depression, alcohol problems, divorce, and health problems. Higher child maltreatment potential has been associated with low self-efficacy for managing difficult child behaviour, and negative internal attributions about one's own parenting [93]. Consistent with Clément et al. [90], other nationally representative research (United States) found that the likelihood of physical abuse increased for parents with depression, maternal alcohol consumption, and history of family violence [87].

Victims of child sexual abuse frequently report poor parent child relationships [94], parental substance use, and domestic violence [95]. Children living with one biological parent rather than two are at double the risk of sexual victimisation [96] and parents of sexually abused children have a higher likelihood of psychiatric symptomatology [97]. Mothers of maltreated children and children at risk of maltreatment report ongoing stressful life events and low emotional support [98, 99]. Perpetrator characteristics include a history of being victims of child maltreatment themselves—approximately 30% of caregivers with a history of being a victim of maltreatment go on to engage in child maltreatment [100]. Studies of perpetrators of child sexual abuse have identified modest elevations in psychological distress, loneliness, rigidity and unhappiness compared to control groups, and higher levels of emotional neediness [88].

Community Risk Profiles

It has long been established that children from dangerous and economically disadvantaged communities are at elevated risk of sexual abuse [96, 101, 102], and the risk of child maltreatment increases for communities where housing stress, child care burden, and drug and alcohol availability are high [103–105]. Families coming to countries as refugees and asylum seekers have pre-migration and transit

trauma [106]. These families are first displaced in their homeland, subsequently many must stay in overcrowded, impoverished and unsafe camps during transit [107]. These families frequently experience ongoing economic hardship, unemployment, social isolation, problems accessing health and educational services, prejudice, and racism. As a result of relocating to a new country, they must acquire a new language, social values, customs, and traditions to thrive in the new environment [108, 109]. Children in these families are susceptible to physical and emotional abuse and neglect as parents and carers are overwhelmed by their own acculturative stress [110].

Children, who enter countries as an asylum seeker spend a substantial amount of time in detention centres [111]. Unstable living arrangement or stay in the camp exposes the children to sexual abuse [112]. Along with mental health issues, such as severe depression and anxiety, these children are at risk of abuse and maltreatment as their parents/carers are unable to provide emotional support and care due to their own mental health issues [113]. These incapacitated parents can also abuse these children emotionally and physically. Further, the circumstances of an unaccompanied child refugee/asylum seekers are severe as they might complete the migratory journey without adult supervision or guidance [114]. These children encounter neglect and are at risk of experiencing physical, emotional, and sexual abuse because of their interaction with a range of perpetrators during their journey to safety [115].

In sum, family and community risks often co-occur and profiles are rarely simple. Family risk factors include stress, early parenthood, mental health, substance use and financial problems, low emotional support, family breakdown and parenting skills deficits. For asylum seeking children and families, the risks of exposure to child maltreatment in detention centre settings are further elevated.

Evidence-Informed Approaches to the Prevention of Child Maltreatment

School-Based Approaches

Experience of childhood maltreatment has the potential to significantly and detrimentally impact on educational attainment trajectories [116]. Mediating pathways include attentional problems, lower engagement in extracurricular activities, and disciplinary absences [117]. Childhood maltreatment is also associated with poorer emotional regulation, social difficulties [118], mental health problems [119], internalizing and externalizing behaviour problems [120], bullying and cyberbullying [121], and developmental delay [122], all likely to impact on educational engagement and achievement.

There has been a particular focus on preschool education settings and their critical role in prevention, identification, and effect remediation for children prior to school [123]. Regardless of type, timing, and chronicity, maltreatment has a detrimental effect on both the cognitive and non-cognitive aspects of school readiness [124–127]. School readiness is a high priority because competencies at school entry are highly predictive of ongoing educational trajectories [128] and competency gaps are likely to widen, rather than close, across the school years [129]. For children who have experienced childhood adversity, the key school readiness skillset of social-emotional competence (self-regulation, prosocial skills, relational abilities) is both detrimentally affected [118, 130] and, when strengthened, can serve as a buffer against poorer long-term outcomes [131]. For these reasons a focus on social-emotional and behavioural outcomes in the early years of education is imperative with a number of key strategies identified [132].

