Child Abuse & Neglect 145 (2023) 106444

Contents lists available at ScienceDirect

Child Abuse & Neglect

journal homepage: www.elsevier.com/locate/chiabuneg

Child abuse and neglect and mental health outcomes in adulthood by ethnicity: Findings from a 40-year longitudinal study in New Zealand/Aotearoa

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ARTICLE INFO

Keywords:
Childhood maltreatment
Childhood sexual abuse
Childhood physical abuse
Childhood neglect
Mental health
Longitudinal study
Māori ethnicity

ABSTRACT

Background: Longitudinal studies consistently report adverse long-term outcomes of childhood maltreatment. Little is known about the impact of childhood maltreatment on mental health among a marginalized population (New Zealand Māori); therefore, we cannot assume the effects of maltreatment are the same across the population.
Objective: Associations were examined between childhood sexual abuse (CSA), childhood physical punishment (CPP) and childhood neglect (CN) (<16 years) and mental health outcomes 18–40 years, by ethnicity (Māori/non-Māori).
Participants and setting: Data from the Christchurch Health and Development Study, a study of a birth cohort of 1265 children born in Christchurch in 1977. By age 40, 17.8 % (n = 191) reported New Zealand Māori ethnic identity; 82.2 % (n = 883) were non-Māori.
Methods: CSA, CPP (<16 years) were measured at 18, 21 years; CN was measured at 40 years. Major depression, anxiety disorder, suicidal ideation, alcohol abuse/dependence and cannabis abuse/dependence were measured at ages 21, 25, 30, 35 and 40 years. Childhood confounding variables controlled. Analyses were extended to include Māori ethnicity.
Results: After statistical adjustment, experience of severe childhood maltreatment increased odds of mental health problems 1.8–2.6×, compared to no maltreatment; the effects of maltreatment were similar for males and females. For Māori, some higher rates of mental health problems were seen among those maltreated, no statistically significant associations were detected after Bonferroni correction (among severe maltreatment vs. no maltreatment). Limitations should be considered when interpreting results.
Conclusions: Exposure to childhood maltreatment has long-term effects into middle-age. Further research employing culturally-sensitive approaches may help clarify Māori childhood maltreatment outcomes.

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https://doi.org/10.1016/j.chiabu.2023.106444
Received 12 March 2023; Received in revised form 23 August 2023; Accepted 30 August 2023
Available online 11 September 2023

1. Introduction

Globally and in New Zealand/Aotearoa, rates of child maltreatment are a problem and have been described as one of the greatest public health challenges (Hughes et al., 2017; Sara & Lappin, 2017). Although precise estimates are unknown, the increasing availability of data from population-based surveys and the scientific literature has allowed for a greater understanding of the prevalence and global burden of violence against children. In 2019, one in two children or nearly one billion children aged 2 to 17 years, experienced violence globally (The United Nations Office on Drugs and Crime (UNODC), 2019); with one in five women and one in 13 men reporting having been sexually abused as a child between 0 and 17 years (World Health Organization, 2022). According to UNICEF (2017), six in 10, or 250 million children, are punished by physical means worldwide and three in four children aged 2 to 4 years regularly experience physical punishment and/or psychological violence at the hands of parents and caregivers. The extent and epidemiology of child maltreatment is also documented in systematic reviews and meta-analyses of global literature, showing that differing regions have similar prevalence rates impacting the lives of millions of children (Stoltenborgh, Bakermans-Kranenburg, Alink, & van IJzendoorn, 2015). In that study, prevalence rates for a range of maltreatment types were: 163/1000 for physical neglect, 184/1000 for emotional neglect, 363/1000 for emotional abuse, 226/1000 for physical abuse and 127/1000 for sexual abuse. Another more recent study showed that the global pooled prevalence for physical violence victimisation was 17.3 %, indicating that violence of this nature is relatively common affecting around one-in-six children (Whitten, Tzoumakis, Green, & Dean, 2023).

Data from the Organisation for Economic Co-operation and Development (OECD), shows that New Zealand/Aotearoa has the seventh highest rate of child homicide as a result of family violence, with one child death every 5 weeks (UNICEF, 2017). In addition, it appears that in New Zealand/Aotearoa, the prevalence of violence against children is increasing. The number of children who were victims of assault in 2021 was estimated to be 30 % higher than 2016 (The Salvation Army, 2022), and the number of young people (aged 0 to 19) reporting sexual offences increased by 25 % in the year ending June 2021 (Oranga Tamariki, 2022). However, it is unclear whether the increased rates are due to increased prevalence of violence, or increased reporting.

Over recent decades, a large body of evidence has amassed on the developmental outcomes of child abuse and neglect on individuals across the life-course (Bell, Foulds, Horwood, Mulder, & Boden, 2019; Geoffroy, Pereira, Li, & Power, 2016). To help synthesize this information, meta-analytic summaries and other reviews have shown that major depression, generalized anxiety disorder, self-injury, and substance abuse were elevated among those reporting childhood maltreatment, regardless of report type (Newbury et al., 2018). Child maltreatment including childhood sexual abuse (CSA), childhood physical punishment (CPP), and childhood neglect (CN) was associated with later: depression and anxiety (Amado, Arce, & Herraiz, 2015; Li, D'Arcy, & Meng, 2016; Mandelli, Petrelli, & Serretti, 2015) suicidal behaviors (Angelakis, Gillespie, & Panagioti, 2019; Ng, Yong, Ho, Lim, & Yeo, 2018), self-injury and substance use disorders (Newbury et al., 2018). CN was associated with depressive disorder risk (Mandelli et al., 2015). Meta-analyses have also examined gender differences in mental health outcomes among those who have experienced maltreatment (Amado et al., 2015; Angelakis et al., 2019; Gallo, Munhoz, de Mola, & Murray, 2018; Halpern et al., 2018; Maniglio, 2009). For example, among females CN was associated with an increased risk of substance use disorders (Halpern et al., 2018). While some meta-analyses reported that mental health outcomes of maltreatment were moderated by gender (Amado et al., 2015; Halpern et al., 2018; Maniglio, 2009), a meta-analysis of childhood maltreatment and later major depression and generalized anxiety disorder concluded that there was insufficient evidence for the existence of gender-differentials (Gallo et al., 2018). Similar findings were reported for the association between maltreatment and suicidality (Angelakis et al., 2019).

