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## The economic burden of child maltreatment and co-occurring parental domestic violence and abuse in the UK

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### ABSTRACT

**Background:** Child maltreatment (CM) and parental domestic violence and abuse (pDVA) impose considerable lifelong adverse outcomes on those affected. Despite sharing multiple family and environmental risk factors, the economic burden of child exposure where they co-occur has not previously been estimated in detail.

**Objective:** To estimate average lifetime societal costs resulting from CM or childhood exposure to pDVA, and incremental costs for scenarios where they co-occur.

**Participants and setting:** Avon Longitudinal Study of Parents and Children, G1 (child) cohort.

**Methods:** We developed a model to estimate lifetime societal costs (2019 GBP) for fatal and non-fatal exposure to CM and/or pDVA for the study sample. Total lifetime costs per child exposed, total UK economic burden, and UK government-specific costs were then estimated for the cohort of children born in the UK in 2013.

**Results:** Lifetime costs for childhood exposure to CM and/or pDVA, were £71,309 per child (non-fatal exposure), and £1,292,377 per CM fatality, with £27.8 billion projected costs (2013 UK birth cohort). Total costs for exposure to pDVA alone was £1.0 billion (£16,639 per child exposed), rising to £2.0 billion (£71,037 per exposed child) for children reporting awareness of pDVA. Co-occurring CM and pDVA imposed greater costs than either alone, including costs from child perpetration of intimate partner violence.

**Conclusions:** CM and/or pDVA exposure incurs large personal and societal economic burdens, and costs from both pDVA exposure and intergenerational transmission of IPV perpetration, highlight the importance for policies to address both CM and domestic violence and abuse in affected households.

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## 1. Introduction

Child maltreatment (CM) and domestic violence and abuse (DVA) are widely prevalent violations of human rights, responsible for substantial adverse short- and long-term impacts on the health, wellbeing and life opportunities of the affected individuals, with additional impacts on the family and society overall (Gilbert et al., 2009; Oliver et al., 2019).

Approximately 8.5 million adults in England and Wales are estimated to have been exposed to CM (physical, sexual or emotional abuse or emotional or physical neglect of a child by a parent or caregiver) before their 16th birthday (2019, Office for National Statistics, 2020b). Longitudinal studies report a broad range of adverse health, social, and economic outcomes in CM survivors, spanning poor mental and physical health, risky behaviours (e.g., smoking, heavy alcohol consumption, illegal drug use), contact with the criminal justice system (CJS), and reduced quality of life and economic well-being as an adult (Conti et al., 2017; Fang et al., 2012; Gilbert et al., 2009; Herbert et al., 2023; Hughes et al., 2020; Peterson, Florence, & Klevens, 2018). The most recent societal cost study for CM in the UK population, estimated a discounted average lifetime incidence-based cost of £89,390 per non-fatal CM victim, and £940,758 per CM fatality (2015 GBP; Conti et al., 2021).

In England and Wales (2016/17), an estimated 1.9 million individuals were subjected to DVA (non-sexual abuse, sexual assault or stalking by a partner of family member), costing an estimated £66 billion GBP (£34,000 per victim) (Oliver et al., 2019). Costs incurred include those due to physical and emotional harms to the victim, health service costs, criminal justice and civil legal system costs, provision of victim services, and losses to the economy through reductions in output and productivity (Oliver et al., 2019; Peterson, Kearns, et al., 2018; Walby, 2009; Walby & Allen, 2004; Walby & Olive, 2014).

DVA between adult parents/guardians (hereafter referred to as 'parental DVA' [pDVA]) also impacts on the life outcomes of child witnesses, however there is a lack of suitable data due to its 'hidden' nature, and an absence of consensus over whether children have been directly/indirectly exposed where pDVA does occur, (Oliver et al., 2019; Walby, 2004, 2009). Where pDVA costs have been identified and estimated, these were restricted to the provision of child protection care (Walby & Olive, 2014).

CM and DVA are complex phenomena, with multiple common family and environmental risk factors contributing to a high degree of the two co-occurring. In the UK, approximately 1 in 4 children are thought to live with an adult who has experienced domestic violence or abuse (Children's Commissioner's Office, 2018), with CM/DVA co-occurrence estimated to occur in 30 % to 60 % of households reporting either CM or DVA (Appel & Holden, 1998; Edleson, 1999; Herrenkohl et al., 2008; Walby & Olive, 2014). As few prospective cohort studies have measured both CM and pDVA to date, previous research has typically focused on each adversity in isolation, potentially failing to fully capture the economic burden incurred when both intersect. Understanding how CM and DVA interact, and accurately quantifying the resulting impacts, is key to obtaining a true picture of the deriving accurate estimates of overall costs, and to provide a solid basis for evaluating interventions targeting abuse prevention and survivor support.

This study presents new estimates of the separate economic burdens for CM and pDVA in terms of average lifetime costs per exposed individual, and aggregate lifetime costs for the 2013 UK child population, alongside costs of the co-occurrence of CM and pDVA.

## 2. Methods

### 2.1. Overview

This study adopted a UK societal perspective for measurement of relevant costs. All costs were estimated in Pound sterling (GBP), adjusted to the cost reference year (2019) via the UK GDP deflator (HM Treasury, 2020a). In the base case analysis, future costs which are assumed to accrue over time were discounted to reflect present values at an annual rate of 3.5 %, following guidance from the 'The Green Book: appraisal and evaluation in central government' (HM Treasury, 2020b). Detailed model input parameter and result tabulations are presented in the Appendices (Supplementary File A).

### 2.2. ALSPAC analysis

Data in this study on the incidence and consequences of CM and pDVA are from the Avon Longitudinal Study of Parents and Children (ALSPAC) (Boyd et al., 2013; Fraser et al., 2013; Northstone et al., 2019). Pregnant women resident in Avon, UK with expected dates of delivery 1st April 1991 to 31st December 1992 were invited to participate in ALSPAC, from which an initial 14,541 pregnancies were enrolled. Subsequent contact of eligible mothers when children were aged 7 increased the overall total to 15,447 enrolled pregnancies, resulting in 15,658 fetuses. Of these, 14,901 were alive at 1 year of age. Study data were collected and managed using the REDCap (Research Electronic Data Capture) electronic data capture tool, a web-based software platform hosted at the University of Bristol (Harris et al., 2009). Ethical approval for the study was obtained from the ALSPAC Ethics and Law Committee and the Local Research Ethics Committees.

Input parameters for the cost model were informed via an econometric analysis of data from the ALSPAC study, exploring the relationship of exposures to CM and/or child exposure to pDVA with a range of long-term outcomes. Full details of the of the variables used and analytical methodology are detailed in Herbert et al. (2023).

A total of 6252 participants from the G1 (child) generation were eligible for analysis of exposures and outcomes, based upon the criteria that at least 50 % of answers were provided for questions on adverse childhood experience exposure, as detailed previously (Houtepen et al., 2018). Additional analyses were conducted to estimate the marginal probability of life outcomes for the exposed population, relative to their unexposed counterparts and controlling for potentially confounding variables.

### 2.3. Exposure definitions

CM was defined as the reporting by the mother, partner or child, of one or more of the following, when the child was between the ages of 0–16 years:

- a. physical abuse – physical cruelty towards the child, or the child being physically hurt by an adult family member;
- b. sexual abuse – sexual abuse, or forcing of the child to perform sexual acts or sexual touching;
- c. emotional abuse – emotional cruelty or the direction of hurtful/insulting language towards the child;
- d. emotional neglect – child had persistent feelings of exclusion, misunderstanding or unimportance to the family or were ignored/ never asked about their free time;

pDVA was defined as the reporting (by either the mother, partner, or the child) of adult family members displaying physically cruel behaviour or violence towards each other, including: hitting; choking; strangling; beating; or shoving. For binary constructs measuring exposure of the child to pDVA, the exposure window was confined to the time period from the start of pregnancy to when the child was 16 years of age.

Co-occurrence of CM and pDVA was defined as when the child had a record of any instance of pDVA within the household in addition to any instance of any form of CM, within the periods as defined above. Full details of the variables used to derive the binary exposure constructs are reported in [Herbert et al. \(2023\)](#), together with the controlling variables used in the econometric analysis for each exposure-outcome scenario type (summarised in Appendix A).