Teacher-student relationships are a key context within which support for social-emotional development can be provided. However, in an additional double-burden for children who have been maltreated, their challenging behaviour and poorer self-regulation skills may make it more difficult for positive teacher-student relationships to develop [133]. Given that teacher-child closeness predicts growth in children's social-emotional competence, at least in the preschool years [134], this is a real challenge for early education settings. Education of teachers in relation to trauma is a key contemporary approach to addressing the impact of childhood maltreatment in education settings and in a small qualitative study was successful in improving teacher-child relationship quality [135].

Trauma-informed practice and its educational counterpart, trauma-aware education, has developed from the recognised need to increase educators' understanding of trauma effects on children's behaviour and development, and appropriate responses. The premise is that educators need to understand and be sensitive to the effects of child maltreatment rather than relying on disciplinary practices that further compound these effects [117]. While enthusiasm for trauma-informed practice within some educational jurisdictions is high [136] evidence for its effectiveness is scarce [137], though several small evaluations have delivered promising results. This growing movement has seen policies, strategies, and frameworks for supporting children with trauma published for early childhood [138, 139] and school settings [140]. However, the extent to which these are successfully enacted and go on to have the intended positive outcomes for students is largely unknown and a key challenge for future research and practice.

Along with acting to address the educational impacts of child maltreatment, educators are mandatory reporters in many jurisdictions. Given the amount of time children

and young people spend in education settings, educators have a key role to play in detection. However, studies have documented the complexities of this role with levels of self-efficacy, attitudes, knowledge, and experience of educators in this area influencing reporting behaviour [141]. Effective education and training to build the requisite professional capabilities for child maltreatment reporting have been documented [142–144] but it is not yet known how these translate to actual reporting outcomes, and these initiatives are yet to be widely disseminated [137, 145].

School-based programs that aim to develop students' understanding of abuse as part of prevention and intervention efforts have also been documented as successful for children from early childhood [146–148]. While Walsh et al. [148] provide strong evidence that children's knowledge and self-protective skills are increased by school-based sexual abuse prevention programs, these programs are not implemented early or frequently enough [147]. Yet to be the focus of longitudinal research are the life course effects of family violence prevention programs delivered in childhood and adolescence with a view to influencing the next generation of parents. Further, with an increasing number of program options available to early education and school settings, a key challenge for the education sector is to choose the most appropriate, rigorous, and effective approaches and to implement these with fidelity [149]. Adding further complexity, educational settings themselves have been sites for child maltreatment [150, 151] but prevention and intervention efforts have been few in terms of addressing this with educators [143].

The challenging behaviour often presented by children who have experienced trauma has been shown to impact on teachers' mental health and well-being [152]. Given teacher retention in the profession is a key concern for the field [153, 154] addressing teacher stress is an important consideration. Schools and parents working together for consistent messaging and skill building is critical [147]. However, few school-based programs for the prevention of child maltreatment simultaneously address parents and students [155]. How child protection authorities collaborate with education settings is also an important consideration [117] and addressing health and education silos remains an ongoing challenge. Finally, there have been recent calls for system-wide embedding of trauma-informed practice to best support children and educators [136], with the complexity of the system presenting a challenge to this ideal.

Family-Oriented Prevention Approaches

Family interventions typically target physical and emotional abuse but also reduce family dysfunction risk factors that impact other categories of abuse and neglect. Interventions for child maltreatment can be broadly categorised into

preventative and treatment interventions. Prevention programs target known and modifiable risk factors outlined in section 1.5 (e.g., harsh or coercive parenting practices), with the goal halting a potential trajectory towards potential abuse and neglect [156]. Treatment interventions reduce the incidence of maltreatment in target parents and families where maltreatment is already occurring. Treatment interventions often target similar risk factors, but they are typically more intensive and focus on changing unhelpful or dysfunctional patterns of behaviour.