Meta-analyses permit rating and ranking of included studies in order of quality based on factors such as: effect size, consistency, control for confounding factors, meaning that this study type of design also provides some confidence that any effects found may be causal (Weed, 2000). Meta-analyses may also assist in identifying gaps in the literature or areas in which more evidence is needed. One such gap may be that there are few studies of adult outcomes of maltreatment from the specific New Zealand/Aotearoa context, including the experience of New Zealand Māori (Māori) the indigenous people of New Zealand/Aotearoa. Prior to the arrival of European settlers in the closing decades of the 18th century, during the reign of Queen Victoria, an estimated 100,000 Māori were settled in New Zealand/Aotearoa (McLintock, 1996). Māori had voyaged across the Pacific Ocean around the 1300's, arriving by waka (canoe). They established themselves in distinct and independent tribal regions after initially settling in the North Island where the warmer weather suited their agricultural lifestyle.

With the arrival of European however, came diseases such as measles, influenza, typhoid fever and tuberculosis that decimated thousands of Māori who had not developed medicines or biological immunity to the infections. In the 1830s, the Māori population decreased from 100,000 to 70,000 although they still outnumbered European (Pool & Kukutai, 2022). Unfortunately, European migration and colonization meant exploitation, marginalization, displacement, loss of resources/forced urban migration and perpetrated trauma that has ultimately reverberated through generations of Māori. Colonization processes also led to warfare, land alienation, language discrediting, suppression and mockery of who Māori were as a people in their own right. A treaty (Te Tiriti o Waitangi) promising partnership and protection of Māori culture and wellbeing was signed in 1840 by over 500 Māori chiefs and representatives of the Crown. This disingenuous agreement led to the British Crown acquiring New Zealand (Kingi, 2005). While it was one of the most important documents in New Zealand/Aotearoa history, it was mostly ignored and dishonored by the Crown. Over the following 60 years, European dominated Māori and in 1896 the Māori population had declined to just 42,000 (Kingi, 2005). These circumstances have led to current wide-spread discrepancy and inequality between Māori and New Zealand European (non-Māori) wellbeing; evident in our national health system with Māori being particularly overrepresented in the mental health system (Huriwai, McClintock, & McClintock, 2022; Moewaka Barnes & McCreanor, 2019). Adding to ethnic disparities between Māori and non-Māori, is that much research to-date adopts deficit approach frameworks which likely reinforce and reiterate marginalization and engrained

harmful stereotypical views of Māori. Research is urgently needed that engages with Māori, develops and uses culturally-relevant tools and approaches, and affirms and acknowledges Māori to enhance Māori wellbeing (Rolleston et al., 2020).

To study a specific understudied, marginalized population in the context of child maltreatment and later adult outcomes, one of the best methods is to use prospective longitudinal population cohorts which include Māori participants. Longitudinal population research can overcome many methodological problems of cross-sectional designs by reducing recall bias and assisting the ascertainment of causality due to the collection of prospective data (Caruana, Roman, Hernández-Sánchez, & Solli, 2015; Simkus, 2021; Widom, Raphael, & DuMont, 2004).

Longitudinal studies including, for example, the Avon Longitudinal Study of Parents and Children (ALSPAC) (Fraser et al., 2013), the Dunedin Multidisciplinary Health and Development Study (Poulton, Moffitt, & Silva, 2015), and the British Birth Cohort (Power & Elliott, 2006), are world-renowned for uncovering life course development phenomena including the lifelong detrimental impacts of child abuse and neglect. These longitudinal studies have documented associations between childhood adversity and later risk of depression (Houtepen, Heron, Suderman, Tilling, & Howe, 2018; Lacey et al., 2020); post-traumatic stress disorder (Breslau et al., 2014) and physical health problems (Danese et al., 2008; Danese et al., 2009). Overall, CN and all forms of abuse were associated with poorer adult mental health in the British Birth cohort (Geoffroy et al., 2016). Little information is available on Māori developmental outcomes of maltreatment over the life-course to mid-adulthood (Theodore et al., 2019), with the exception of Christchurch Health and Development Study and the Dunedin Multidisciplinary Health and Development Study.

Taken together, it is clear that child maltreatment has deleterious impacts across the life course. In addition, few studies report findings from longitudinal studies on marginalized populations such as Māori, in a country with higher rates of maltreatment in the OECD. Research in this area will increase the understanding of the long-term effects of child maltreatment on the population.

Against this background, we address this issue by reporting rates of child abuse and maltreatment among a longitudinal birth cohort of children born in Christchurch in 1977. This study, the Christchurch Health and Development Study prospectively assessed a representative sample collating a wide range of information on potential childhood confounding factors, exposure to child abuse and neglect and later developmental outcomes to age 40. Further, the sample includes Māori, a group with well-documented struggles against colonization and the resulting outcomes of living with long-term inequity. The aims of the study are:

1. To examine the associations between childhood abuse/neglect exposure before the age of 16 and measures of mental health outcomes (major depression, any anxiety disorder, suicidal ideation, alcohol abuse/dependence, and cannabis abuse/dependence) pooled over repeated assessments from 18 to 40 years.
2. To statistically adjust the associations for a range of childhood, family, and individual confounding factors.
3. To determine if there is evidence of differing patterns of mental health outcomes for males and females.
4. To report all associations by ethnicity (Māori/non-Māori), noting that this study will not use a deficit framework or compare associations across groups.

2. Methods

2.1. Participants

The Christchurch Health and Development Study is a longitudinal study that collected data on a birth cohort of 1265 individuals (females n = 630, males n = 635) born in Christchurch in 1977. The cohort comprises 97 % of all births occurring during that period (Fergusson & Horwood, 2001, 2013). The cohort has been assessed at birth, four months, annually to age 16, and then at ages 18, 21, 25, 30, 35, and 40 years. To date 3.6 % (n = 45) deaths of cohort members prior to age 40 have been recorded. Over the course of the study, data have been gathered using a combination of sources including parental interviews (0–16 yrs); interviews with the cohort member (from age 8 onwards); teacher reports; standardized testing; medical and other official records (Fergusson, Beautrais, Horwood, & Shannon, 1982; Fergusson, Horwood, Beautrais, & Shannon, 1981). New Zealand Māori ethnic identity. When cohort members were aged 21, 25 and 40 years they were asked if they had New Zealand Māori ethnic identity; by age 40, 17.8 % (n = 191) of the cohort had ever identified as Māori at one or more of these assessments; 82.2 % (n = 883) were non- Māori. All data were gathered subject to the signed consent of the research participants, and all phases of the study have received approval from the regional Health and Disability Ethics Committee.