**Table 1**  
Categories of outcomes used in the cost analysis.

Acute outcomes <sup>a</sup>	Long-term outcomes (cont.)
Maltreatment or violence related injuries (MVR)	Physical Health (cont.)
Health care	Suicide
Lost productivity	Health care
Short-term mental health problems	Lost productivity
Health care	Other
Criminal justice	Economic and Social Outcomes
Fatality	Employment: Likelihood
Health care	Health care
Criminal justice	Public finance cost
Lost productivity	Lost productivity (employment)
Long-term outcomes	Social welfare use
Anxiety	Health care
Health care	Lost productivity
Lost productivity	Employment: Monthly earnings loss
Eating disorders	Lost productivity
Health care	Problem gambling
Lost productivity	Health care
Other (out-of-pocket expenses)	Lost productivity
Depression	Criminal justice
Health care	Child social care
Lost productivity	Child protection plan: Fixed Costs
Substance Abuse	Children requiring ongoing support (0–6 months)
Alcohol misuse	Children requiring ongoing support (6 months - 2 years)
Health care	Foster care and Local authority care <sup>a</sup>
Criminal justice	Special education
Other (e.g., property damage and loss, direct administrative costs, and social work services)	Special educational services
Drug use	Criminal Justice
Health care	CM perpetrator (non-homicide) <sup>a</sup>
Lost productivity	Criminal justice
Criminal justice	Perpetrator lost productivity
Smoking, heavy	DVA perpetration (by exposed child) <sup>b</sup>
Health care	Criminal justice
Lost productivity	
Other (social care, fire costs)	
Physical Health	
Health: BMI	
Health care	
Lost productivity	
Risky behaviour: Sexually transmitted infections	
Health care	
Lost productivity	

Abbreviations: A&E, accident and emergency; BMI, body mass index; CM, child maltreatment; DVA, domestic violence and abuse.

<sup>a</sup> These outcomes are assumed to be CM-specific, and thus not included in costs for exposure to pDVA alone.

<sup>b</sup> Perpetration of DVA by the exposed child (ALSPAC G1 cohort), on a partner with which they were in a relationship.

The above constructs were classified as a child being “ever/never” exposed during childhood. Since exposure could have been reported at any age between the defined exposure start and end points, a pragmatic assumption of exposure to CM from a mean age of 6 years was made (Conti et al., 2021; Fang et al., 2012). In the absence of published data, this was also assumed to be the mean starting age of exposure to pDVA.

#### 2.4. Exposure scenarios

The costs of the following exposures to CM and/or pDVA was explored:

1. Exposure to ANY form of CM combined, excluding any pDVA exposure (a single model with an individual indicator for all forms of CM combined [yes/no] – either physical abuse AND/OR sexual abuse AND/OR emotional abuse AND/OR emotional neglect vs none of these);
2. Exposure to pDVA, excluding any CM exposure (a single model with an individual indicator for pDVA vs no pDVA [yes/no]);
3. Exposure to ANY form of CM combined AND/OR pDVA (a single model with an individual indicator for CM AND/OR pDVA vs neither [yes/no]);
4. Exposure to co-occurring emotional abuse AND pDVA (a single model with an individual indicator for exposure to emotional abuse and pDVA combined vs neither emotional abuse OR DVA [yes/no]);
5. Exposure to co-occurring emotional abuse AND physical abuse AND pDVA, combined (a single model with an individual indicator for exposure to emotional abuse AND physical abuse AND pDVA combined vs none of emotional abuse OR physical abuse OR DVA [yes/no]);
6. Exposure to an individual form of CM, excluding any co-occurring pDVA exposure (four separate models each with individual indicators for physical abuse vs no physical abuse [yes/no], sexual abuse vs no sexual abuse [yes/no], emotional abuse vs no emotional abuse [yes/no] and emotional neglect vs no emotional neglect [yes/no]);

Models 4 and 5 were selected as emotional abuse was the form of CM most highly correlated with pDVA, and emotional abuse and physical abuse being the two most highly correlated forms of reported CM (Herbert et al., 2023). Results for model 6 were provided for context with regards to the societal costs from individual CM exposures.

#### 2.5. Cost model

The findings in this study were derived from an economic model developed to estimate incremental costs for childhood exposure to CM and/or pDVA (relative to an unexposed control group), for a range of short- and long-term health, social and economic outcomes (Table 1). These costs were estimated on a per capita basis and disaggregated into sub-categories, thus allowing for summation of the separate outcomes into defined cost categories (e.g., health care costs, child social care costs, lost productivity, criminal justice costs, social welfare costs, and costs for special education). Government burden costs were specified as the summation of UK government-financed cost categories: health care; child social care; criminal justice; education and social welfare costs. As a sensitivity analysis, government burden in terms of aggregated per capita public finance costs (welfare benefits, loss of direct and indirect taxes, and loss of National Insurance contributions; Coles et al., 2010) were included. These replaced the estimates for social welfare costs used in the base case analysis, to avoid double counting.

For exposure scenarios that include CM, all costs (acute and long term) were calculated. For the scenario of child exposure to pDVA alone, costs arising from acute health outcomes and child fatalities were not included, as they were not applicable to this form of exposure. Costs for short-term mental health problems were also not included for the pDVA only exposure scenario, as outcome data were not available.

The Consolidated Health Economic Evaluation Reporting Standards checklist (Husereau et al., 2013) was used when writing this report (For completed checklist, see Supplementary File B).

#### 2.6. Exposure prevalence and CM/pDVA exposure estimates

Prevalence estimates for exposure to CM and/or pDVA by sex were derived from analysis of a sample of the G1 (child) cohort from the ALSPAC longitudinal study (Herbert et al., 2023; Appendix A). Study participants were eligible for the analysis if a minimum of 50 % of questions used to define binary exposure constructs within the overall age window for childhood exposure to CM (0 to 16 years) and/or pDVA (pregnancy to 16 years of age) had been answered, as specified in previous studies (Houtepen et al., 2018; Houtepen et al., 2020). Prevalence of exposure is reported as a percentage of the total eligible ALSPAC G1 (child) sample population.

Estimates for the number of children exposed during childhood were calculated by multiplying the exposure prevalence estimates by the relevant UK 2013 birth cohort population estimates (Office for National Statistics, 2021).

#### 2.7. Marginal probabilities

Point estimates and measures of uncertainty were used to populate marginal probabilities for individual outcomes in the cost model. These were derived from the ALSPAC analysis study where details of the statistical and modelling approaches are described (Herbert et al., 2023). Where possible, marginal probabilities reported by sex were used in the model. Alternatively, total study sample

estimates were used, with the assumption made that the outcomes for males and females were equal.

## 2.8. Cost calculations

Summary lifetime cost estimates for all exposure scenarios are reported in the Results (below), with detailed costs tabulated in Appendix B. All models were run separately for males and females, and cost estimates are reported by sex and for the total exposed population.

Best available data for relevant costs arising for each outcome, were sourced via a keyword search across peer-reviewed publications in Medline, Embase, psycINFO and Econlit databases, and a search of grey literature. Where available, cost estimates for the most recent, comprehensive, UK-based peer-reviewed studies were used in the first instance. Where data were not available (and where appropriate), costs were calculated using national statistics for the year 2019. Where estimates were quoted in previous published literature (e.g., UK national statistics), and where possible, these were updated using more recently published releases of these data.

As data was sourced from different publications reporting estimates with different units of analysis, these were converted where required, to estimates based upon common denominators (e.g., outcome-related unit costs converted to one-time, annual or lifetime costs per capita). Cost estimates were converted to 2019 GBP (where required) by indexed inflation/deflation using the UK GDP deflator (HM Treasury, 2024). Sources of cost estimates are summarised below for each cost category.

Direct attributable costs (e.g., healthcare costs for treatment of maltreatment or violence related injuries) were applied where such evidence was available. Alternatively, the expected costs from exposure (i.e., the marginal probability of a given outcome multiplied by the associated estimated cost of that outcome) were used. Societal costs from premature mortality resulting from exposure to CM and/or pDVA were assumed to be captured within the model via outcome-specific costs where available (e.g., child homicide, depression, smoking, alcohol misuse, illegal drug use). Where applicable, future costs for outcomes were calculated by discounting, then summing the annual costs for each year of the term over which the marginal effect was assumed to apply.

For the base case model, the period over which future costs for each outcome applied, was defined by the term start and end ages:

- a. term start age: the greater of either the age of the G1 child when the first record for the relevant outcome was taken, or the assumed mean age of exposure (6 years age);
- b. term end age:
  - i. For health outcomes, the lower of either the average life expectancy at birth, or 30 years from the start age;
  - ii. For lost productivity outcomes, the lower of either the retirement age of 65 years, or 30 years from the start age;

A conservative value of 30 years for duration of productivity losses was chosen pragmatically to balance the capture of potential future losses, with a limit on the assumed duration for which the effects of CM and/or pDVA exposure may last. Life expectancy estimates were derived from UK national projections (Office for National Statistics, 2022b). We also note that the effect discounting will dramatically reduce costs incurred beyond this point in time. The effect of this assumption on estimates for cost of exposure were tested in the sensitivity analyses.

