

## **Child maltreatment and adult living standards at 50 years**

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Abbreviations: long-term sickness absence (LTS), not in employment, education or training (NEET), odds ratios (ORs)

### What's known on this subject

Child maltreatment (abuse and neglect) has established effects on long-term mental health. The extent to which broader adult life circumstances (e.g. economic productivity) are affected and underlying child-to-adult pathways are less well understood due to scarcity of long-term follow-up.

### What this study adds

Child maltreatment was associated with poor adult socioeconomic outcomes, with evidence of accumulating burden for those experiencing multiple maltreatments. Associations for neglect operated via cognition; associations for sexual and non-sexual abuse were little affected by adolescent cognition and mental health.

## Contributors' Statement

Dr Pinto Pereira designed and conducted the research, performed statistical analysis, drafted the initial manuscript and approved the final manuscript as submitted.

Dr Li designed and conducted the research, reviewed and revised the manuscript and approved the final manuscript as submitted.

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## **Abstract (250/250 words)**

**Background:** Child maltreatment (abuse and neglect) has established effects on mental health. Less is known about its influence on adult economic circumstances. We aimed to establish associations of child maltreatment with such outcomes and explore potential pathways.

**Methods:** We used 1958 British birth cohort data (N=8,076) to examine associations of child neglect and abuse with adult (50y) long-term sickness absence (LTS), not in employment, education or training (NEET), lacking assets, income-related support, poor qualifications, financial insecurity, manual social class and social mobility. We assessed mediation of associations by 16y cognition and mental health.

**Results:** Abuse prevalence varied from 1% (sexual) to 10% (psychological); 16% were neglected. 21% experienced one maltreatment type, 10% experienced  $\geq 2$ . Sexual and non-sexual abuse were associated with several outcomes e.g. for sexual abuse,  $OR_{adjusted}$  of income-related support was 1.75 (1.12,2.72). Associations were little affected by potential mediating factors. Neglect was associated with several adult outcomes (e.g.  $OR_{adjusted}$  of NEET was 1.43 (1.10,1.85)) and associations were mediated by cognition and mental health (primarily by cognition): percent explained varied between 4% (NEET) to 70% (poor qualifications). In general, the risk of poor outcome increased by number of maltreatment types, e.g.  $OR_{adjusted}$  for LTS increased from 1.0 (reference) to 1.76 (1.32,2.35) to 2.69 (1.96,3.68) respectively for 0, 1,  $\geq 2$  types of maltreatment.

**Conclusions:** Childhood maltreatment is associated with poor mid-adulthood socioeconomic outcomes, with accumulating risk for those experiencing multiple types of maltreatment. Cognitive ability and mental health are implicated in the pathway to outcome for neglect but not abuse.

## Introduction

Child maltreatment, encompassing abuse and neglect, is a major social-welfare problem. Several consequences have been identified including mental ill-health, obesity and poor cardiovascular profiles with effects perpetuating into adulthood<sup>1-4</sup>. Although early-life socioeconomic disadvantage is known to affect adult circumstances in terms of economic productivity, including employment, and social mobility<sup>5</sup>, less is known about the influence of maltreatment on such outcomes<sup>3</sup>. Identifying influences on these outcomes is important, given their economic implications: e.g., costs of long-term absences from work are substantial and shared between individuals, employers and the State. Individuals suffer financial and social losses, becoming increasingly distanced from the labour market; UK employers pay £9bn/year in sick-pay associated costs; the State spends £13bn/year on health-related benefits<sup>6</sup>. Therefore, reducing unfavourable outcomes is high on the policy agenda<sup>6,7</sup>.

The limited evidence available on associations between child maltreatment and adult socioeconomic outcomes comes from cross-sectional studies<sup>8,9</sup> or includes maltreatment cases that have been reported to authorities, which may be atypical of maltreatment in the general population<sup>10</sup>. Moreover, because child maltreatment is associated with poorer educational achievement and cognition<sup>3,11</sup>, we might expect less favourable social mobility patterns from class of origin, as well as less advancement over the individuals' working life. The deficits in cognitive abilities and behavioural adjustment observed in maltreated children<sup>11</sup> could represent important pathways to reduced economic circumstances in adulthood, given that such deficits have detrimental economic consequences<sup>12-14</sup>. It is important to improve understanding of the full consequences of child maltreatment and likely explanations, partly because detrimental socioeconomic outcomes have implications for health<sup>15-18</sup> yet, to our knowledge, such associations have not been demonstrated.

Using a general population birth cohort, we aimed to establish the extent to which child maltreatment is associated with adult circumstances in respect of labour market participation, living standards and social mobility, taking account of other early-life factors such as parental education. We

also examined potential mediating pathways via adolescent cognition and mental health. Specific outcomes included: long-term sickness absence; not in employment, education or training; lacking assets; income-related support; poor educational qualifications; financial insecurity; manual social class and inter- and intra-generational social mobility to mid-adulthood. We examined neglect and (different types of) abuse separately to assess whether there were differential effects on outcomes and also examined associations for multiple types of maltreatment to assess cumulative burden.