2.2. Measures

2.2.1. Childhood sexual abuse (CSA) (0–16 years)

Participants were questioned at 18 and 21 years of age about whether they experienced any forms of CSA prior to 16 years of age, or whether anyone had attempted to include them in a series of 15 sexual activities when they did not want this to happen. Examples of activities included: (a) non-contact episodes involving indecent exposure, public masturbation or unwanted sexual propositions; (b) episodes involving sexual contact in the form of sexual fondling, genital contact or attempts to undress the respondent; and (c) episodes involving attempted or completed vaginal, oral or anal intercourse. Participants who reported exposure to CSA were questioned further about the context of the abuse, the frequency of abuse, the characteristics of the perpetrator(s), and abuse disclosure and related factors (Fergusson, Horwood, & Lynskey, 1996; Fergusson, Horwood, & Woodward, 2000). The most severe report of CSA at 18 or 21 years of age was used to classify participants on a four-point scale: (0) no CSA (85.9 % of the cohort), (1) non-contact CSA (2.7 % of the cohort), (2) contact CSA not involving attempted or completed sexual penetration (5.1 % of the cohort), and (3) severe CSA

involving attempted or completed sexual penetration including vaginal, oral, and anal intercourse (6.3 % of the cohort) (Fergusson et al., 2000; Fergusson & Lynskey, 1997).

2.2.2. Childhood physical punishment (CPP) (0–16 years)

Participants were questioned at 18 and 21 years of age about the extent to which their parents or caregivers used physical punishment prior to 16 years of age. A five-point scale was used that ranged from "parents never used physical punishment" to "parents treated me in a harsh and abusive way". Separate reports were obtained for mother and father figures (if applicable) which were then combined into one score. The most severe rating of CPP at either 18 or 21 years of age was used: (0) parents never used physical punishment (4.5 % of the cohort), (1) parents seldom used physical punishment (78.0 % of the cohort), (2) at least one parent regularly used physical punishment (11.2 % of the cohort), and (3) at least one parent used frequent or severe punishment or treated the participant in a harsh or abusive manner (6.4 % of the cohort).

2.2.3. Childhood neglect (CN) (0–16 years)

Participants were questioned at 40 years of age about the presence of emotional (i.e. "*Did your parents/guardians understand your problems/worries?*") and physical neglect (i.e. "*How often did your parents/guardians not give you enough food even when they could easily have done so?*") during their childhood, prior to 16 years of age. The scale used items from the Adverse Childhood Experiences International Questionnaire (ACE-IQ) (World Health Organization, 2020). Participants' responses to physical neglect questions were reverse-coded and all responses were categorized on a four-point scale: (0) no neglect (38.3 %); (1) neglectful some of the time (29.8 %); (2) neglectful most of the time (18.0 %); (3) severe neglect (13.9 %). The internal consistency was $\alpha = 0.63$.

2.2.4. Major depression, any anxiety disorder, suicidal ideation, alcohol abuse/dependence and cannabis abuse/dependence (18–40 years)

At ages 21, 25, 30, 35, and 40, participants were questioned about their experience of the following mental health problems since the previous interview for the intervals 18–21, 21–25, 25–30 and 35–40 years.

2.2.4.1. Major depression and any anxiety disorder. Participants were questioned about symptoms of major depression and a range of anxiety disorders (generalized anxiety disorder, panic disorder, agoraphobia, social phobia, specific phobia) since the previous assessment. The questioning was based on the relevant components of the Composite International Diagnostic Interview (CIDI: World Health Organization, 1993) and DSM-IV criteria (American Psychiatric Association, 1994). Using this information, dichotomous measures were constructed to reflect whether the participant met diagnostic criteria for a diagnosis of a major depressive episode and/or any anxiety disorder.

Suicidal ideation/attempt. Participants were questioned using custom-written survey items about whether they had ever thought about killing themselves or had attempted suicide since the previous assessment (Fergusson, Boden, & Horwood, 2008). Using this information, participants were classified on a dichotomous measure reflecting whether they reported any suicidal ideation/attempt.

Alcohol abuse/dependence and cannabis abuse/dependence. Participants were questioned about problems associated with their use of alcohol since the previous assessment, using CIDI (CIDI: World Health Organization, 1993) items to assess DSM-IV symptom criteria for abuse/dependence (American Psychiatric Association, 1994). Using this information, participants were classified on dichotomous measures reflecting whether they met diagnostic criteria for alcohol or cannabis abuse/dependence.

Any mental health problem. To provide an overall measure of the burden of mental health problems, the above measures of mental disorder were combined to classify participants as to whether they had experienced any mental health problems.

2.2.4.2. Potential covariates. A range of factors were selected from the Christchurch Health and Development Study database to control the associations between childhood maltreatment (<16 years) and adult mental health outcomes for the correlated effects of social, family functioning and individual context. The factors were chosen on the basis that they were: (a) theoretically relevant predictors of childhood maltreatment and (b) known to be linked with one or more adult mental health outcomes. These factors spanned domains of socio-demographic background (maternal age, maternal education, family SES and living standards), family functioning (parental IPV, number of parental changes, parental adjustment problems) and child factors (sex, parental bonding, novelty seeking, neuroticism, self-esteem, parental attachment) (see Online Supplement 1. for the description of the covariate factors).

2.3. Statistical methods

2.3.1. Unadjusted associations

The first phase of the analysis pooled the repeated observations at ages 21, 25, 30, 35 and 40 years for the intervals 18–21, 21–25, 25–30 and 35–40 years to obtain an estimate of the population-averaged associations between the extent of childhood maltreatment (CSA, CPP and CN) and adult mental health outcomes. Tabular analyses show the frequencies (%, n) of those who experienced mental health outcomes by each abuse exposure measure, at each assessment age and pooled across observations. Associations were tested for statistical significance using a generalized estimating equation (GEE) logistic regression modelling framework (Liang & Zeger, 1986; Zeger & Liang, 1986) in which each of the mental health outcomes were modelled as a function of the three maltreatment exposure measures using the five waves of repeated-measures data simultaneously. A Wald test p-value was a joint test that the coefficients of each level of maltreatment (none to severe) for each form of maltreatment were equal to zero. A statistically significant p-value (<0.05) indicated that the coefficients were not equal to zero and that there were statistically significant associations between

Table 1
Summary table of unadjusted associations between childhood sexual abuse, physical punishment, and neglect (<16 years) and mental health outcomes, pooled across observations 18–40 years.