High-quality reviews, assessed as strong by *Health Evidence*, show that parenting programs for reducing child maltreatment are effective [156–158]. Metanalytic studies comparing effect sizes of different maltreatment interventions of various types show small but significant effect sizes with treatment interventions showing larger effects than prevention focus programs ($d=0.36$ versus $d=0.26$ respectively) although prevention interventions tend to have ongoing effects which further improve at follow up [159]. Overall, these effect sizes are small to moderate but when considered as a whole of population they offer a significant contribution to the reduction of maltreatment [160]. Implementation factors such as training, fidelity monitoring and supervision have been shown to have substantial impacts on intervention outcome particularly in the area of child maltreatment [161, 162].

General parent training programs have been shown to reduce both substantiated and self-reported child maltreatment as well as to reduce risk factors and enhance protective factors [156]. For a detailed review of parenting training programs see [163]. Importantly, parenting programs, most of which have been developed in the West, have also been demonstrated to be efficacious across a range of cultural groups [156, 164] including in Indigenous Australians [165] and low resource settings where the majority of the world's children live [166, 167]. In fact, metanalytic studies have shown the Western parenting programs implemented in the developing world have similar or stronger effects than in their country of origin [168]. Given that violence towards children is particularly high in such contexts parenting programs have a significant role to play.

In addition to prevention and treatment programs are a small number of programs that purport to be universal (e.g., The Triple P Positive Parenting Program, and SOS! Help for Parents [169, 170]). These differ in an important way from other interventions in that they do not specifically target individual families; instead, they aim to increase parent knowledge and skills, and reduce maltreatment, at a whole of population level using a public health approach and a blending of prevention and treatment programs [160]. Truly universal programs aim to reduce the population level prevalence of maltreatment, not the incidence in intervention families, and are evaluated at a population level rather

than individual client or case level. As such they are well placed to inform broad policy and are more likely to be cost-effective.

Only one parent training program has been evaluated at a whole of population level—the Triple P System [171] and this study only examined the impact of parenting on a single measure of maltreatment—physical abuse. The trial randomly assigned 18 United States counties to the Triple P System or care-as-usual and compared 3 independently derived measures of maltreatments from state records. After controlling for baseline large effect sizes were found on substantiated cases of child maltreatment, out of home placements, and child maltreatment related injuries (hospital admissions and ER visits). These objective measures of maltreatment are likely to under-represent real change given much maltreatment fails to meet thresholds required for health or child protective services involvement and that assessment was limited to physical abuse [172]. A similar study showed population level effects of the Triple P System on child maltreatment risk factors including the prevalence of coercive parenting, parental stress and parental depression and on child internalising and externalising disorders [173]. The reduction of child internalizing and externalising problems is especially important given the impact of these in educational outcomes. Such populations studies suggest there is promise in universal public-health interventions, particularly Triple P, for reducing child maltreatment (i.e. physical abuse) at the population level. However, replication is needed, and more work is needed to examine the impact of such intervention on other forms of maltreatment. Ideally parenting interventions would form one part of a multifaceted approach where families received tailored support and children received similar messages (e.g. about body integrity to prevent sexual abuse) from both critical settings may be especially beneficial and are consistent with Bronfenbrenner's ecological model.

Recommendations

We make five key recommendations for rebuilding and maintaining an evidence-based approach to reducing the prevalence of child maltreatment and improving recovery and outcomes for children who experience maltreatment.

Recommendation 1

Establishing reliable and valid survey tools to capture trends in prevalence over time. Data from agencies underestimate the prevalence of child maltreatment and evidence indicates that self-reported prevalence is more likely to be a false negative than a false positive. Reliable and valid measures will enable clear conclusions about the impact of policies and

programs oriented toward the prevention of and interventions for child maltreatment.