## **Methods**

The 1958 British birth cohort is a longitudinal study of all born in one week, March 1958, across England, Scotland and Wales (n=17,638) and 920 immigrants with the same birth week<sup>19</sup>. Information was collected throughout childhood (birth, 7, 11, 16y) and adulthood (23, 33, 42, 45, 50y) from individuals, as well as parents, teachers and school doctors (childhood surveys) and nurses (at 45y). Of 11,971 invited, 9,377 participated in the 45y survey, with 9,315 completing childhood maltreatment questions; of these, 8150 participated at 50y (Supplementary Figure 1). Respondents in mid-adulthood were broadly representative of the surviving cohort<sup>20</sup>. Ethical approval was given for various surveys, including at 50y by the London Multi-centre Research Ethics Committee; informed consent was obtained from participants at various ages.

*Childhood maltreatment:* Neglect (prospective) was identified from information collected in childhood from parental interviews (usually the mother) and the child's teacher, using structured questionnaires (Table 1). Emotional neglect and abuse (sexual, physical, psychological or witnessing) to 16y were reported at 45y using a confidential direct computer data entry questionnaire (CASI) (Table 1).

*Adult outcomes:* Details are given in Table 2. In brief, we identified three labour market groups from participant reports of their current economic activity: the (i) long-term sick (LTS) (ii) not in employment, education or training (NEET) and (iii) employed (full or part-time as an employee or self-employed) or in education or training. Home ownership and receipt of income-related support were used as markers of assets/wealth. Education level was measured prospectively to 50y. At 45y,

information on financial insecurity was ascertained. For social class and mobility, we used information on occupation collected at birth, 23y and 50y to group non-manual and manual classes. Social mobility was examined from (i) parent's class to own class at 50y (inter-generational) and (ii) own class at 23y to 50y (intra-generational). For inter-generational mobility we created two binary variables: (i) upward mobility from manual class at birth (vs stable manual); and (ii) downward mobility from non-manual class at birth (vs stable non-manual). Similar variables were created for intra-generational mobility (23-50y).

*Covariates* were identified as early-life factors that influence socioeconomic destinations and included those related to socioeconomic background (i.e. social class in 1958, parental education, household amenities, crowding and tenure), birth (maternal age, birthweight, birth order) and child ill-health. *Potential mediating factors* include cognitive ability and mental health assessed at 16y (indicated by reading/maths tests and internalizing/externalising behaviours respectively, as in previous work<sup>11</sup>).

## **Analysis**

We used logistic regression to assess associations of each type of maltreatment with adult outcomes (labour market participation, living standards and social class) separately. We tested the interaction between each type of maltreatment and sex; there was little evidence of effect modification, hence results are presented for sexes combined. We examined univariable associations before adjusting for covariates (listed above). Next, because different types of maltreatment co-occur<sup>21</sup>, we assessed (i) associations for all types of maltreatment simultaneously and (ii) two-way correlations between maltreatment types. Mutual adjustment for six types of maltreatment may be over-adjustment. Thus, we derived a score to represent the number of moderately correlated types of maltreatment (i.e. pairwise correlation coefficients  $\geq 0.4$ ) and examined the score and other types of maltreatment simultaneously with outcomes. To assess possible mediation of associations by cognition and mental health we used two methods in which these factors were modelled separately and combined: (i) in a series of adjusted models; and (ii) in mediation analyses using inverse odds ratio weighting<sup>22</sup> from which we obtained 'total effects' of maltreatment on outcomes and 'direct

effects' that were not via potential mediator(s) (percent of 'total effect' explained was calculated). To investigate cumulative burden of multiple types of maltreatment, we examined associations between number of types (0, 1,  $\geq 2$ ) and outcomes using a trend test.

In sensitivity analyses we checked, first whether child maltreatment associations with adult (50y) outcomes were replicated with similar outcomes, where available, at 23y, i.e. LTS, NEET and social class. Second, we examined associations for NEET as two categories: unemployed seeking work and looking after home/family. Associations with outcomes were broadly similar for the two categories (data not shown) possibly because individuals may identify as home/family rather than unemployed, thus associations for combined NEET groups are presented.

To investigate whether those maltreated in childhood were as likely as the non-maltreated to be socially mobile, we estimated odds ratios (ORs) for upward and downward mobility from class at birth (inter-generational mobility). Specifically, we examined upward mobility among those who were from a manual background and downward mobility among those from a non-manual class. Similar analyses were undertaken for intra-generational mobility.