Child sexual abuse	None (n = 905)			Non-contact (n = 28)			Contact (n = 54)			Sexual penetration (n = 66)			p
	%	OR	(95 % CI)	%	OR	(95 % CI)	%	OR	(95 % CI)	%	OR	(95 % CI)	
Major depression													
Pooled 18–40 years	18.1	Ref	–	30.6	2.03	(1.23, 3.35)	38.2	2.76	(1.94, 3.94)	44.6	3.70	(2.69, 5.07)	<0.001
Anxiety disorder													
Pooled 18–40 years	14.4	Ref	–	21.9	1.66	(0.92, 3.00	22.7	1.74	(1.13, 2.68)	40.8	4.11	(2.93, 5.77)	<0.001
Suicidal ideation													
Pooled 18–40 years	7.6	Ref	–	13.1	1.65	(0.80, 3.39)	14.8	2.13	(1.30, 3.49)	25.3	4.19	(2.85, 6.16)	<0.001
Alcohol abuse/ dependence													
Pooled 18–40 years	19.2	Ref	–	17.5	0.81	(0.41, 1.59	25.0	1.45	(0.95, 2.21)	19.9	1.07	(0.70, 1.61)	0.332
Cannabis abuse/ dependence													
Pooled 18–40 years	9.0	Ref	–	3.7	0.38	(0.10, 1.42)	9.0	1.12	(0.60, 2.10)	14.6	1.75	(1.07, 2.87)	0.063
Any mental health problem													
Pooled 18–40 years	41.8	Ref	–	48.9	1.36	(0.83, 2.25)	59.4	2.02	(1.39, 3.91)	71.5	3.45	(2.39, 4.98)	<0.001

Childhood physical punishment	None (n = 47)			Seldom (n = 821)			Regular (n = 118)			Severe (n = 67)			p
	%	OR	(95 % CI)	%	OR	(95 % CI)	%	OR	(95 % CI)	%	OR	(95 % CI)	
Major depression													
Pooled 18–40 years	17.7	Ref	–	19.1	1.02	(0.63, 1.65)	26.3	1.54	(0.90, 2.63)	40.8	2.97	(1.69, 5.19)	<0.001
Anxiety disorder													
Pooled 18–40 years	13.3	Ref	–	15.0	1.16	(0.65, 2.06)	19.7	1.6	(0.85, 3.04)	33.8	3.28	(1.70, 6.31)	<0.001
Suicidal ideation													
Pooled 18–40 years	8.1	Ref	–	7.6	0.82	(0.43, 1.58)	13.2	1.5	(0.73, 3.07)	24.9	3.34	(1.61, 6.89)	<0.001
Alcohol abuse/ dependence													
Pooled 18–40 years	20.6	Ref	–	18.1	0.83	(0.5, 1.36)	31.0	1.75	(1.01, 3.02)	16.4	0.74	(0.39, 1.39)	<0.001
Cannabis abuse/ dependence													
Pooled 18–40 years	8.1	Ref	–	8.1	0.99	(0.48, 2.06)	12.4	1.43	(0.64, 3.22)	16.7	2.22	(0.96, 5.12)	0.005
Any mental health problem													
Pooled 18–40 years	41.2	Ref	–	42.1	0.98	(0.65, 1.48)	54.9	1.67	(1.04, 2.66)	63.6	2.26	(1.34, 3.81)	<0.001

Childhood neglect	None (n = 345)			Some of the time (n = 268)			Most of the time (n = 162)			Severe neglect (n = 125)			p
	%	OR	(95 % CI)	%	OR	(95 % CI)	%	OR	(95 % CI)	%	OR	(95 % CI)	
Major depression													
Pooled 18–40 years	13.5	Ref	–	22.4	1.87	(1.44, 2.43)	25.8	2.27	(1.70, 3.02)	34.4	3.4	(2.52, 4.57)	<0.001
Anxiety disorder													
Pooled 18–40 years	11.2	Ref	–	16.4	1.56	(1.15, 2.11)	18.9	1.84	(1.31, 2.58)	29.7	3.37	(2.41, 4.71)	<0.001

(*continued on next page*)

Table 1 (*continued*)

Childhood neglect	None (n = 345)			Some of the time (n = 268)			Most of the time (n = 162)			Severe neglect (n = 125)			p
	%	OR	(95 % CI)	%	OR	(95 % CI)	%	OR	(95 % CI)	%	OR	(95 % CI)	
Suicidal ideation													
Pooled 18–40 years	4.6	Ref	–	8.8	2.1	(1.40, 3.13)	13.6	3.23	(2.13, 4.91)	16.1	4.03	(2.62, 6.21)	<0.001
Alcohol abuse/ dependence													
Pooled 18–40 years	14.1	Ref	–	20.9	1.62	(1.23, 2.14)	23.5	1.91	(1.40, 2.60)	24.3	1.99	(1.43, 2.79)	<0.001
Cannabis abuse/ dependence													
Pooled 18–40 years	4.3	Ref	–	10.1	2.89	(1.87, 4.48)	11.7	3.3	(2.05, 5.29)	15.6	4.26	(2.62, 6.92)	<0.001
Any mental health problem													
Pooled 18–40 years	31.8	Ref	–	47.8	1.98	(1.54, 2.46)	52.7	2.4	(1.86, 3.09)	62.1	3.58	(2.70, 4.74)	<0.001

childhood maltreatment (CSA, CPP, CN) < 16 years and the pooled mental health outcomes (18–40 years). Analyses were then extended to include ethnicity (Māori, non-Māori) by fitting nested GEE regression models.

2.3.2. Adjusting for covariates

Associations between the maltreatment measures and dichotomized covariate factors were examined by testing each association for statistical significance using the Mantel-Haenszel test of linearity. The potential covariates were dichotomized for the purposes of data display; all regression models used the selected covariates in their natural metric. The unadjusted regression models, were extended to include the statistically significant covariate factors; the OR (95 % CI), p is reported for each association. Finally, given the number of comparisons made, there is a chance that the statistically significant findings were due to chance. Therefore, a Bonferroni corrected p-value ($p < 0.003$) was used to adjust for these multiple comparisons.

2.3.3. Multiplicative interactions by sex

To examine whether the associations between maltreatment and mental health outcomes varied between males and females, the covariate-adjusted regression models were extended to include multiplicative sex × maltreatment exposure interaction terms.