For a given exposure, from the 2013 UK birth cohort (2013 mid-year UK population of children, aged less than one year old), the numbers of children estimated to be exposed before their 16th birthday, were calculated using the relevant prevalence estimate. The economic burden for a given exposure was then estimated separately for males and females in the 2013 UK birth cohort, and the costs summed to derive the total aggregate economic burden. Full details and calculation steps for the derivation of unit costs, are available in the full cost model (Children and Families Policy Research Unit, 2024).

## 2.9. Incidence estimates

Incidence estimates for non-fatal exposure to CM and/or pDVA within the 2013 birth cohort were calculated by multiplying the population estimate for children less than one year old in 2013 (Office for National Statistics, 2021), by the relevant percentage exposure values. Estimates for the overall childhood probability of death from CM exposure, were calculated using the 2019 UK data for child homicide (reported by <1 year, 1–4 year and 5–15 year age groups) where the suspect was a parent or step-parent, giving a total of 18 male and 11 female fatalities in a 2013 UK child population of 12,058,589 (Office for National Statistics, 2021, 2022c; Police Service of Northern Ireland, 2022; Scottish Government, 2021). For each age group, a Poisson distribution estimation for total probability of fatal CM was derived from the one-year incidence data, and summed to obtain the total probability of fatal CM in childhood.

## 2.10. Non-fatal CM, average lifetime unit costs per child exposed

### 2.10.1. Short-term costs

Expected short-term costs per child exposed to CM are comprised of the health care costs for MVR injuries resulting in admission to hospital, and treatment of short-term mental health problems due to the exposure. For exposure to pDVA, the incremental probabilities for both outcomes were assumed to be zero.

To obtain estimates for the number of MVR cases in 2019, incident rate estimates for the model age groups (Gonzalez-Izquierdo et al., 2014) were multiplied by the UK population for the relevant age group (<1 year, 1–10 years, and 11–16 years). In the absence of

a direct estimate for the 11–16 year UK age group incident rate, the 11–18 year group rate was multiplied by the UK population for the 11–16 year age group. The total childhood probability of MVR-associated admission was then derived for each age group using a Poisson distribution and summed to obtain the total childhood probability.

Total costs for MVR injuries, was estimated using the average, case-weighted paediatric injury healthcare unit cost for England (£978) for unplanned non-elective short and long stay hospital admissions, assuming that equal case rates are applicable across the whole of the UK (Department of Health, 2021). Although injuries may occur from repeat episodes of abuse, in the absence of longitudinal data for new CM case admissions, it was necessary to assume that each admission relates to a new case of child maltreatment.

Expected short-term mental health costs were calculated, as previously described (Conti et al., 2021), by multiplying the incremental probability from CM exposure on suffering either emotional disorders, conduct disorders or hyperkinetic disorders, by the sum of their discounted mean annual unit healthcare costs (from age of exposure to 18 years of age). Assuming exposure at the age of 6 years, the unit cost for the short-term mental health impact of CM was £11,935.

### 2.10.2. Long-term costs

The discounted lifetime unit costs for all cost categories are summarised in Table 2.

*Long-term mental health problems:* Expected long-term mental health costs were calculated from estimates for the incremental probabilities of children exposed to CM and/or DVA to experience long-term mental health disorders (anxiety, depression or eating disorders), multiplied by their respective unit costs. Total lifetime unit costs for anxiety (Konopka & König, 2020), depression (König et al., 2020; Oliver et al., 2019; Thomas & Morris, 2003) and eating disorders (Jenkins, 2021), are detailed in Table 2.

*Substance abuse:* Lifetime unit costs associated with CM and/or pDVA exposure were calculated for alcohol misuse, illegal drug use and heavy smoking, by multiplying the incremental probability of the respective outcome with the associated unit cost.

The annual economic burden of alcohol consumption as a proportion of UK GDP, for costs including health care, CJS and other costs (Public Health England, 2016), was used to calculate the lifetime unit cost per alcohol consumer over 18 years of age.

The annual economic burden of illegal drug use for health care costs (mental health costs, overdoses and poisonings, neonatal disorders, infectious diseases and drug treatment costs), lost productivity (deaths) and criminal justice costs (drug-related acquisitive crime, criminal justice and enforcement costs), per frequent drug user were derived from UK government data (UK Government Home Office, 2019a, 2019b). To avoid double counting of CM/pDVA-attributable mental health costs from illegal drug use, in this model these costs are assumed to be captured via the long-term mental health problem costs described above.

The economic burden of heavy smoking for 2019 (healthcare, lost productivity [including through premature mortality], other costs), was obtained from the ASH ready reckoner costs of smoking to society calculator (Action on Smoking and Health, 2022). This was then divided by the estimated UK heavy smoker population (7,279,956; Action on Smoking and Health, 2022; Department of Health Northern Ireland, 2019; Grant, 2013; Scottish Government, 2020), to derive the lifetime unit cost per heavy smoker (Table 2).

*Physical health problems:* To quantify the effect of obesity on physical health, annual per-child NHS health care costs were calculated for five obesity-related diseases (CHD, stroke, diabetes, breast cancer and colorectal cancer), as detailed in Hollingworth et al., 2012.

Costs associated with the increased probability of a child exposed to CM and/or pDVA subsequently engaging in risky sexual behaviour, were modelled via the costs from treating sexually transmitted infections (STIs) acquired because of reduced use of condoms during sex. Expected cost estimates for increased cases of a representative basket of STIs (chlamydia, gonorrhoea, and HIV) were calculated for England in 2019 accounting for STI transmission rates, and age-dependent prevalences, sexual contacts and rates of condom use (Ong et al., 2019; Sadler et al., 2016; UK Health Security Agency, 2021, 2022).

*Suicide:* The lifetime probability of suicide for the proportion of suicides where the individual had a history of exposure to abuse or neglect was derived from the one-year suicide rate per 100,000 UK population (10+ years of age, assuming a constant suicide rate across all ages), using a Poisson distribution (National Child Mortality Database, 2021; Office for National Statistics, 2022b; Samaritans, 2024). Associated discounted lifetime costs were calculated for healthcare (suicide-related, self-harm, emergency services and coroner/legal costs), lost productivity, and other costs (family bereavement) (Samaritans, 2024).

### 2.10.3. Economic and social outcomes

*Likelihood of employment and social welfare use:* Unit lost productivity costs incurred by the social welfare system were calculated under an assumed period of 16 weeks unemployment (Institute for Public Policy Research, 2016), at a cost of £9234 per claimant per annum (Hansard, 2013). Although the health benefits for return to work have been estimated by Public Health England (Public Health England, 2017), these are based on mental health conditions and thus are assumed to be captured by the long-term mental health outcomes (anxiety and depression) described above.

Sensitivity analysis for productivity losses incurred by unemployment was performed using the estimates reported in Coles et al. (2010), which incorporated benefits claims (Jobseekers Allowance and Housing Benefit), loss of direct and indirect taxes, and loss of National Insurance contributions.

Unemployment is recognised to have impacts on physical and mental health (McKee-Ryan et al., 2005), however the costs of unemployment associated with exposure to CM and pDVA are assumed to be captured in the other model outcomes (e.g., mental health and obesity).

*Lost monthly earnings:* Lost productivity costs from the reduction in earnings was not included in the base case model due to the potential for double counting, if included in addition to the lost productivity costs captured in other outcomes used (e.g., health outcomes). Reduced monthly earnings was substituted for these costs as a sensitivity analysis to evaluate the impact of differing sources of productivity losses on the cost model.