Of 8,150 participants completing the child maltreatment questions at 45y and participating at 50y, the number available for analysis was 8,076 due to exclusions  $n=98$  with intellectual impairment assessed at 7y and missing data ( $n=5$ ) (Supplementary Figure 1). Social class and mobility analyses were restricted to those employed at 50y ( $n=7,002$ ). Missing data ranged from 0.01% (education level) to 16% (23y social class). To minimize data loss, missing data were imputed using multiple imputation chained equations. Following guidelines (to justify the plausibility of the missing at random assumption) imputation models included all model variables (including 23y outcomes), plus main predictors of missingness (7y behaviour and cognitive ability)<sup>20</sup>. Regression analyses were run across 20 imputed datasets and overall estimates were obtained. Imputed results were broadly similar to those using observed values; the former are presented.

## Results

Prevalence of child maltreatment varied from 1% for sexual abuse, 6% for physical and witnessing abuse, to 10% for psychological abuse; 11% for emotional neglect and 16% were identified as neglected (prospective) (Table 3). In mid-adulthood, outcomes such as LTS, NEET and financial insecurity affected <1 in 10 of the population, while outcomes such as income-related support were more prevalent. Upward mobility from class of origin was common (44%), partly occurring as intra-generational mobility, 23y to 50y.

All types of child maltreatment, when examined separately, were associated with increased risk of adult LTS, NEET, lacking assets and financial insecurity (Supplementary Table (ST) 1, Model 1). Associations attenuated after adjustment for covariates (Model 2); e.g., OR of LTS from 2.50(95% CI: 1.94,3.22) to 1.77(1.34,2.33) for neglect (prospective). For LTS, NEET and social class at 23y patterns of association were similar to those observed for 50y outcomes (ST2). 21% of the population experienced one type of maltreatment; 10% experienced  $\geq 2$  (ST3). Except for qualifications and social class, the risk of unfavourable outcome increased with number of types of maltreatment e.g. OR<sub>adjusted</sub> for LTS increased from 1.0 to 1.76(1.32,2.35) to 2.69(1.96,3.68) ( $p_{\text{trend}} < 0.01$ ) for 0, 1 and  $\geq 2$  types respectively.

When all maltreatment types were considered simultaneously (ST1, Model 3) associations with 50y outcomes were reduced, particularly for emotional neglect, physical, psychological and witnessing abuse. These three types of abuse were moderately correlated ( $r \geq 0.4$ ), whilst other types of maltreatment were less correlated ( $r < 0.3$ ); hence we created a non-sexual abuse score (0,1,2-3). In simultaneous analysis of neglect (prospective), emotional neglect, sexual and non-sexual abuse, both abuse measures were associated with lacking assets, income-related support and financial insecurity (Table 4). Sexual abuse was also associated with poor qualifications and manual class, while non-sexual abuse was associated with LTS: the OR increased from 1.0(reference) to 1.75(1.22,2.51) to 2.10(1.40,3.17) ( $p_{\text{trend}} < 0.01$ ) respectively for 0, 1 and 2-3 types. For both abuse measures, associations with outcomes were generally little affected by cognition and mental health at 16y (Table 4; ST4). Emotional neglect was associated with only one outcome (financial insecurity) and again, 16y cognitive ability and mental health did not explain the association. Lastly, neglect (prospective) was



associated with several outcomes (LTS, NEET, lacking assets, poor qualifications and manual class), e.g., the OR of LTS was 1.69(1.28,2.23) and for NEET was 1.43(1.10,1.85). Associations were attenuated or abolished when cognition and mental health were included in models (Table 4) or considered as mediators (ST4). Hence, associations were mediated by these factors, with percent explained varying from 4% (NEET) to 70% (poor qualifications); in separate models for each mediator, the effect was mostly via cognition (percent explained range: 8% to 67%, data not shown).

Neglect (prospective) and sexual abuse were associated with social mobility (Table 5). These groups were less likely to be upwardly mobile (move from manual to non-manual class) both between and within generations (e.g. neglect (prospective) OR: 0.45(0.39,0.53) and 0.61(0.50,0.74) respectively). The neglected (prospective) were also more likely to be downwardly mobile (move from non-manual to manual class) between and within generations (OR: 2.31(1.56,3.41) and 2.11(1.63,2.74)). No clear social mobility patterns were found for non-sexual abuse.

## **Discussion**

In this population based study of child maltreatment and adult socioeconomic outcomes, we showed two important findings. First, there were long-term associations of childhood abuse and neglect with unfavourable outcomes in mid-adulthood across a range of important socioeconomic indicators such as LTS and lacking assets. Associations were mostly robust after adjustment for other early-life factors including social class and parental education, and risk of unfavourable outcomes increased with multiple types of maltreatment. Second, our study elucidates on some important mechanisms underlying the child maltreatment–adult outcome associations by showing that adolescent cognitive ability had a predominant mediating role in neglect (prospective) associations with several adult outcomes, whilst cognition and mental health had negligible mediating effects for sexual and non-sexual abuse associations.