2.4. Sample size and sample bias

This analysis is based on data from respondents studied at ages 21 years (n = 1011), 25 years (n = 1003), 30 years (n = 987), 35 years (n = 962) and 40 years (n = 904) for whom information was available on both exposure to maltreatment (CSA, CPP, CN) and mental health outcomes for at least one assessment from age 21 to 40 years. These samples represented between 74.0 % and 81.5 % of the participants surviving to 21 years (n = 1240), 25 years (n = 1234), 30 years (n = 1231), 35 years (n = 1223) and 40 years (n = 1221). Analyses were conducted using SAS 9.4 (SAS Institute Inc, 2012) and STATA 17 (StataCorp LLC, 2021). Statistical significance was set at $\alpha = 0.05$. Comparison of the analysis sample with surviving members of the cohort not assessed at age 40 was conducted to examine whether selection bias due to the processes of sample attrition influenced the findings. Online Supplement Table 1 shows modest but statistically significant tendencies for the analysis sample to under-represent cohort members from disadvantaged backgrounds (single-parent families, low socioeconomic status families, maternal smoking).

3. Results

3.1. Associations between the extent of child maltreatment and mental health outcomes (18–40 years)

Table 1 shows a summary of the unadjusted associations between the extent of CSA (<16 years) from 0 (none) to 3 (sexual penetration) and a series of mental health outcomes in adulthood. The mental health outcomes were: major depression, any anxiety disorder, suicidal ideation, alcohol abuse/dependence, cannabis abuse/dependence and an overall measure reflecting the experience of any mental health problem, pooled over the assessment intervals from 18 to 40 years (see Statistical methods). The source data for this table is located in Online Supplement Table 2. For each mental health outcome Table 1 reports the pooled rates, the odds ratios (95 % CI) for each level of CSA and a test of statistical significance (p-value) for the linear association between the 4-level maltreatment variable and the dichotomous outcome.

The results show that the extent of CSA is statistically significantly associated with major depression, any anxiety disorder, suicidal ideation, cannabis abuse/dependence and the overall measure of any mental health problems ($p < 0.001$). However, the alcohol abuse/dependence was not statistically significant. The table shows that as CSA increases in severity, the rates of mental health

problems (major depression, any anxiety disorder, suicidal ideation, cannabis abuse/dependence and the overall measure of any mental health problems) increase. Those in the most severe CSA category reported >4 × the odds of mental health problems in adulthood compared to those who did not experience CSA.

Table 1 also shows the summaries of the unadjusted associations between the extent of CPP from 0 (none) to 3 (severe) and CN from 0 (none) to 3 (severe neglect) respectively, and the series of mental health outcomes in adulthood, pooled over the assessment intervals at ages 18–40 years (see Statistical methods). The results show that the extent of CPP and CN was statistically significantly associated with all measures of mental health problems in adulthood to age 40 ($p < 0.001$). The tables show that as CPP and CN increases in severity, the rates of mental health problems increase. Those in the most severe CPP category reported >3 × the odds of mental health problems in adulthood compared to those who did not experience CPP. Those in the most severe CN category reported >4 × the odds of mental health problems in adulthood compared to those who did not experience CN.

3.2. Adjusting for covariates

Online Supplement Table 3 shows the associations between the extent of CSA and measures of socio-demographic background, family functioning and child factors, and the test of statistical significance. Cohort members who experienced greater severity of CSA

Table 2
Summary of adjusted associations (AOR, 95 % CI) between childhood sexual abuse, physical punishment and neglect (<16 years) and mental health outcomes, pooled across observations 18–40 years.

Childhood sexual abuse	None (n = 905)	Non-contact (n = 28)	Contact (n = 54)	Sexual penetration (n = 66)	p
Major depression	Ref	1.40	1.77	1.89	<0.001
(95 % CI)		(0.78, 2.53)	(1.27, 2.48)	(1.31, 2.71)	
Anxiety disorder	Ref	1.19	1.03	2.06	0.004
(95 % CI)		(0.63, 2.26)	(0.65, 1.62)	(1.39, 3.06)	
Suicidal ideation	Ref	1.71	1.58	2.60	<0.001
(95 % CI)		(0.93, 3.12)	(0.88, 2.82)	(1.64, 4.12)	
Alcohol abuse/dependence	Ref	1.37	1.57	1.21	0.171
(95 % CI)		(0.86, 2.47)	(1.01, 2.46)	(0.80, 1.85)	
Cannabis abuse/dependence	Ref	0.66	1.01	1.47	0.379
(95 % CI)		(0.27, 1.62)	(0.55, 1.88)	(0.85, 2.55)	
Any mental health problem	Ref	1.46	1.56	2.23	<0.001
(95 % CI)		(0.85, 2.50)	(1.07, 2.28)	(1.45, 3.42)	

Childhood physical punishment	None (n = 47)	Seldom (n = 821)	Regular (n = 118)	Severe (n = 67)	p
Major depression	Ref	1.34	1.89	1.80	0.074
(95 % CI)		(0.74, 2.44)	(0.97, 3.65)	(0.90, 3.59)	
Anxiety disorder	Ref	1.43	1.95	1.94	0.140
(95 % CI)		(0.67, 3.02)	(0.86, 4.42)	(0.85, 4.45)	
Suicidal ideation	Ref	1.11	1.90	2.11	0.012
(95 % CI)		(0.57, 2.14)	(0.89, 4.06)	(0.98, 4.55)	
Alcohol abuse/dependence	Ref	1.03	1.66	0.62	0.003
(95 % CI)		(0.57, 1.85)	(0.86, 3.21)	(0.30, 1.27)	
Cannabis abuse/dependence	Ref	1.36	1.19	1.39	0.821
(95 % CI)		(0.65, 2.84)	(0.52, 2.73)	(0.57, 3.38)	
Any mental health problem	Ref	1.14	1.48	1.18	0.417
(95 % CI)		(0.69, 1.88)	(0.82, 2.65)	(0.62, 2.22)	

Childhood neglect	None (n = 345)	Some of the time (n = 268)	Most of the time (n = 162)	Severe neglect (n = 125)	p
Major depression	Ref	1.62	1.69	2.30	<0.001
(95 % CI)		(1.26, 2.09)	(1.25, 2.28)	(1.66, 3.18)	
Anxiety disorder	Ref	1.30	1.33	2.25	<0.001
(95 % CI)		(0.96, 1.78)	(0.94, 1.87)	(1.57, 3.21)	
Suicidal ideation	Ref	1.65	2.11	2.01	<0.001
(95 % CI)		(1.10, 2.49)	(1.35, 3.30)	(1.23, 3.27)	
Alcohol abuse/dependence	Ref	1.49	1.63	1.76	0.002
(95 % CI)		(1.12, 1.97)	(1.19, 2.23)	(1.25, 2.48)	
Cannabis abuse/dependence	Ref	2.60	2.33	2.47	<0.001
(95 % CI)		(1.69, 3.99)	(1.40, 3.89)	(1.46, 4.19)	
Any mental health problem	Ref	1.63	1.74	2.24	<0.001
(95 % CI)		(1.32, 2.02)	(1.33, 2.27)	(1.69, 2.97)	

Note. AOR = adjusted odds ratio.