The average percentage reduction in monthly earnings relative to their unexposed peers was calculated using the minimum non-

**Table 2**  
Lifetime unit costs, long-term outcomes (Base case).

Outcome	Reported unit cost	Unit cost time frame	Lifetime cost	Cost year	Inflation index	Lifetime unit cost (2019 GBP)	Cost source
<b>Mental Health</b>							
<b>Anxiety</b>							
Health care	£455.88	Annual	£8384.52	2010	UK GDP	£9793.90	Konnopka & König, 2020
Lost productivity	£455.88	Annual	£8384.52	2010	UK GDP	£9793.90	
<b>Eating Disorders</b>							
Health care	£362.79	Annual	£6672.45	2017	UK GDP	£6944.56	Jenkins, 2021
Lost productivity	£2262.26	Annual	£41,607.67	2017	UK GDP	£43,304.47	
Other (out-of-pocket expenses)	£8.12	Annual	£149.41	2017	UK GDP	£155.50	
<b>Depression</b>							
Health care	£1419.22	One-time	£1419.22	2019	UK GDP	£1419.22	König et al., 2020
Lost productivity, morbidity	£4496.40	Annual	£69,995.60	2000	UK GDP	£103,574.62	Oliver et al., 2019
<b>Substance abuse</b>							
<b>Alcohol Misuse</b>							
Health care	£72.43	Annual	£1332.15	2016	UK GDP	£1412.23	Sheron & Gilmore, 2016
Criminal justice	£19.81	Annual	£364.26	2016	UK GDP	£386.16	
Other (e.g., property damage and loss, direct administrative costs, and social work services)	£473.63	Annual	£8710.98	2016	UK GDP	£9234.69	
<b>Drug Use</b>							
Health care	£661.65	Annual	£12,169.07	2016	UK GDP	£12,900.68	Public Health England, 2017a
Lost productivity	£6866.17	Annual	£126,282.83	2016	UK GDP	£133,875.00	
Criminal justice	£10,241.47	Annual	£188,361.50	2016	UK GDP	£199,685.86	
<b>Smoking, Heavy</b>							
Health care	£298.08	Annual	£5482.36	2019	UK GDP	£5482.36	Action on Smoking and Health, 2022; Grant, 2013; Public Health Agency Northern Ireland, 2015; Scottish Government, 2020
Lost productivity	£1526.70	Annual	£28,079.11	2019	UK GDP	£28,079.11	
Other (social care, fire costs)	£169.46	Annual	£3116.76	2019	UK GDP	£3116.76	
<b>Physical Health</b>							
<b>BMI</b>							
Health care	£13,967.00	Lifetime	£13,967.00	2005	UK GDP	£18,352.90	Hollingworth et al., 2012
Lost productivity	£0.00	Annual	£0.00	2019	NA	£0.00	
<b>Risky Behaviour: Sexually Transmitted Infections</b>							
Health care	£19.23	Lifetime	£19.23	2019	UK GDP	£19.23	This study
Lost productivity	£0.00	Annual	£0.00	2010	NA	£0.00	
<b>Suicide</b>							
Health care	£59,281.81	Lifetime	£59,281.81	2022	UK GDP	£53,716.26	Samaritans, 2024
Lost productivity	£741,703.81	Lifetime	£741,703.81	2022	UK GDP	£672,070.42	
Other (Families, bereavement)	£653,724.19	Lifetime	£653,724.19	2022	UK GDP	£592,350.60	
<b>Economic and Social Outcomes</b>							
<b>Employment: Likelihood</b>							
Health care	£0.00	Annual	£0.00	2019	NA	£0.00	Coles et al., 2010
Public finance cost	£56,301.00	Lifetime	£56,301.00	2009	UK GDP	£66,804.80	
Lost productivity (employment)	£0.00	Lifetime	£0.00	2019	NA	£0.00	
<b>Social Welfare Use</b>							
Health care	£0.00	Annual	£0.00	2012	NA	£0.00	Institute for Public Policy Research, 2016
Lost productivity	£2831.51	One-time	£2831.51	2013	UK GDP	£3121.52	
<b>Employment: Monthly Earnings Loss</b>							
Lost productivity (employment)	£688,906.61	Lifetime	£688,906.61	2019	UK GDP	£688,906.61	This study
<b>Problem Gambling</b>							
Health care	£63.19	Annual	£1162.12	2016	UK GDP	£1231.99	Institute for Public Policy Research, 2016
Lost productivity	£17.55	Annual	£322.81	2016	UK GDP	£342.22	
Criminal justice	£14.04	Annual	£258.25	2016	UK GDP	£273.78	
<b>Child Social Care</b>							
Child protection plan: Fixed costs	£5663.00	One-time	£5663.00	2019	UK GDP	£5663.00	Adapted from Conti et al., 2021
Children requiring ongoing support (0–6 mths)	£3175.84	One-time	£3175.84	2019	UK GDP	£3175.84	
Children requiring ongoing support (6 mths - 2 yrs)	£9127.65	One-time	£9127.65	2019	UK GDP	£9127.65	
Foster Care	£32,142.00	One-time	£65,449.25	2015	UK GDP	£70,745.31	

(continued on next page)

Table 2 (continued)

Outcome	Reported unit cost	Unit cost time frame	Lifetime cost	Cost year	Inflation index	Lifetime unit cost (2019 GBP)	Cost source
Local Authority Care	£166,188.75	One-time	£338,402.36	2015	UK GDP	£365,785.39	Conti et al., 2021
Special Educational Services	£4638.47	Annual	£44,823.12	2019	UK GDP	£44,823.12	
CM Perpetrator, non-homicide							This study
Criminal justice	£2735.24	One-time	£2735.24	2017	UK GDP	£2846.78	
Perpetrator lost productivity	£0.00	Annual	£0.00	2019	NA	£0.00	
IPV as YP, Perpetration <sup>a</sup>							This study
Criminal justice	£890.70	Annual	£890.70	2017	UK GDP	£927.03	
Perpetrator lost productivity	£0.00	Annual	£0.00	2019	NA	£0.00	

Abbreviations: BMI, body mass index; CM, child maltreatment; CPP, child protection plan; DVA, domestic violence and abuse; GBP, Pound sterling.

<sup>a</sup> Perpetration of DVA by the exposed child (ALSPAC G1 cohort), on a partner with which they were in a relationship.

zero marginal effect of exposure on monthly earnings, from all relevant time points. This percentage was multiplied by the discounted age-dependent national average earnings, accounting for employment rates by age, and 2% assumed future annual earnings growth, to obtain the average total reduced monthly earnings per exposed child. A conservative approach was taken, assuming that the reduction in monthly earnings started only at the latest time point at which earnings were reported (25 years of age).

**Problem gambling:** The only report identified for the lifetime unit costs of problem gambling in the UK was published by the Institute for Public Policy Research (Institute for Public Policy Research, 2016). Whilst these costs are incorporated in the cost model, it should be noted that the authors acknowledged that the costs reported should be taken as illustrative estimates for the excess fiscal costs incurred by people who are problem gamblers, due to limitations in available data. Therefore, as a conservative approach, only the lower bound values were used to calculate lifetime unit cost per child estimates for health care (£1232), lost productivity (£342), and criminal justice costs (£274).

**Child social care:** Per-child cost estimates for (a) CPPs as a consequence of exposure to CM and/or pDVA, and for (b) child social care (foster or local authority [LA] care), were included as both are identified as a high prevalence, high impact risk factors for CPP. Cost estimate calculations were adapted from the approach detailed in Conti et al. (2021).

CPP case and cost estimates were based upon 2019 UK data for new CPPs (excluding those which were a second or subsequent plan) (Department for Education, 2021; National Society for the Prevention of Cruelty to Children, 2022). Unit costs (2019 GBP) for CPPs were estimated to be £5663 (fixed costs), £3175 (children requiring ongoing support, 0 to 6 months), and £9127 (children requiring ongoing support, 6 months to 2 yrs).

Estimates for children who started to be looked after in 2019, percentages of those receiving care, and child social care costs used UK government data (Department for Education, 2020). Assuming an average stay in care of 785 days at £88 per day for foster care and £455 per day for LA care (2015 GBP, Conti et al., 2021), the total discounted costs per child in care were £70,745 for foster care, and £365,785 for LA care (2019, GBP). Weighted by the numbers of children entering foster or LA care, the discounted expected child social care costs per child exposed to CM and/or pDVA was calculated to be £11,481.

**Special education provision:** Exposure to CM or pDVA is estimated to have an incremental effect on the probability of the affected child receiving special education of 22% and 2%, respectively (Conti et al., 2021; Oliver et al., 2019). Total high needs block funding for special educational needs (SEN) in England for 2019, was £6,114,900,000 for a total of 1,318,300 SEN pupils (Department for Education, 2019; UK Parliament, 2021). Assuming equivalent spending and SEN rates for the rest of the UK, and that SEN education is required from the age of exposure (6 years) until 16 years of age, the unit SEN service costs per SEN pupil was £44,823.

#### 2.10.4. Criminal justice system costs

In the base case analysis, CJS costs were included only where reported in association with specified individual outcomes (e.g., illegal drug use, the perpetration of DVA by the exposed child later in life) and for CJS resource costs relating to the perpetration of non-fatal CM by the parent or guardian. Not included were CJS costs associated with short-term mental health problems, to avoid potential double counting of exposure-related alcohol misuse and illegal drug use CJS costs. CJS costs associated with fatal cases of CM were estimated separately and are described below.

**CM perpetrator:** Costs arising from the perpetration of non-fatal CM by the parent or guardian were based on 2019 incident cases and are incurred from policing (child abuse-flagged police recorded crime), the criminal legal system (Crown Prosecution Service costs, courts costs, jury costs, legal aid and private representation), and miscellaneous CJS-associated services (probation and prison services, HM Prison & Probation Service and Youth Justice Board). Due to lack of available data, no estimates were included on long-term outcomes specifically relating to survivors of CM and/or pDVA who themselves go on to perpetrate CM.