Our study has several strengths including prospectively measured mediating factors and a range of socioeconomic outcomes. Potential confounding factors were also recorded prospectively,

e.g., family socioeconomic background (parental education, household tenure). We cannot exclude the possibility of residual or uncontrolled confounding (e.g. through inadequate measurement of relevant factors e.g. parental cognitive capacities). Ascertainment of childhood maltreatment is not straightforward with limitations noted for all methods<sup>3</sup>, including those used here. Our neglect measure has the advantage of prospective ascertainment of some (failure to meet a child's basic physical, emotional or educational needs) but not all aspects (e.g. inadequate nutrition) of the conventional definition<sup>3</sup>. Multiple sources for neglect reporting (parent and teacher) may reduce misclassification<sup>23</sup> and rather than relying on individual items, we used a composite score. Abuse by a parent to 16y was reported in adulthood; exclusion of abuse by others may lead to an under-estimate of prevalence and information is lacking on timing, frequency, and duration of abuse. Despite differences in study design, prevalence was generally within ranges reported in a review<sup>3</sup> and similar to another UK study<sup>24</sup>. Study power to detect associations with sexual abuse was limited, due to the few reported cases. Retrospective reports are common due to the lack of reliable alternative methods<sup>3</sup>, but concerns remain about validity<sup>25</sup> e.g. biases from rationalizing economic under-achievement<sup>26</sup>. In this regard, our sensitivity analyses replicating associations for outcomes two decades prior to retrospective reports suggests that such biases are unlikely to be a major explanation for associations. Construct validity of retrospective reports is suggested by previous work showing expected associations with prospectively assessed family dysfunction<sup>27</sup> and mental ill-health<sup>11</sup>. Reported abuse was blind to knowledge of research questions and most mid-adult outcomes (6 of 7) were assessed 5y later (age 50y). Participants in mid-adulthood are generally representative of the surviving cohort<sup>20</sup>; we followed current guidelines for multiple imputation<sup>28</sup> to avoid loss from missing data.

Our study demonstrates associations for a breadth of maltreatments and adult outcomes measured decades later in mid-adulthood. The range of outcomes is important because there is no single measure of socioeconomic position; indicators reflect different, although often related, characteristics<sup>29</sup> that may have specific limitations, e.g. housing varies over time and geographically. The outcomes are important because of their costs to individuals and society: e.g., in Britain approximately 140 million working days/year are lost from sickness absence<sup>6</sup>; 1.68 million are

unemployed<sup>30</sup>. LTS is associated with premature mortality<sup>15-17</sup>; worklessness with physical and mental ill-health<sup>18</sup> and with educational and economic outcomes in subsequent generations<sup>31</sup>. Therefore reduction of LTS absence and worklessness are policy priorities<sup>6,7</sup>. The timing of outcomes is also noteworthy: previous studies have examined socioeconomic outcomes in early adulthood<sup>32</sup> or mixed age samples<sup>8,9</sup>, our findings for both early and later adulthood outcomes suggests that the impact of childhood maltreatment persists over decades. To our knowledge this has not been demonstrated previously. Age 50y is close to peak earning capacity in the UK<sup>33</sup>; poor outcomes at this age, e.g. lacking assets, may presage hardship and associated ill-health during old age. Patterns of association were generally consistent across maltreatments, and when multiple types were examined cumulatively, the greatest maltreatment burden was associated with greatest risk of unfavourable outcome. Findings for LTS and NEET are consistent with other studies showing that greater exposure to adverse childhood experiences is linked to inability to work<sup>8</sup> and unemployment<sup>8,9</sup> in US mixed age samples. The observed magnitude of maltreatment—outcome associations is not negligible, when compared to other influences: ORs for LTS varied between 1.4 to 2.3 for different maltreatments versus 2.2 reported for depression<sup>34</sup>. With few exceptions<sup>9</sup> previous studies examine single (e.g. sexual abuse<sup>32,35</sup>) or combined maltreatments without examining potential differential effects<sup>8</sup>. Nevertheless, our findings generally agree with the literature<sup>10,32,35,36</sup>, thereby adding credence to the growing evidence (especially given differences in maltreatment ascertainment methods). For example, the detrimental maltreatment associations with education, employment and assets in our general population agree with those for documented (i.e. more extreme) maltreatment<sup>10</sup>. Our witnessing abuse findings are novel; to our knowledge, this has not been examined, although witnessing parental violence has been associated with lower adult income<sup>36</sup>. However, not all findings are consistent, e.g., sexual abuse and education associations shown here agree with some<sup>37</sup> but not all<sup>32</sup> studies and sex differences<sup>10,35</sup> in associations were not replicated. Child neglect and sexual abuse but no other maltreatments were associated with later social class and interestingly, these groups were less likely to be upwardly mobile across and within generations. Findings are consistent with more general observations on disadvantaged groups having less favourable mobility patterns; they are important given policy commitments to lowering poverty and increasing social mobility<sup>38</sup>.