Table 3
Adjusted associations (AOR, 95 % CI)[a] between childhood maltreatment (CSA, CPP, CN) and mental health outcomes (major depression, any anxiety disorder, suicidal ideation, alcohol abuse/dependence, and cannabis abuse/dependence) at ages 18–40 years, by ethnicity.

Childhood sexual abuse	Māori					Non-Māori				
	None (n = 156)	Non-contact (n = 4)	Contact (n = 13)	Sexual penetration (n = 12)	P[a]	None (n = 749)	Non-contact (n = 24)	Contact (n = 41)	Sexual penetration n = 54	P[b]
Major depression (95 % CI)	Ref	3.33 (0.79, 13.93)	1.64 (0.84, 3.17)	2.23 (0.97, 5.15)	0.077	Ref	1.09 (0.59, 2.03)	1.81 (1.24, 2.63)	1.81 (1.22, 2.67)	0.013
Any anxiety disorder (95 % CI)	Ref	2.32 (1.03, 5.20)	0.87 (0.35, 2.18)	3.32 (1.30, 8.51)	0.016	Ref	1.08 (0.52, 2.27)	1.06 (0.63, 1.77)	1.96 (1.27, 3.05)	0.026
Suicidal ideation (95 % CI)	Ref	2.73 (0.89, 8.37)	1.51 (0.40, 5.68)	2.57 (0.90, 7.36)	0.122	Ref	1.70 (0.86, 3.36)	1.64 (0.89, 3.03)	2.68 (1.61, 4.46)	0.002
Alcohol abuse/ dependence (95 % CI)	Ref	0.15 (0.02, 1.05)	1.53 (0.70, 3.37)	1.54 (0.74, 3.21)	0.114	Ref	1.93 (1.07, 3.46)	1.67 (0.99, 2.82)	1.20 (0.74, 1.95)	0.047
Cannabis abuse/ dependence[c] (95 % CI)	Ref		0.92 (0.34, 2.46)	1.68 (0.48, 5.91)	0.680	Ref		0.86 (0.44, 1.70)	1.64 (0.87, 3.08)	0.237
Any mental health problem (95 % CI)	Ref	2.62 (0.92, 7.47)	1.91 (1.00, 3.64)	1.67 (0.71, 3.91)	0.058	Ref	1.34 (0.74, 2.42)	1.47 (0.95, 2.28)	2.34 (1.44, 3.81)	0.003

Childhood physical punishment (<16 years)	Māori					Non-Māori				
	None (n = 4)	Seldom (n = 134)	Regular (n = 28)	Severe (n = 19)	P[a]	None (n = 43)	Seldom (n = 687)	Regular (n = 90)	Severe (n = 48)	P[a]
Major depression (95 % CI)	Ref	0.97 (0.30, 3.08)	1.18 (0.32, 4.33)	0.73 (0.19, 2.78)	0.785	Ref	1.35 (0.69, 2.64)	1.98 (0.94, 4.18)	2.15 (0.99, 4.66)	0.034
Any anxiety disorder (95 % CI)	Ref	0.95 (0.14, 6.70)	0.95 (0.13, 6.98)	1.18 (0.16, 8.64)	0.963	Ref	1.52 (0.67, 3.45)	2.27 (0.92, 5.63)	2.10 (0.83, 5.27)	0.118
Suicidal ideation (95 % CI)	Ref	0.62 (0.16, 2.41)	0.66 (0.14, 3.18)	0.96 (0.20, 4.66)	0.839	Ref	1.14 (0.56, 2.33)	2.27 (0.98, 5.25)	2.16 (0.96, 4.88)	0.004
Alcohol abuse/ dependence (95 % CI)	Ref	0.86 (0.16, 4.65)	1.78 (0.31, 10.37)	0.85 (0.16, 4.52)	0.198	Ref	1.93 (0.53, 1.85)	1.67 (0.75, 3.20)	1.20 (0.21, 1.22)	0.047
Cannabis abuse/ dependence (95 % CI)	Ref	0.42 (0.06, 2.80)	0.33 (0.04, 2.80)	0.36 (0.05, 2.63)	0.759	Ref	1.67 (0.72, 3.90)	1.54 (0.60, 3.97)	1.69 (0.61, 4.70)	0.686
Any mental health problem (95 % CI)	Ref	1.41 (0.20, 10.15)	1.71 (0.22, 13.10)	1.09 (0.14, 8.32)	0.803	Ref	1.09 (0.65, 1.83)	1.48 (0.79, 2.76)	1.21 (0.61, 2.40)	0.436

Childhood neglect (<16 years)	Māori					Non-Māori				
	None (n = 44)	Some of the time (n = 56)	Most of the time (n = 25)	Severe neglect (n = 34)	P[a]	None (n = 301)	Some of the time (n = 212)	Most of the time (n = 137)	Severe neglect (n = 91)	P[a]
Major depression (95 % CI)	Ref	1.46 (0.78, 2.73)	1.27 (0.57, 2.81)	1.54 (0.75, 3.18)	0.630	Ref	1.63 (1.24, 2.15)	1.73 (1.25, 2.39)	2.49 (1.73, 3.58)	<0.001
Any anxiety disorder (95 % CI)	Ref	2.04 (1.05, 3.94)	2.32 (1.03, 5.22)	2.30 (1.03, 5.13)	0.102	Ref	1.16 (0.81, 1.66)	1.17 (0.81, 1.70)	2.27 (1.52, 3.37)	<0.001

(*continued on next page*)

Table 3 (*continued*)