Lifetime unit costs of £2847 per child, were calculated using published cost and case number estimates for policing (Heeks et al., 2018; Office for National Statistics, 2020a, 2020c), and criminal legal system costs (Ministry of Justice, 2021; Office for National Statistics, 2020a; Oliver et al., 2019). Expected costs per CM exposed child was calculated as detailed in Eq. 1:

Equation 1. Calculation of expected CM perpetrator costs, per non-fatal CM exposure

$$\text{Expected cost} = \text{Lifetime unit cost} \times \frac{\text{Total CM flagged criminal cases (2019)}}{\text{Total CM exposed child population (2019)}}$$

CM-flagged criminal cases relate to all instances of physical, emotional and sexual criminal offences, as well as neglect of a child, that is referred to the UK Crown Prosecution Service for a charging decision ([The Crown Prosecution Service, 2023](#)).

DVA perpetration by exposed child: Costs arising from the exposed child perpetrating physical, psychological or sexual victimisation of their partner subsequent to exposure to CM and/or pDVA were derived from those associated with policing, the criminal legal system and miscellaneous CJS-associated services, and multi-agency risk assessment conferences (MARACs), as a consequence of IPV, from [Oliver et al. \(2019\)](#). The total expected costs per case of DVA perpetration was calculated to be £927.

**CM Fatalities:** Costs modelled for fatal instances of CM, consisted of those for the treatment of fatal injuries, lost productivity, and perpetrator-associated CJS costs. Health care costs associated with fatal injuries from CM were derived from [Christensen et al. \(2008\)](#). A human capital approach to lost productivity was taken, summing the discounted national average earnings, accounting for employment rates by age, and assumed future annual earnings growth of 2% ([HM Revenue & Customs, 2021](#); [Office for National Statistics, 2022a](#)). Earnings relating to lost productivity were assumed to start at 18 years of age and end at a retirement age of 65 years.

CJS costs for fatal CM cases were based upon the same cost elements as those described for non-fatal cases. To appropriately reflect the CJS resources used for CM homicide prosecutions and convictions, the type and numbers of cases, proportions of legal aid and private representation, and costs relating to the courts, probation and prison services, HM Prison & Probation Service and Youth Justice Board, were amended where required.

### 2.11. Sensitivity analyses

To evaluate the effect of key assumptions for the model on estimated lifetime costs, sensitivity analyses as detailed in Appendix C, were conducted. For each scenario, lifetime cost estimates per child exposed are summarised in the results section with detailed results presented in Appendix C.

Exploratory analysis was also performed with the base case model to derive cost estimates based on child-reported awareness of pDVA. Exposure prevalences and marginal effects data for an alternative, narrower definition of pDVA were used (young person has ever been aware of and affected by one 'parent' slapping, kicking, hitting or otherwise physically hurting the other) in place of those for the wider binary outcome variable for pDVA exposure to derive cost estimates for children reporting awareness of violence between adults in the household during childhood (Appendix B).

**Table 3**  
Average lifetime costs per child exposed to non-fatal maltreatment or pDVA.

Average lifetime costs per child exposed, 2019 GBP (Percentage of total costs)										
Cost category	Any form of CM and/or DVA		Any form of CM <sup>a</sup>		Any form of CM with co-occurring DVA		Emotional abuse with co-occurring DVA		Physical abuse & Emotional abuse with co-occurring DVA	
Health care	£13,973	20.0 %	£13,391	21.0 %	£26,425	17.0 %	£28,336	16.0 %	£15,321	15.0 %
Child social care	£11,481	16.0 %	£11,481	18.0 %	£11,481	13.0 %	£11,481	12.0 %	£11,481	11.0 %
Lost productivity	£23,522	33.0 %	£19,078	30.0 %	£33,764	38.0 %	£35,031	38.0 %	£41,323	41.0 %
Criminal justice	£10,607	15.0 %	£7517	12.0 %	£17,144	19.0 %	£19,929	21.0 %	£19,944	20.0 %
Education	£9861	14.0 %	£9861	16.0 %	£9861	11.0 %	£9861	11.0 %	£9861	10.0 %
Other	£1865	3.0 %	£1622	3.0 %	£2080	2.0 %	£2078	2.0 %	£2084	2.0 %
Government burden	£45,922	64.0 %	£42,250	67.0 %	£64,912	60.0 %	£69,607	60.0 %	£56,607	57.0 %
Total	£71,309	100.0 %	£62,951	100.0 %	£100,756	100.0 %	£106,717	100.0 %	£100,014	100.0 %

Average lifetime costs per child exposed, 2019 GBP (Percentage of total costs)										
Cost category	pDVA <sup>b</sup>		Physical abuse <sup>a</sup>		Sexual abuse <sup>a</sup>		Emotional abuse <sup>a</sup>		Emotional neglect <sup>a</sup>	
Health care	£237	1.0 %	£13,269	25.0 %	£12,269	23.0 %	£14,123	18.0 %	£12,198	27.0 %
Child social care	£11,481	69.0 %	£11,481	21.0 %	£11,481	22.0 %	£11,481	15.0 %	£11,481	26.0 %
Lost productivity	£1801	11.0 %	£17,285	32.0 %	£17,667	34.0 %	£25,733	34.0 %	£9076	20.0 %
Criminal justice	£26	0.0 %	£154	0.0 %	£66	0.0 %	£13,900	18.0 %	£66	0.0 %
Education	£896	5.0 %	£9861	18.0 %	£9861	19.0 %	£9861	13.0 %	£9861	22.0 %
Other	£2198	13.0 %	£1553	3.0 %	£1097	2.0 %	£1598	2.0 %	£1695	4.0 %
Government burden	£12,640	76.0 %	£34,765	65.0 %	£33,677	64.0 %	£49,366	64.0 %	£33,606	76.0 %
Total	£16,639	100.0 %	£53,603	100.0 %	£52,441	100.0 %	£76,697	100.0 %	£44,377	100.0 %

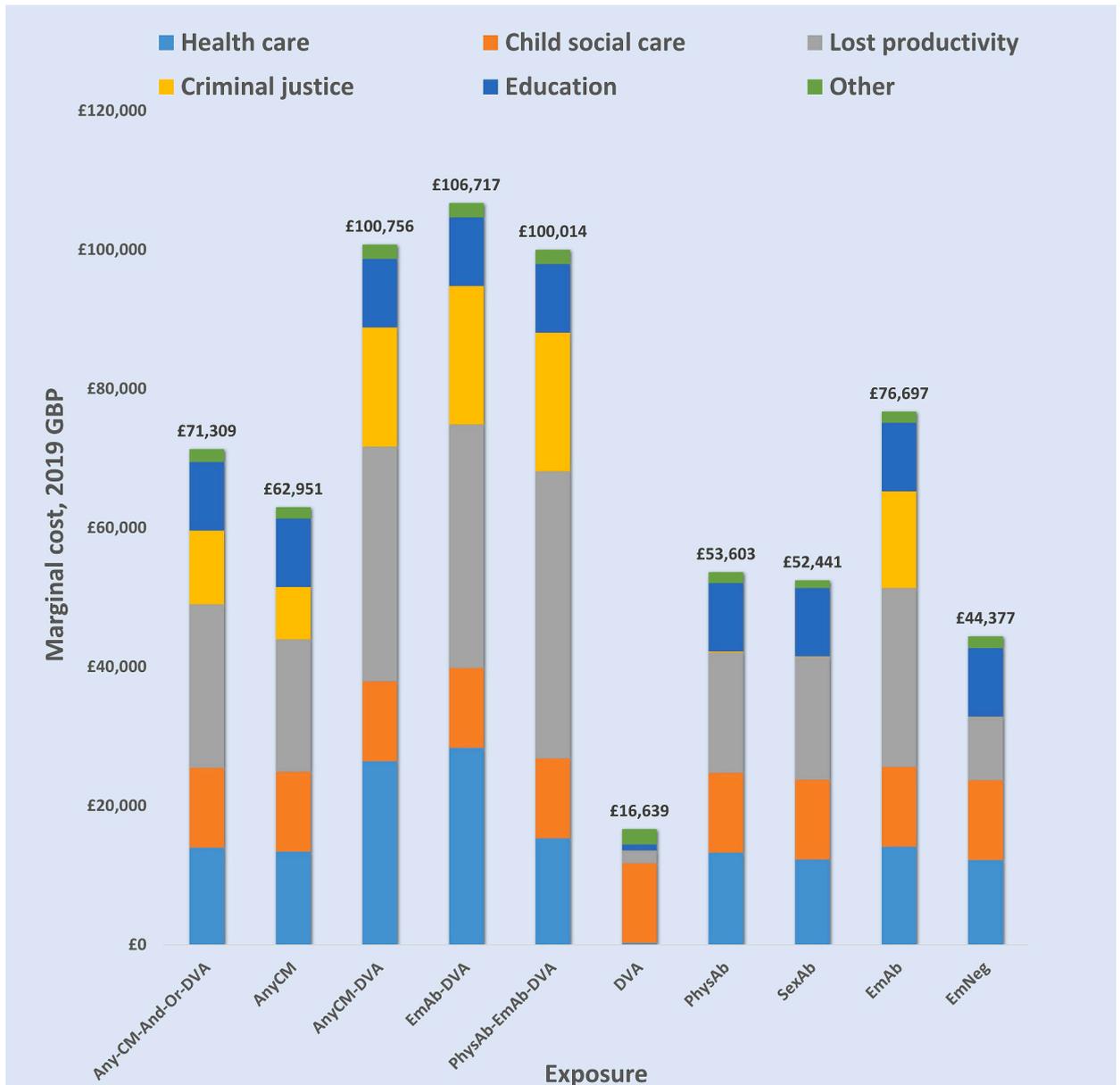
Abbreviations: CM, child maltreatment; GBP, Pound sterling; pDVA, parental domestic violence and abuse.