Recommendation 2

Further research on how brain structure and functional abnormalities (chronic stress and epigenetics) that are the sequelae of maltreatment may be recalibrated to more normative patterns. Longitudinal and detailed surveying of brain circuitry and gene activity will reveal the acute and chronic neurobiological effects of child maltreatment and help understand how early experiences affect biological systems governing our response to stress. The dynamic nature of neurobiological markers will also allow assessment of intervention and treatment strategies for child maltreatment and its consequences on long-term mental and physical health.

Recommendation 3: Teleservices

Technology provides a way of transcending social isolation and reaching children, families and communities that have historically been too difficult to reach. In some countries, governments are finally investing in telehealth services to address mental health problems. For example, in Australia, people with identified mental health conditions receive support for a range of services, but it is unclear how much funding is available for evidence-based prevention approaches to child abuse and neglect. In the COVID-19 context, e-health technologies have evolved at great pace, and offer unique and safe opportunities to reach isolated and vulnerable communities and individuals.

Recommendation 4: Community-based approaches

A key conclusion of this paper is that determinants of child maltreatment are multi-systemic. It therefore makes sense that interventions be multi-systemic in their approach through a mix of individual, family and social systems focused interventions (school/community) and a weighted approach to detection, prevention, early intervention and treatment. Community coalition approaches to children's mental health problems show great promise for ACEs prevention [174] and have solid efficacy for prevention of adolescent substance use and crime [175–177]. These approaches have utility for preventing child maltreatment through mixes of individual, school and family-oriented programs. Another strength is that coalition approaches build sustainable and locally focused skills and resources that are co-created with community stakeholders [178]. These approaches typically involve the building of local coalitions (consisting of existing individuals and organisations focusing on children, mental health, education, social work,

and justice) under the auspices of a lead agency and local champions. Local coalitions identify community priorities through evidence collection using reliable and valid tools, and skills building in the delivery of cost-effective programs and policies to address the problems.

Recommendation 5: Investment in evidence-based policy, practice, and research-oriented think tanks

Multi-systemic approaches to child maltreatment prevention are clearly under-resourced and will need substantial investment from government and nongovernment sectors. Silo-ed approaches to service provision hamper reliable measurement, high quality and synchronised delivery of services, dovetailing of services to maximise effects, and cross-disciplinary collaboration. There is a substantive risk that the spotlight on child abuse and neglect may dim as a consequence of the global focus on vaccine development/distribution and COVID-related economic recovery. COVID has increased rates of family distress, domestic violence and heavy alcohol and other drug use, which are known determinants of adverse child outcomes. Subsequent waves of COVID, including those occurring through its variants, will place further pressure on families and communities. As government budgets shift to economic recovery, there is a risk that early detection policies and programs for child maltreatment will receive lower prioritisation.

Summary

This review has highlighted the high and most likely underestimated prevalence of child maltreatment, the ongoing challenges of measurement, the profound and long-lasting impacts of child maltreatment on mental and physical health, and the substantial economic costs associated with these impacts. Mapping trends in child maltreatment using valid and reliable measures is needed to evaluate the impact of prevention and early intervention programs. We summarised structural and functional brain alterations that result from child maltreatment, and the impact of chronic stress and trauma on gene activity via DNA methylation mechanisms. Detailed surveys tracking the longitudinal associations between child maltreatment, brain circuitry and gene activity are needed. We summarised the familial and macro-system risk factors centre around economic disadvantage, mental health problems, social isolation and domestic violence. Finally, we reviewed prevention and early intervention programs for child maltreatment, concluding that there is good evidence that school and family-focused programs have significant positive effects on child outcomes. A key challenge in promoting a paradigm shift from treatment to prevention is in justifying the upfront costs of preventive

measures, given the longer-term nature of positive health and economic outcomes. There is a paucity of evidence on the cost-effectiveness of preventive approaches for child maltreatment, and further studies are needed. Current evidence suggests that while the cost-effectiveness of specific programs may vary, preventive approaches are likely to be highly cost-effective and have the potential to produce net cost-savings to society when lifetime health and social benefits are accounted for [179, 180].

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