Childhood neglect (<16 years)	Māori					Non-Māori				
	None (n = 44)	Some of the time (n = 56)	Most of the time (n = 25)	Severe neglect (n = 34)	P[a]	None (n = 301)	Some of the time (n = 212)	Most of the time (n = 137)	Severe neglect (n = 91)	P[a]
Suicidal ideation (95 % CI)	Ref	1.98 (0.88, 4.45)	1.74 (0.63, 4.86)	1.78 (0.63, 5.00)	0.427	Ref	1.43 (0.89, 2.29)	2.05 (1.25, 3.37)	1.96 (1.15, 3.35)	0.026
Alcohol abuse/ dependence (95 % CI)	Ref	1.50 (0.77, 2.93)	1.96 (0.93, 4.14)	1.65 (0.79, 3.46)	0.332	Ref	1.43 (1.05, 1.95)	1.59 (1.11, 2.25)	1.81 (1.22, 2.70)	0.009
Cannabis abuse/ dependence (95 % CI)	Ref	2.61 (0.91, 7.44)	3.28 (0.93, 11.58)	1.42 (0.41, 4.91)	0.139	Ref	2.41 (1.49, 3.89)	2.17 (1.24, 3.82)	2.88 (1.61, 5.16)	<0.001
Any mental health problem (95 % CI)	Ref	1.72 (1.02, 2.91)	1.83 (0.94, 3.60)	1.36 (0.74, 2.48)	0.171	Ref	1.56 (1.23, 1.97)	1.66 (1.24, 2.22)	2.49 (1.80, 3.44)	<0.001

[a] AOR = adjusted odds ratios.

[b] $p < 0.05$ represents statistically significant associations between childhood maltreatment (CSA, CPP, CN) < 16 years and the pooled mental health outcomes (18–40 years) separately by ethnicity (see Methods).

[c] Due to a zero cell count in the cross-tabulation between CSA and cannabis abuse/dependence (see Online Supplement Table 3) CSA categories non-contact and contact were combined for the regression model.

were more likely to have come from families characterized by more childhood adversity, and parental adjustment problems, to have been exposed to other forms of child maltreatment (CPP and CN), to be female, and to have a lower attachment to parents. This table also shows that cohort members who experienced greater severity of CPP or CN experienced similar adversity in childhood.

To account for the correlated effects of the covariates shown in Online Supplement Table 3, the regression models in Table 1 were extended to incorporate these covariates (see Methods). Table 2 summarizes the results, showing the pooled OR (95 % CI), p for the associations between maltreatment and mental health outcomes. Inspection of Table 2 shows that after adjustment for childhood confounding factors, statistically significant associations remained between CSA and major depression, any anxiety disorder and the summary variable any mental health problem. For CPP, statistically significant associations remained after adjustment for suicidal ideation and alcohol abuse/dependence. Finally, the adjusted associations between CN and mental health outcomes all remained statistically significant. However, given 18 statistical tests were conducted, assessment using a Bonferroni-corrected p-value ($p < 0.003$) showed that associations between CPP and suicidal behaviors and CPP and alcohol abuse/dependence may be due to type II error.

3.3. Multiplicative interactions by sex in adjusted models

Given differing rates of mental health outcomes by the sex of the cohort members, multiplicative sex × maltreatment exposure interaction terms were added to the adjusted models. The results showed that no interaction terms were statistically significant in the adjusted models indicating that the effects of childhood maltreatment were similar for males and females.

3.4. Associations between maltreatment and mental health outcomes, by ethnicity

The adjusted regression models in Table 2 were extended to include ethnicity (see Methods). Table 3 shows the adjusted associations between childhood maltreatment and the mental health outcomes of the pooled observations at ages 18–40 years, by ethnicity (source data, prevalence's and unadjusted associations are shown in Online Supplement Tables 4 and 5). Statistical significance testing was conducted within ethnic groups, not between ethnic groups (see Statistical methods).

Inspection of the associations between severity of CSA and mental health outcomes show that for Māori, CSA was associated with the experience of any anxiety disorder. In particular, severe CSA was associated with 3 × the odds of experiencing an anxiety disorder compared to those who had not experienced CSA. While rates of some disorders were higher among those exposed to CPP and CN, they were not statistically significantly associated with any analyzed mental health outcomes. For non- Māori, CSA was associated with the experience of major depression, any anxiety disorder, suicidal ideation, and the summary variable any mental health problem. CPP was associated with major depression, suicidal ideation, and alcohol abuse/dependence, while CN was associated with all analyzed mental health problems. It can be seen in Table 3, that for non-Māori, experience of any type of childhood maltreatment could nearly triple the odds of experiencing a mental health problem among those severely maltreated compared to those who were not maltreated. However, assessment of these findings against the Bonferroni p-value < 0.003 showed that only the associations between CSA and suicidal behaviors; CPP and suicidal behaviors; and CN and: major depression, any anxiety disorder, alcohol abuse/dependence, cannabis abuse/dependence and any mental health disorder remained.

4. Discussion

This study examined the associations between CSA, CPP and CN prior to 16 years and measures of mental health outcomes (major depression, any anxiety disorder, suicidal ideation, alcohol abuse/dependence, cannabis abuse/dependence) pooled over repeated assessments from 18 to 40 years. In general, the results showed that the experience of childhood maltreatment increased the odds of mental health problems in adulthood. After statistical adjustment for a range of potentially confounding factors, a number of associations remained. More specifically, experience of severe childhood maltreatment increased the odds of experiencing a mental health problem between 1.8 and 2.6 times, compared to those who did not report maltreatment. No evidence was found that the mental health effects of childhood maltreatment were different for males and females.

Traditionally, very little research has focused on Māori so we cannot assume the effects of maltreatment are the same across the New Zealand/Aotearoa population (Theodore et al., 2019). Therefore, the analyses were extended to examine the associations between maltreatment and mental health outcomes by ethnicity (Māori/non-Māori). The results showed that after adjustment, for Māori, only an association between CSA and any anxiety disorder was found in which the odds of any anxiety were >3 times higher for those reporting the most severe CSA compared to Māori who did not experience CSA. For non-Māori, a wide range of associations remained. However, after applying a Bonferroni p-value, the association for Māori CSA and any anxiety disorder became non-significant. Potentially, the smaller Māori sample size reduced the ability to detect mental health outcome differences between those who had been exposed to severe vs. no maltreatment. Therefore, it is possible that harm to Māori may not follow a specific dose-response pattern but occur across all levels of maltreatment exposure. After Bonferroni assessment, remaining associations for non-Māori were: CSA and suicidal behaviors; CPP and suicidal behaviors; CN and major depression, any anxiety disorder, alcohol abuse/dependence, cannabis abuse/dependence and any mental health problem.