<sup>a</sup> Excluding co-occurring pDVA exposure.

<sup>b</sup> Excluding co-occurring CM exposure.

2.12. Probabilistic sensitivity analysis

Where data were available to quantify the uncertainty of the value for individual model input parameters, the effect on model outputs (overall and per-child total costs, costs by category, government burden) was evaluated by probabilistic sensitivity analysis (PSA). Randomly sampled input values based on pre-specified distributions (Appendix D) were used over 1000 iterations to derive probabilistic estimates for the model outputs (point estimates and 95 % credible intervals [CI]). Cumulative averages of the total cost point estimates were plotted with each iteration to confirm that sufficient iterations had been used to derive stable estimates.



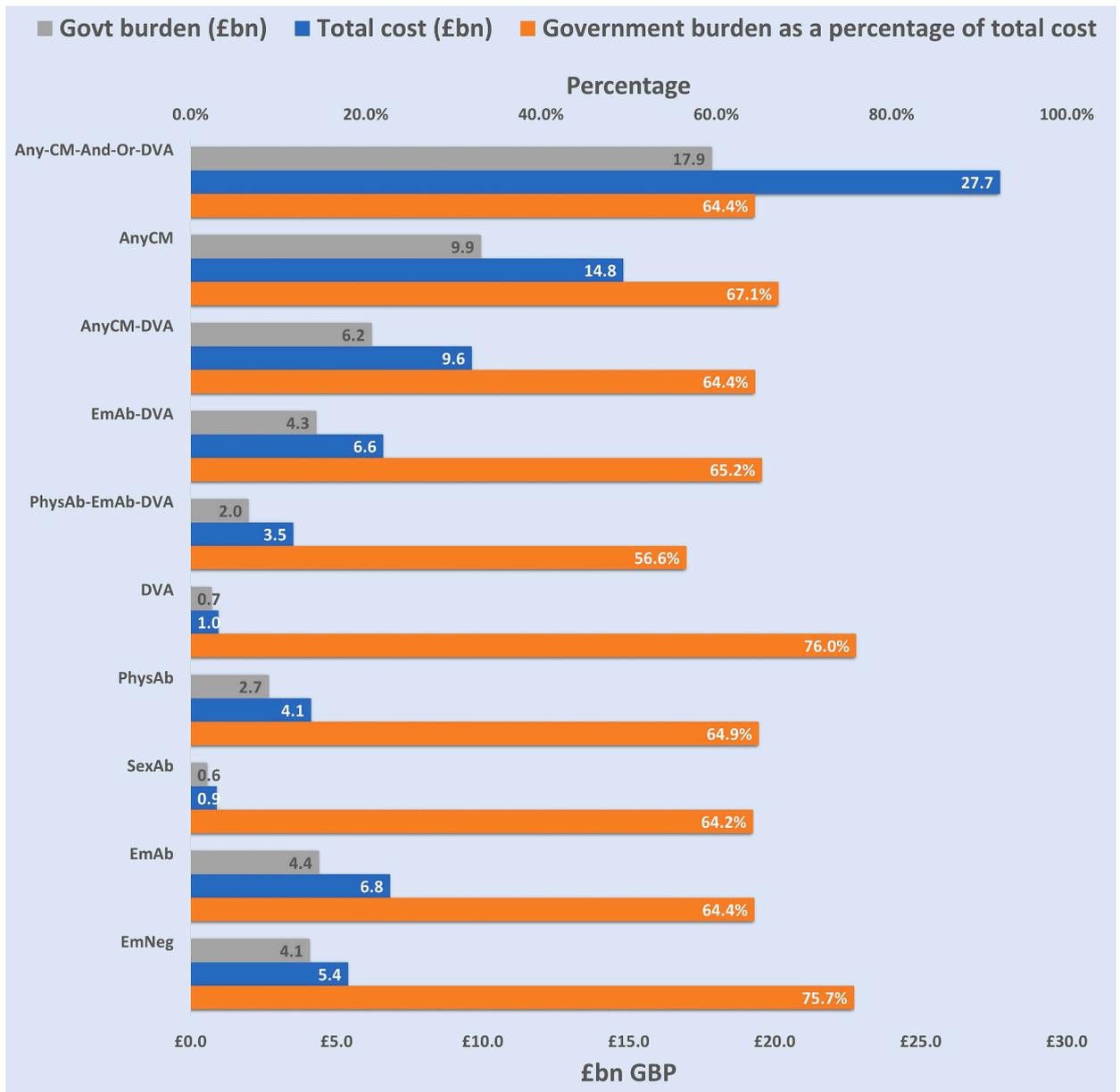
**Fig. 1.** Lifetime costs per child exposed to non-fatal maltreatment and/or pDVA (2019 GBP). Abbreviations: AnyCM, any form of child maltreatment; AnyCM-pDVA, any form of child maltreatment and co-occurring parental domestic violence and abuse; AnyCM-And-Or-pDVA, any form of child maltreatment and/or parental domestic violence and abuse; CM, child maltreatment; EmAb, emotional abuse; EmAb-pDVA, emotional abuse and co-occurring parental domestic violence and abuse; EmNeg, emotional neglect; pDVA, parental domestic violence and abuse; PhysAb, physical abuse; PhysAb-EmAb-pDVA, co-occurring physical abuse, emotional abuse and parental domestic violence and abuse; SexAb, sexual abuse.

2.13. Software used

Estimation of exposures, outcomes and analyses of marginal effects were performed using the R statistical software platform version 3.6.3, and Stata/IC version 14.2. (The code is available on request).

3. Results

The total UK lifetime societal cost estimate for the 388,739 children from the 2013 UK birth cohort (total population: 792,557; prevalence 49 %) estimated to experience childhood CM and/or pDVA exposure was £27.8 billion, at an estimated cost per child of



**Fig. 2.** Total lifetime costs and government burden for childhood exposure to maltreatment and/or pDVA (2019 GBP). Abbreviations: AnyCM, any form of child maltreatment; AnyCM-pDVA, any form of child maltreatment and co-occurring parental domestic violence and abuse; AnyCM-And-Or-pDVA, any form of child maltreatment and/or parental domestic violence and abuse; CM, child maltreatment; EmAb, emotional abuse; EmAb-pDVA, emotional abuse and co-occurring parental domestic violence and abuse; EmNeg, emotional neglect; pDVA, parental domestic violence and abuse; PhysAb, physical abuse; PhysAb-EmAb-pDVA, co-occurring physical abuse, emotional abuse and parental domestic violence and abuse; SexAb, sexual abuse.

£71,309 (Table 3, Appendix E, Appendix B). This comprised of 235,348 children exposed to one or more form of CM (not including those with co-occurring pDVA), and 57,795 exposed to pDVA (not including co-occurring CM), with 95,596 estimated to have had co-occurring CM and pDVA exposure.

Children exposed to specific forms of CM, comprised totals of 77,078 for physical abuse, 17,147 for sexual abuse, 89,070 for emotional abuse, and 121,551 for emotional neglect (Appendix A). Total reported exposures (304,846) sum to more than the total of 235,348 children exposed to any CM, as multiple exposures are possible for a single child.