With regard to potential mechanisms underlying child maltreatment—adult outcome associations, we found support for mediating effects of adolescent cognitive abilities and mental health in associations for neglect (prospective) where a predominant effect was observed for cognition. Such findings are as expected from evidence of deficits in cognitive abilities and behavioural adjustment among maltreated children<sup>11</sup>, and the detrimental economic consequences related to these deficits<sup>12-14</sup>. This finding argues for support for remedial inputs to cognitive skills and development of children who have been neglected, which may involve clinicians, child welfare and other practitioners. Intriguingly, our results provide little support for mediating effects of adolescent cognitive abilities or behavioural adjustment in the associations for sexual and non-sexual abuse. Explanations for this unexpected finding are not clear. Our cognitive and behavioural measures were prospectively assessed and of demonstrable relevance to neglect associations, but may not capture the most salient dimensions for abuse. Given these findings and the scarcity of other studies on potential mechanisms, our study highlights the need for future research to confirm our results and to investigate additional mechanisms. This research is warranted to inform the direction of effective remedial strategies.

In conclusion, childhood abuse and neglect have long-term associations with detrimental outcomes in mid-adulthood, indicated by a range of socioeconomic measures. Risk of unfavourable outcome(s) was increased for those experiencing multiple types of maltreatment. Our findings suggest that the maltreated grow-up to experience socioeconomic disadvantage, which in turn may affect their health and that of the next generation. Our study therefore contributes to the evidence base on the full long-term costs of child maltreatment, elucidation of which is important to determine policy priorities. Prevention of maltreatment is a primary goal but represents an enormous challenge for which continued efforts are essential. In addition, investment in programmes to alleviate the ill-effects of maltreatment is needed. Our study suggests that one important target for action is the maximisation of cognitive skills and development of neglected children.

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Table 1: Definition of child maltreatment and representative variables from the 1958 British birth cohort.

	Definition <sup>3</sup>	1958 British birth cohort variables*	Reference age	Age collected (Ascertainment method <sup>¥</sup> )
Neglect (prospective) <sup>‡</sup>	Failure to meet a child's basic physical, emotional, medical/dental, or education need; failure to provide adequate nutrition, hygiene, or shelter; or failure to ensure a child's safety	constructed from:		
		- child looks undernourished, scruffy or dirty	7y and 11y	7 and 11y (T)
		- hardly ever takes outings with mother	7y and 11y	7 and 11y (P)
		- hardly ever takes outings with father	7y and 11y	7 and 11y (P)
		- mother has little interest in education	7y and 11y	7 and 11y (T)
		- father has little interest in education	7y and 11y	7 and 11y (T)
Emotional neglect <sup>χ</sup>		constructed from:		
		- how affectionate was your mother towards you?	0-16y	45y (S)
		- how affectionate was your father towards you?	0-16y	45y (S)
Sexual abuse	Any completed or attempted sexual act, sexual contact, or non-contact sexual interaction with a child by a caregiver.	I was sexually abused by a parent	0-16y	45y (S)
Physical abuse	Intentional use of physical force or implements against a child that results in, or has the potential to result in, physical injury.	- I was physically abused by a parent – punched, kicked or hit or beaten with an object, or needed medical treatment	0-16y	45y (S)



Psychological abuse	Intentional behaviour that conveys to a child that h/she is worthless, flawed, unloved, unwanted, endangered, or valued only in meeting another's needs. <i>UK definition includes harmful (unintentional) parent-child interactions: 'the persistent emotional ill-treatment of a child such as to cause severe and persistent adverse effects on the child's emotional development'</i>	- I was verbally abused by a parent - I suffered humiliation, ridicule, bullying or mental cruelty from a parent	0-16y	45y (S)
Witnessing intimate partner violence	Any incident of threatening behaviour, violence, or abuse (psychological, physical, sexual, financial, or emotional) between intimate partners or adult family members, irrespective of sex or sexuality	- I witnessed physical or sexual abuse of others in my family	0-16y	45y (S)

\*for retrospective reports at 45y, information was obtained via CASI (direct computer data entry) derived from the Personality and Total Health Through Life Project,<sup>39</sup> originating from the Parental Bonding Instrument,<sup>40</sup> British National Survey of Health and Development,<sup>41</sup> and US National Comorbidity Survey<sup>42</sup>. Participants were instructed: "The following are statements about your childhood. For each, please say whether the statement applies to you." Response options were: "Yes", "No", "Can't say".