The finding that childhood maltreatment increases the odds of mental health problems in adulthood is consistent with previous research (Bell et al., 2019; Danese et al., 2008; Danese et al., 2009; Duncan, Mulder, Wilkinson, & Horwood, 2019; Fanslow, Hashemi, Gulliver, & McIntosh, 2021; Fergusson et al., 2008; Fergusson, McLeod, & Horwood, 2013; Geoffroy et al., 2016; McLeod, Fergusson, & Horwood, 2014; Scheuer et al., 2018; Tracy, Salo, Slopen, Udo, & Appleton, 2019) irrespective of abuse type (Newbury et al., 2018). Furthermore, unlike previous research the current study did not find that the results varied by gender (see also: Gallo et al., 2018; Halpern et al., 2018). It is important to note here that the rates of maltreatment do differ in other previous research on Māori and non-Māori. Rouland, Vaithianathan, Wilson, and Putnam-Hornstein (2019) reported rates that were much higher than those for Māori than non-Māori in the current study. However, that study used officially notified New Zealand maltreatment statistics whereas Christchurch Health and Development Study describes parental self-report maltreatment from a representative population with the apparent differences in the findings explained by a well-known methodological and conceptual error known as the “clinician's illusion” (Cohen & Cohen, 1984).

Upon inspection of the results of the Māori sample, it is important note that there may be a relatively homogeneous approach to child-raising by Māori and non- Māori. For more than a Century, the processes of colonization and the role missionaries played in converting Māori to Christianity altered parenting behaviors and increased the acceptance of religiously justified violence towards children in New Zealand society (Wood, Hassall, Hook, & Ludbrook, 2008). Working alongside this, was the introduction of the Plunket Society in the early 1900's which operated an organization aiming to westernize and control mother's parenting behaviors under the guise of improving infant health (Walker, 2022).

It is important to report findings for Māori, a marginalized indigenous population of New Zealand/Aotearoa, as colonization has had detrimental impacts on health and wellbeing (Huriwai et al., 2022; Moewaka Barnes & McCreanor, 2019; Rolleston et al., 2020). Even reports on child maltreatment and later adult outcomes are important as they will engage with Māori, affirm, acknowledge and lead to enhanced wellbeing (Rolleston et al., 2020). In addition, unhelpful generalizations and stereotyping from deficit-based models has neglected the significance of intergenerational trauma by way of discrimination, colonization and shaming views by Europeans.

To find a consistent body of Māori health findings, more research and scholarship on Māori needs to be implemented using culturally sensitive approaches (Theodore et al., 2019). While the statistical approach of this research arose from an understanding that colonization has had detrimental impacts leading to adverse mental health outcomes for Māori, future research should focus on accounting for the wider historical and cultural context of trauma across generations that was caused by colonization, discrimination, forced urban migration and inequalities. To enhance Māori wellbeing, future research that encompasses mātauranga Māori – traditional knowledge of the Māori people of New Zealand/Aotearoa – will be invaluable to highlight areas of need for continued mental health support for Māori.

When interpreting the study results, we need to acknowledge a number of limitations. This study draws on longitudinal data which is useful for studying the life course development of a population. At present, it is unclear as to whether the findings are generalizable outside of this cohort as the data was collected during a specific historical context from a specific cohort of people who live in a specific society (Fergusson et al., 2008; Fergusson & Lynskey, 1997).

The CN measure had low internal consistency suggesting the items in the questionnaire are not very consistent when measuring neglect (Cronbach, 1951). Future research should also focus on developing a more reliable scale to measure CN. In addition, retrospective reports of abuse and neglect were used which may be subject to reporting bias (Colman et al., 2016); although no evidence suggests that the findings were influenced be recall bias or current mood (Fergusson, Horwood, & Boden, 2011; Newbury et al., 2018; Pinto Pereira, Rogers, & Power, 2021). Further, the timing of the assessments of CSA and CPP meant that information on the exposures of interest was collected in close proximity to the occurrence of the exposure which can help decrease recall bias. The measure of CN was collected when the cohort members were aged 40 years, when cohort members were asked to report on their experience of neglect prior to age 16. Therefore, it is possible that the results related to this measure were influenced by recall bias. For the results of the

Māori sample, the results should be interpreted by considering limitations including that the Christchurch Health and Development Study cannot assess cultural variables of colonization, discrimination and forced urban migration in analyses. Further, the measures and tools used by the Christchurch Health and Development Study may not have been culturally relevant or appropriate to Māori.

Finally, while the sample size and retention of participants is a strength of this study – at age 40, nearly 74 % of this birth cohort were still alive and participating in study assessments – it should be noted that the Māori cohort is substantially smaller (17.8 % participants) than the non-Māori cohort, reducing the power to detect the effects of abuse exposure in this group.

A particular strength of the Christchurch Health and Development Study is that the study has collected a large number of prospectively collected confounding factors which were used to adjust the estimates. In addition, although the life course of child maltreatment is well-reported in the literature, research on marginalized populations is scarce, especially in the OECD. Hence, this research fills the gap by examining the impact of CSA, CPP, and CN on adult mental health outcomes among a Māori cohort.

In conclusion, the present study shows that the experience of childhood maltreatment increases the odds of mental health problems in adulthood, even after controlling for potentially confounding factors. Using a method that avoided the deficit-based approach to the research, we found that for non-Māori mental health appeared more adversely impacted by childhood maltreatment than Māori, even after controlling for a wide range of childhood background factors. However, the impact of childhood maltreatment on mental health outcomes may not have been detected in our study due to limitations and it is possible that any level of maltreatment may adversely impact Māori. Therefore, this study highlights the importance of applying culturally sensitive approaches and increasing research efforts so that a consistent picture of childhood maltreatment outcomes will emerge for Māori.

Funding statement

This research was funded by the Health Research Council of New Zealand (Program Grant 16/600). This research was previously funded by grants from the National Child Health Research Foundation (Cure Kids), the Canterbury Medical Research Foundation and the New Zealand Lottery Grants Board.

Declaration of competing interest

The Authors declare no conflict of interest. The authors alone are responsible for the content and writing of the paper.

Data availability

Data will be made available on request.

Acknowledgements

The authors would like to thank the Christchurch Health and Development Study participants for their life-long involvement in this study.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.chiabu.2023.106444.

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Further reading

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