### 3.1. Exposure to pDVA, or co-occurring CM and pDVA

Discounted average lifetime costs per child exposed to pDVA (excluding co-occurring CM) was estimated to be £16,639 (Table 3) 69.0 % of which consisted of child social care costs (£11,481). Therefore, a total economic burden in 2019 for exposure to pDVA was estimated at £961,661,469. Sensitivity analysis estimated that the total per-child cost of exposure would be reduced to £16,098 (–3.3 %) using a discount rate of 5 % and increased to £17,509 (5.2 %) with a 1.5 % discount rate (Appendix C).

Rates of CM and pDVA co-occurrence are presented in Appendix F. The effects of co-occurrence were explored in greater detail for the scenarios of co-occurring emotional abuse and pDVA, co-occurring emotional abuse, physical abuse and pDVA, and exposure to any form of CM with co-occurring pDVA (Appendix B). For the 2013 UK birth cohort, 61,840 children were estimated to be exposed to co-occurring childhood emotional abuse and pDVA (model 3), with societal costs averaging £106,717 per child (£6.6 billion lifetime costs, 2013 birth cohort; Table 3 and Appendix E). This was a 39.1 % increase relative to estimates for emotional abuse exposure alone, primarily driven by increases in healthcare costs (£14,213 increase), productivity losses (£9298 increase), and criminal justice costs (£6029 increase). When marginal outcome probabilities and associated costs for this subpopulation were included in total costs for the overall emotional abuse exposed population, societal costs rose 7.6 %, to £14.6 billion from the £13.6 billion estimate where pDVA co-occurrence effects were excluded (Appendix G).

An estimated total of 35,217 children from the 2013 UK birth cohort were exposed to both emotional abuse and physical abuse, in addition to co-occurring pDVA (model 4). The discounted lifetime cost per exposed child in the base case model, was estimated to be £100,014 (£3.5 billion lifetime costs, 2013 birth cohort; Table 3 and Appendix E). Cost increases (relative to emotional abuse-only exposure) were primarily composed of those for lost productivity (£15,590) and criminal justice (£6044 increase).

Co-occurring pDVA in children experiencing any form of CM (model 5) resulted in total costs of £100,756 per child exposed – an increase of 60.1 % over those for CM alone. Most additional costs were associated with lost productivity (£14,686 increase), healthcare (£13,034 increase), and the CJS (£9627 increase) (Table 3).

### 3.2. Child awareness of pDVA

For the 27,533 children estimated to grow up with awareness of exposure to household pDVA, discounted average lifetime costs were £71,037 per child, with a total UK economic burden of £1,955,844,747. Total costs were primarily comprised of those relating to CJS (44.7 %, drug use; 0.3 % IPV perpetration), lost productivity (30.0 %, drug use), and child social care (16.2 %).

Average lifetime costs for exposure to CM and/or pDVA (children reporting awareness of household pDVA exposure), was estimated at £69,002 per child (£23.7 billion total cost; £15.9 billion government burden), primarily driven by lost productivity, health care, child social care, and CJS costs (Appendix B).

### 3.3. CM-only exposures

Discounted mean lifetime costs per child exposed to non-fatal CM (with no co-occurring pDVA) ranged from £44,377 (emotional neglect), to £76,697 (emotional abuse) (Fig. 1 and Table 3). The total economic burden for individual CM exposures ranged from £0.9bn (sexual abuse) to £6.8bn (emotional abuse), with the overall government burden estimated at between 64.2 % (physical abuse) and 75.7 % (emotional neglect) of the total costs (Fig. 2 and Appendix E). Exposure to any form of CM (excluding co-occurring pDVA) incurred £62,951 of societal costs, 67.0 % of which were borne by the government.

Application of a 5 % discount rate, resulted in total per-child costs of £46,653 for physical abuse (–13.0 % from base case), £45,854 for sexual abuse (–12.6 %), £62,128 for emotional abuse (–19.0 %), £40,408 for emotional neglect (–8.9 %), and £52,923 for reported exposure to any form of CM (–15.9 %). Discounted at 1.5 %, lifetime costs of exposure were estimated to increase by 23.3 % (£66,073) for physical abuse, 22.2 % (£64,103) for sexual abuse, 35.3 % (£103,804) for emotional abuse, 15.2 % (£51,144) for emotional neglect and 29.2 % (£81,344) for exposure to any form of CM. Full results of the sensitivity analyses performed are presented in Appendix C.

Total discounted lifetime costs for fatal cases of CM were estimated at £1,292,377, primarily comprised of lost productivity (£903,256; 69.9 %), and CJS costs relating to the perpetrator (£383,335; 29.7 %) (Appendix H). Application of a 5 % discount rate to total lifetime costs for fatal cases of CM, resulted in a 20.8 % reduction in total costs (£1,023,290), primarily through a 29.8 % reduction in discounted costs for lost productivity (£634,169).

### 3.4. Perpetration of IPV by children exposed to CM and/or pDVA

Analysis of the ALSPAC dataset identified that children exposed to any form of CM, to physical abuse or to emotional abuse, had an increased risk of perpetrating IPV against a partner they were in a relationship with; this risk increased in the co-occurrence scenarios explored (emotional abuse and pDVA; emotional abuse, physical abuse and pDVA). Total costs relating to IPV perpetration for the

2013 birth cohort resulting from IPV perpetration subsequent to CM and/or pDVA exposure, were estimated to be approximately £19.6 million.

For individual exposure scenarios, costs associated with IPV perpetration were estimated to be £6.8 million (physical abuse), £4.8 million (emotional abuse), £5.4 million (co-occurring emotional abuse and pDVA), and £4.0 million (co-occurring emotional abuse, physical abuse and pDVA).

### 3.5. Probabilistic sensitivity analysis

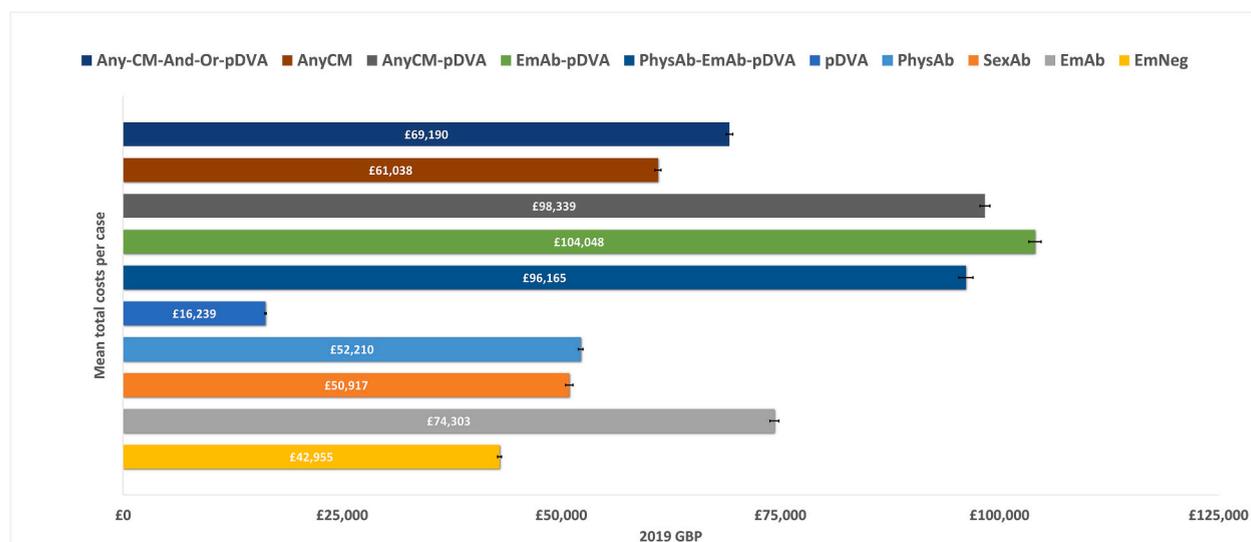
PSA estimates for each form of exposure (mean total costs per child, summary statistics and distributions) are presented in, Fig. 3, Appendix I and Appendix J. For all exposure scenarios studied, PSA mean cost estimates and 95 % CIs were within 4.0 % and  $\pm 0.9$  % of the corresponding deterministic cost estimates respectively. Using the alternative measure of child awareness of pDVA in the household, PSA mean cost estimates and 95 % CIs were respectively within 3.6 % and  $\pm 1.8$  % of the deterministic mean costs estimates (Fig. 3, Appendices I and J).

## 4. Discussion

The lifetime societal cost per child experiencing non-fatal childhood exposure to any form of CM and/or pDVA was £71,309 with total costs of £1,292,377 per CM fatality, and a total economic burden of £27.8 billion for the 2013 UK birth cohort. In this study we have developed robust, updated estimates for the economic impact of CM, and for the first time have developed detailed quantification of the societal costs surrounding childhood exposure to CM and/or pDVA. Within the cost model, we also provide evidence of associations of exposure to CM and/or pDVA with intergenerational DVA perpetration, together with estimates of the resulting costs. The cost model utilises a comprehensive set of measures for childhood exposure, containing both contemporaneous and retrospective reports from either parent or child, and incorporates a broader range of outcomes, thus capturing a detailed picture of individual long-term costs resulting from exposure.