¥ (S): self-report; (T): teacher-report; (P): parent-report

≠ neglect (prospective) defined as  $\geq 2$  items at either 7 or 11y (note at each age, if one or two items were missing we used the sum of the remaining 4 or 3 items respectively; if  $>2$  items were missing, we treated neglect as missing)

χ defined as either parent 'not at all affectionate towards me'

Table 2: Details of outcomes (adult socio-economic conditions), covariates and potential mediating factors

<b>Adult socio-economic outcomes</b>	<b>Age (ascertainment method*)</b>	<b>Details</b>
Long-term sick (LTS)	23y, 50y (S)	current economic activity: sickness absence (23y); permanently sick/disabled (50y)
Not in employment, education or training (NEET)	23y, 50y (S)	current economic activity: unemployed and seeking work or looking after the home or family
Lack of assets	50y (S)	current status: non-home owner
Income-related support	50y (S)	currently in receipt of $\geq 1$ targeted benefit or tax credit including: housing benefit, council tax benefit, jobseekers allowance, income support, working tax credit and child tax credit (universal credits such as child benefit were excluded)
Financial insecurity	45y (S)	affirmative answer to ‘during the last six months have you had a major financial crisis?’
Poor qualifications	up to 50y (S)	<O-levels (broadly comparable to <grade 10 in the US)
Manual social class	23y, 50y (S)**	current occupation coded according to the registrar general's social classification (a standard method of categorising occupations in the UK) and categorised as non-manual (professional/managerial, skilled non-manual) or manual (skilled manual, partly skilled/unskilled)
<b>Covariates</b>		
Maternal age	Birth (P)	age (years) at birth of cohort member in 1958
Birthweight	Birth (M)	kg
Birth order	7y (P)	1, 2, 3, 4+
Childhood ill health	7y (P)	child has any physical handicap or disabling condition
Social class in 1958	Birth (P)	father's occupation categorised as: professional/managerial, skilled non-manual, skilled manual, partly skilled/unskilled/no male head
Parental education	Birth and 7y (P)	both mother and father left school at the minimum leaving age
Household amenities	7y (P)	lack of or sharing a bathroom, lavatory or hot water
Household crowding	7y (P)	>1 person per room
Housing tenure	7y (P)	owner occupier, renter or other
<b>Potential mediating factors</b>		
Cognitive ability	16y (M)	Reading (selection of appropriate words to complete 35 sentences, parallel to the Watts Vernon Comprehension test) and mathematics (numerical and geometric questions with 27 multiple choice questions and 4 true-or-false questions) tests, administered at school. Tests were conducted over several months and were age standardized to 16y. The two scores were converted to a scale of 0 to 100 and averaged. Examined as one internally standardized z score (mean =0, SD=1) <sup>11</sup> .
Mental health	16y (T)	Internalising and externalising behaviours on the Rutter Scale <sup>43</sup> . Examined as two internally standardized z scores (mean =0, SD=1).

\*(S): self-report; (P): parent-report; (T) teacher-report; (M) measured or tests

\*\*social mobility was an additional outcome, using parent report at birth and self-report at 23y and 50y

Table 3: Prevalence of childhood maltreatment, adult labour market participation, living standards social class and mobility in the 1958 birth cohort (N=3,947 males; 4,129 females)

<i>Child maltreatment (0-16y)</i>	Males	Females	Total	$p^{\ddagger}$ sex-difference
	N (%)	N (%)	N (%)	
Neglect (prospective)*	634 (17.2)	574 (14.8)	1208 (16.0)	<0.01
Emotional neglect	429 (10.9)	449 (10.9)	878 (10.9)	0.99
Sexual abuse	18 (0.5)	97 (2.4)	115 (1.4)	<0.01
Physical abuse	225 (5.7)	224 (5.4)	449 (5.6)	0.59
Psychological abuse	314 (8.0)	462 (11.2)	776 (9.6)	<0.01
Witness abuse	166 (4.2)	297 (7.2)	463 (5.7)	<0.01
<i>Labour market participation, living standards and social class (50y)<sup>§</sup></i>				
LTS <sup>ε</sup>	145 (3.9)	168 (4.7)	313 (4.3)	0.10
NEET <sup>ζ</sup>	144 (3.9)	420 (10.9)	564 (7.4)	<0.01
Lack of assets <sup>η</sup>	532 (13.5)	566 (13.8)	1098 (13.7)	0.79
Income-related support <sup>κ</sup>	420 (13.2)	710 (18.0)	1130 (15.9)	<0.01
Financial insecurity <sup>λ</sup>	208 (5.4)	239 (6.0)	447 (5.7)	0.32
Poor qualifications <sup>ι</sup>	1308 (33.2)	1150 (27.9)	2458 (30.4)	<0.01
Manual social class	1390 (39.0)	794 (23.2)	2184 (31.3)	<0.01
<i>Social mobility to age 50y</i>				
<i>From class at birth (inter-generational)</i>				<0.01
Stable manual	1105 (32.0)	603 (18.1)	1708 (25.2)	
Upward from manual class	1251 (36.2)	1715 (51.6)	2966 (43.8)	
Stable non-manual	858 (24.9)	835 (25.1)	1693 (25.0)	
Downward from non-manual class	239 (6.9)	171 (5.1)	410 (6.1)	
<i>From class at age 23y (intra-generational)</i>				<0.01
Stable manual	993 (34.1)	313 (10.6)	1306 (22.2)	
Upward from manual class	632 (21.7)	382 (12.9)	1014 (17.3)	
Stable non-manual	1108 (38.1)	1908 (64.4)	3016 (51.3)	
Downward from non-manual class	177 (6.1)	361 (12.2)	538 (9.2)	

N varies due to missing data

<sup>ε</sup>p-value from  $\chi^2$ -test

\*at either 7y and/or 11y

<sup>§</sup>details in ST1

<sup>ε</sup>LTS: long-term sickness absence

<sup>ζ</sup>NEET: not in employment, education or training

<sup>η</sup>Non-home owner

<sup>κ</sup> receiving  $\geq 1$  targeted benefit or tax credit

<sup>λ</sup>reported at 45y

<sup>ι</sup><O-level (broadly comparable to <grade 10 in the US)

Table 4: OR (95% CI) for associations between types of child maltreatment and adult outcomes (labour market participation, living standards and social class) in the 1958 birth cohort

Adult outcome		Neglect (prospective)	Emotional neglect	Sexual abuse	Non-sexual abuse <sup>z</sup>		
					0	1	2-3
LTS*	Unadjusted <sup>d</sup>	2.50 (1.94,3.22)	1.76 (1.30,2.39)	3.51 (1.93,6.36)	1	2.06 (1.47,2.89)	2.77 (1.93,3.98)
	Adjusted <sup>y</sup>	1.69 (1.28,2.23)	1.18 (0.84,1.65)	1.80 (0.95,3.42)	1	1.75 (1.22,2.51)	2.10 (1.40,3.17)
	+ 16y cognition	1.23 (0.92,1.63)			1	1.87 (1.30,2.68)	2.31 (1.53,3.51)
	+ 16y mental health	1.52 (1.15,2.02)			1	1.67 (1.17,2.40)	1.93 (1.28,2.92)
	+ 16y cognition and mental health	1.19 (0.89,1.58)			1	1.80 (1.25,2.60)	2.18 (1.43,3.31)
NEET <sup>v</sup>	Unadjusted <sup>d</sup>	1.67 (1.32,2.13)	1.41 (1.09,1.82)	1.87 (1.07,3.25)	1	1.33 (0.99,1.79)	1.62 (1.17,2.24)
	Adjusted <sup>y</sup>	1.43 (1.10,1.85)	1.20 (0.92,1.58)	1.35 (0.75,2.43)	1	1.20 (0.89,1.63)	1.33 (0.93,1.90)
	+ 16y cognition	1.29 (0.99,1.69)					
	+ 16y mental health	1.37 (1.06,1.78)					
	+ 16y cognition and mental health	1.27 (0.97,1.67)					
Lack of assets	Unadjusted <sup>d</sup>	2.27 (1.93,2.66)	1.44 (1.19,1.73)	2.60 (1.72,3.92)	1	1.51 (1.22,1.87)	1.78 (1.40,2.27)
	Adjusted <sup>y</sup>	1.68 (1.42,1.99)	1.13 (0.92,1.38)	1.62 (1.04,2.53)	1	1.31 (1.04,1.64)	1.36 (1.04,1.78)
	+ 16y cognition	1.35 (1.13,1.61)		1.49 (0.95,2.33)	1	1.36 (1.08,1.70)	1.44 (1.10,1.89)
	+ 16y mental health	1.55 (1.30,1.85)		1.56 (1.00,2.43)	1	1.27 (1.01,1.59)	1.28 (0.97,1.67)
	+ 16y cognition and mental health	1.31 (1.10,1.57)		1.48 (0.94,2.31)	1	1.32 (1.05,1.66)	1.37 (1.04,1.80)
Income-related support	Unadjusted <sup>d</sup>	1.17 (0.97,1.40)	1.19 (0.98,1.44)	2.15 (1.41,3.27)	1	1.34 (1.08,1.67)	1.49 (1.16,1.91)
	Adjusted <sup>y</sup>	1.03 (0.85,1.24)	1.03 (0.84,1.27)	1.75 (1.12,2.72)	1	1.29 (1.03,1.61)	1.32 (1.00,1.74)
	+ 16y cognition			1.68 (1.07,2.62)	1	1.31 (1.04,1.64)	1.35 (1.03,1.78)
	+ 16y mental health			1.70 (1.09,2.66)	1	1.26 (1.01,1.58)	1.28 (0.97,1.69)
	+ 16y cognition and mental health			1.66 (1.06,2.59)	1	1.29 (1.03,1.61)	1.32 (1.00,1.74)
Financial insecurity	Unadjusted <sup>d</sup>	1.31 (1.02,1.68)	2.37 (1.87,3.00)	2.95 (1.70,5.13)	1	2.42 (1.84,3.19)	2.24 (1.60,3.14)
	Adjusted <sup>y</sup>	1.16 (0.88,1.54)	1.86 (1.43,2.41)	1.86 (1.04,3.34)	1	2.02 (1.51,2.69)	1.56 (1.08,2.27)
	+ 16y cognition		1.85 (1.43,2.40)	1.85 (1.03,3.32)	1	2.02 (1.52,2.70)	1.57 (1.08,2.27)
	+ 16y mental health		1.84 (1.42,2.39)	1.84 (1.02,3.30)	1	2.00 (1.49,2.67)	1.53 (1.06,2.22)
	+ 16y cognition and mental health		1.84 (1.42,2.39)	1.84 (1.02,3.30)	1	2.00 (1.50,2.67)	1.53 (1.06,2.23)
Poor qualifications	Unadjusted <sup>d</sup>	3.67 (3.22,4.18)	1.32 (1.14,1.53)	2.33 (1.61,3.38)	1	1.14 (0.95,1.35)	1.32 (1.07,1.61)
	Adjusted <sup>y</sup>	2.30 (1.99,2.66)	1.11 (0.94,1.32)	1.53 (1.00,2.34)	1	0.90 (0.73,1.09)	0.88 (0.69,1.12)
	+ 16y cognition	1.37 (1.15,1.63)		1.27 (0.78,2.04)			
	+ 16y mental health	2.07 (1.78,2.39)		1.44 (0.93,2.22)			
	+ 16y cognition and mental health	1.32 (1.11,1.58)		1.25 (0.77,2.03)			
Manual social class	Unadjusted <sup>d</sup>	2.54 (2.22,2.91)	1.26 (1.07,1.48)	2.15 (1.37,3.36)	1	0.97 (0.79,1.18)	1.15 (0.90,1.45)
	Adjusted <sup>y</sup>	1.77 (1.53,2.06)	1.17 (0.97,1.40)	1.80 (1.11,2.93)	1	0.79 (0.64,0.98)	0.82 (0.63,1.07)
	+ 16y cognition	1.26 (1.08,1.48)		1.68 (1.01,2.79)			
	+ 16y mental health	1.64 (1.41,1.91)		1.78 (1.09,2.89)			
	+ 16y cognition and mental health	1.23 (1.05,1.45)		1.68 (1.01,2.79)			