At £62,951 per child exposed, the base case estimate for any form of CM exposure (exclusive of pDVA), was 35.2 % lower than that of £97,188 (2019 GBP) from the Conti et al., 2021 study, primarily based upon a more conservative estimate for child social care unit costs through our use of the number of children exposed to CM and/or pDVA as the denominator value for estimation of child social care costs. Sensitivity analysis using the Conti et al., 2021 denominator (number of children in need receiving a CPP) increased costs by 64.3 % (£103,413 per child exposed; £24.4 billion total cost) relative to the Conti et al. (2021) estimate. Our £1.3 million estimated cost per UK CM fatality was 27.1 % greater than the most recent previous UK estimate (Conti et al., 2021), predominantly driven by our inclusion of CJS costs for child homicide perpetrators.

Here we have made a conservative lifetime cost estimate of over £16,600 per pDVA exposed child – primarily due to child social care provision costs. Although subject to greater uncertainty, estimates rose substantially for the subset of children reporting awareness of household pDVA, highlighting the potential for disproportionate impact of costs for specific subgroups within the



**Fig. 3.** Probabilistic sensitivity analysis: Total costs per child. Error bars shows the 95 % CI for the total cost of each type of exposure. Abbreviations: AnyCM, any form of child maltreatment; AnyCM-pDVA, any form of child maltreatment and co-occurring parental domestic violence and abuse; AnyCM-And-Or-pDVA, any form of child maltreatment and/or parental domestic violence and abuse; CM, child maltreatment; EmAb, emotional abuse; EmAb-pDVA, emotional abuse and co-occurring parental domestic violence and abuse; EmNeg, emotional neglect; pDVA, parental domestic violence and abuse; PhysAb, physical abuse; PhysAb-EmAb-pDVA, co-occurring physical abuse, emotional abuse and parental domestic violence and abuse; SexAb, sexual abuse.

exposed population. Whilst not directly comparable to the £66.2 billion estimate for societal costs of DVA amongst adults DVA (Oliver et al., 2019), childhood pDVA exposure imposes a notable cost as yet unquantified in the consideration of DVA-associated harms and the potential benefits of interventions.

Relative to previous studies, a key addition to this cost model was the incorporation of costs arising from the increased risk of IPV perpetration by exposed children within their own relationships. Here we have provided evidence for this in childhood exposure to both physical abuse or emotional abuse, and in the co-occurring CM and pDVA scenarios explored in this study, where the risks and subsequent costs of IPV perpetration increased relative to exposure to CM alone.

Given the recognised common risk factors for CM and DVA, a substantial proportion of cases can be expected to exhibit co-occurrence together with the associated poorer outcomes for children. Consequently, programs designed to address either form of these exposures, may also unknowingly impart additional benefits (or even harms) within the wider household. This study provides quantitative evidence for the first of these possibilities, and a model upon which the second might be evaluated.

This study enables for the first time, both an evaluation of the costs associated with childhood exposure to pDVA – a phenomenon previously acknowledged, but until now unquantified – as well as a better understanding of the exacerbation of poor life outcomes and associated costs resulting from the co-occurrence of CM and pDVA. Incorporating healthcare, social and economic costs within the model provide a detailed insight into the wide societal implications of CM and/or childhood pDVA exposures. Testing of the key assumptions made, and the effect of uncertainty on the estimates derived tested (by sensitivity and probabilistic sensitivity analyses respectively), contributes to the robustness of the model presented.

Whilst providing valuable new evidence, this study has a few limitations. The ALSPAC longitudinal study dataset provides a rich array of measures, however most recent data collection only extends to the earlier stages of adulthood (up to 25 years of age). Assumptions for the duration of marginal effects from exposure and thus total incremental costs were therefore required. It should also be noted that due to the regional nature of the ALSPAC study (the geographical Southwest of England), the eligible cohort for this study was skewed towards participants of White ethnicity. The econometric analysis this model is based upon attempted to mitigate for these factors, however the findings may not be fully generalisable to minority ethnic groups or the UK more widely.

It should be noted that whilst MVR hospitalisation costs are captured in the model, it was not possible to include those arising from primary care presentations – an aspect that would be a valuable addition to future models. Whilst costs from risky sexual behaviour are included in this study, the assumptions required to translate this into a risk of unintended teenage pregnancy mean that these costs were not included in the model.

As with previous studies on CM or DVA, the repeat nature of abuse makes estimation of the number of individual events difficult. The model uses a pragmatic ‘ever reported’ approach, where exposure was taken to have occurred where any relevant report was made within the eligible time period. As a result, repeated episodes of abuse (e.g., maltreatment related injuries) may not be fully captured and the model may underestimate the total costs.

Whilst the cost model presented here advances the understanding of costs of CM and DVA to UK society, several areas of future study may allow for further improvements. Work to develop a core outcome set for capturing outcomes important to all relevant stakeholders (Powell et al., 2022) may extend on those in the current model, as well as enable consistency in data collection for the evaluation of existing and prospective interventions. Whilst not captured in this study, as with the intergenerational perpetration of IPV evidenced here, the model could be expanded to accommodate recent evidence on the risks of children perpetrating CM subsequent to their exposure during childhood (Armfield et al., 2021). The inclusion of QALY loss estimates resulting from exposure CM and/or pDVA may also be a valuable addition particularly if based upon comprehensive data for the QALY impacts in a UK-based population sample. Attention would have to be paid, however, to the potential for double counting of costs where these may be realised through other outcomes such as productivity losses via reduced employment and earnings.

The burden on UK society because of CM and household DVA is substantial, affecting the health and social care, criminal justice, education, and economic sectors. Given the evidence presented here and elsewhere, the imperative for stakeholders to develop more effective policies to break the cycle of intergenerational transmission of CM and IPV becomes ever more pressing. The identification and adoption of cost-effective policies, therefore, has implications which resonate in both the short and long term, and potentially across generations.

## 5. Conclusions

This study provides a detailed quantification of the costs to society of CM and p DVA exposure, both separately and where they co-occur. In summary, 388,739 cases of non-fatal CM and/or childhood pDVA exposure were estimated to be experienced by the 2013 UK birth cohort with an estimated 25 instances of fatal CM across the 2013 UK child population – incurring an overall lifetime societal economic burden of £27.8 billion (£71,309 per non-fatal exposure; £1,292,377 per CM fatality).

The evidence provided here for the societal costs from childhood exposure to pDVA and the intergenerational transmission of IPV perpetration (an outcome unaccounted for in previous studies), highlights the need for targeted early intervention plans to support at-risk families and child survivors. The high level of associated costs resulting from co-occurring CM and pDVA, and child-reported awareness of pDVA, also raises the potential that the comparatively poor outcomes for a relatively small number of highly affected individuals can make a disproportionately large contribution to estimates of the overall economic burden.

Given the scale of burden accrued over the life course after CM and/or pDVA exposure, this model can provide a framework upon which policy makers can identify the best use of resources to maximise the societal benefits from the effective interventions needed to tackle a complex social issue.

### CRediT authorship contribution statement

**Kevin Herbert:** Writing – original draft, Methodology, Investigation, Formal analysis. **Gene Feder:** Writing – review & editing, Validation. **Ruth Gilbert:** Writing – review & editing, Validation, Supervision, Funding acquisition. **Claire Powell:** Writing – review & editing, Validation. **Emma Howarth:** Writing – review & editing, Validation. **Stephen Morris:** Writing – review & editing, Supervision, Methodology, Conceptualization.

### Ethical approval and informed consent

Ethical approval for the study was obtained from the ALSPAC Ethics and Law Committee and the Local Research Ethics Committees. Informed consent for the use of data collected via questionnaires and clinics was obtained from participants following the recommendations of the ALSPAC Ethics and Law Committee at the time.

### Authors declaration

This publication is the work of the authors, who will serve as guarantors for the contents of this paper. The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

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### Declaration of competing interest

The authors declare no conflicts of interest.

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### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.chiabu.2025.107435>.

### Data availability

The data that support the findings of this study are available from ALSPAC. Restrictions apply to the availability of these data, which were used under license for this study.

ALSPAC has well-developed methods to support the sharing of data, and strict policies to ensure confidentiality of participants. Please note that the study website contains details of all the data that is available through a fully searchable data dictionary and variable search tool. Full details of policy and procedures for access to ALSPAC data can be found at <https://www.bristol.ac.uk/alspac/researchers/access/>.

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