\*LTS: long-term sickness absence (baseline = employed, in education or training).

<sup>v</sup>NEET: not in employment, education or training (baseline = employed, in education or training).

<sup>d</sup>Results are presented for sexes combined as there was no evidence of differences in effect (i.e. p-value for maltreatment\*sex $\geq$ 0.06); all associations are sex adjusted

<sup>y</sup> Additionally adjusted for covariates (maternal age, birthweight, birth order, childhood ill-health, social class in 1958, parental education, household amenities, crowding and tenure) and simultaneously for other types of child maltreatment

<sup>z</sup>Score for cumulative experience of physical, physiological or witnessing abuse (0=86.8; 1=7.9%; 2-3=5.5%)

Table 5: OR (95% CI) for associations between types of child maltreatment and (inter- and intra-generational) social mobility in the 1958 birth cohort

	Neglect (prospective)	Emotional neglect	Sexual abuse	Non-sexual abuse <sup>z</sup>		
				0	1	2-3
Inter-generational 0-50y				0		
Upward vs stable manual	0.45 (0.39,0.53)	0.87 (0.71,1.06)	0.50 (0.30,0.85)	Ref	1.24 (0.98,1.57)	1.14 (0.86,1.53)
Downward vs stable non-manual	2.31 (1.56,3.41)	1.15 (0.77,1.72)	1.85 (0.57,6.04)	Ref	0.93 (0.59,1.48)	0.95 (0.53,1.70)
Intra-generational 23-50y						
Upward vs stable manual	0.61 (0.50,0.74)	0.96 (0.75,1.24)	0.47 (0.22,1.01)	Ref	1.46 (1.08,1.98)	1.30 (0.87,1.94)
Downward vs stable non-manual	2.11 (1.63,2.74)	1.16 (0.85,1.58)	1.49 (0.71,3.13)	Ref	1.11 (0.81,1.53)	1.15 (0.76,1.74)

Results are presented for sexes combined as there was no evidence of differences in effect (i.e. p-value for maltreatment\*sex $\geq$ 0.10); all associations are adjusted for sex and for other types of child maltreatment

<sup>z</sup> Score for cumulative experience of physical, physiological or witnessing abuse