Longitudinal associations of experiences of adversity and socioeconomic disadvantage during childhood with labour force participation and exit in later adulthood

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Abstract

The Extending Working Lives (EWL) agenda seeks to sustain employment up to and beyond traditional retirement ages. This study examined the potential role of childhood factors in shaping labour force participation and exit among older adults, with a view to informing proactive interventions early in the life-course to enhance individuals' future capacity for extending their working lives. Childhood adversity and socioeconomic disadvantage have previously been linked to ill-health across the life-span and sickness benefit in early adulthood. This study builds upon previous research by examining associations between childhood adversity and self-reported labour force participation among older adults (aged 55). Data was from the National Child Development Study – a prospective cohort of all English, Scottish, & Welsh births in one week in 1958. There was evidence for associations between childhood adversity and increased risk of permanent sickness at 55 years – which were largely sustained after adjustment for educational disengagement and adulthood factors (mental/physical health, qualifications, socioeconomic disadvantage). Specifically, children who were abused or neglected were more likely to be permanently sick at 55 years. In addition, among males, those in care, those experiencing illness in the home, and those experiencing two or more childhood adversities were more likely to be permanently sick at 55 years. Childhood factors were also associated with part-time employment and retirement at 55 years. Severe childhood adversities may represent important distal predictors of labour force exit at 55 years, particularly via permanent sickness. Notably, some adversities show associations among males only, which may inform interventions designed to extend working lives.

Keywords

Childhood social conditions; Disability pension; Adversity; Extending working life; Early retirement, Unemployment; Older adults; Economic activity

In the final quarter of 2014, 25% of adults in the UK between 50 years of age and state retirement age were not participating in the labour force (Penfold & Foxton, 2015). In recent years, the Extending Working Life (EWL) agenda emerged to sustain employment up to, and beyond, state retirement age; as necessitated by an ageing population, a reduction in private saving for retirement, and an increase in the state pension age (Strudwick & Kirkpatrick, 2013). The success of the EWL agenda depends on improved understanding of what leads over half of men and women to have exited the labour force by the year before they reach state pension age (Department for Work and Pensions, 2014). Existing research has primarily focused on employment factors leading to disability pension as opposed to taking a life-course approach. Understanding the way in which labour force participation in later life may be influenced by childhood factors will facilitate the design and implementation of proactive, early intervention aiming to maximise future labour force participation across the life-span.

"Adverse childhood experiences" describes experiences of traumatic events or chronic stressors during childhood which are not within the child's control such as experiences of abuse or loss of a parent (Tiet et al., 1998). Theoretically, childhood adversity may indirectly impact labour force participation via aspects of adult life. Specifically, poorer mental and physical health, reduced educational attainment, higher levels of risky health-related behaviours (e.g. smoking, drug use, physical inactivity), and reduced employment opportunities in early adulthood have previously been linked to childhood experiences of adversity (Anda et al., 2006; Clark et al., 2010; Dube et al., 2009; Dube et al., 2003) and socioeconomic disadvantage (Lynch et al., 1997; Stansfeld et al., 2008). However, even after accounting for adulthood factors, we expect to see associations between childhood experiences and later life employment via biological, neurological, or psychological mechanisms. Childhood and adolescence represent critical periods during which exposure to stress may shape neurobiological and immune system development with changes persisting across the life-span (Teicher et al., 2003). Adversity-related stress during childhood has been shown to be associated with several aspects of

complex cognitive functioning including decreased intellectual and academic performance, poorer language abilities, and impairments in executive functioning such as planning and inhibitory control (Pechtel & Pizzagalli, 2011). In addition, early life stress and adversity are associated with lasting impairments to affective functioning in terms of increased attention to negative stimuli, difficulties in emotional regulation and higher risk of psychiatric illness, and impairments in reward-related decision-making, and decreased motivation to pursue rewards (Ford, Clark, & Stansfeld, 2011; Pechtel & Pizzagalli, 2011). Cognitive and affective impairments may be particularly salient as these may represent the mechanisms by which childhood adversity may directly impact capacity for labour force participation among older adults. Harkonmäki et al. (2007) provided some evidence to support this direct pathway between childhood adversity and labour force participation as they found an association between retrospective reporting of a greater number of childhood adversities in a sample of non-retired 40-54 year olds in Finland and an increased risk of permanent sickness in adulthood five years later which was sustained after adjusting for mental health, physical health, and socioeconomic status in adulthood. In addition, Joensuu et al. (2015) identified a cluster of young adults on permanent sickness due to mental illness who were characterised by experiences of adversity during childhood which provides further evidence of a direct pathway between adversity and permanent sickness due to mental illness, in adulthood.

Even though research on childhood adversity has examined several different types of adversity and found evidence suggesting that experiences of multiple adversities may be associated with particularly detrimental outcomes (Clark et al., 2010; Rosenman & Rodgers, 2004),there are still considerable gaps in the literature. Associations between childhood adversity and labour force participation has not been examined in prospective cohorts followed from birth, nor have these

associations been tested in a UK population in order to better inform government policy in this country. In addition, labour force participation outcomes have been limited to permanent sickness resulting in little knowledge relating to other labour force participation outcomes (e.g. retirement or homemaking).

Focusing specifically on evidence for associations between socioeconomic disadvantage in childhood and labour force participation in adulthood Bowen and González (2010) reported increased risk of permanent sickness in adulthood among children whose fathers reported manual social class, never working, or a disability. It is plausible that these associations may be indirect via educational attainment (e.g. Baumberg, 2015) as, for example, previous research has suggested that those experiencing socioeconomic disadvantage during childhood are underrepresented in higher education, largely due to heightened financial pressures and reduced access to enriched educational resources (Archer et al., 2005).However, even after controlling for this, we expect to see an effect via similar biological, psychological and cognitive pathways as those proposed for other forms of adversity.

While researchers have recently begun to examine predictors of early exit from the labour force, much existing research is cross-sectional and often few labour force participation statuses are examined, with most studies based on disability pension receipt data. Few studies examine population-wide cohorts. Where population-wide cohorts are examined, this is often using retrospective adversity data collected in adulthood (e.g. Harkonmäki et al. (2007)), possibly introducing recall biases. Moreover, previous studies have often focused exclusively on a cumulative adversity measure (e.g. Harkonmäki et al 2007) which limits understanding as to whether particular adversities are driving effects. In addition, the comparability of Finnish or other national cohorts to a UK population is unknown. Therefore, the primary aim of this study was to expand on previous research by using prospective cohort data to examine associations between childhood adversity and labour force participation and exit in the form of full-time employment, part-time employment, unemployment, permanent sickness, retirement, and

homemaking. It was hypothesised that those who experienced adversity or socioeconomic disadvantage during childhood would report reduced labour force participation and increased labour force exit by age 55.

This study also had two secondary aims. First, we examined whether males or females were at a greater risk of labour force exit associated with experiences of childhood adversity and socioeconomic disadvantage. Notably, while retirement age for females and males is becoming aligned (Strudwick & Kirkpatrick, 2013), there are still large gender differences in the type of work carried out and reasons for labour force exit (Loretto & Vickerstaff, 2013). To date, however, few studies have compared predictors of labour force participation for males and females. Second, we examined whether associations between childhood adversity and labour force participation and exit in older adulthood were sustained after taking account of educational disadvantage during childhood (leaving school by 16 or being kept of school to help in the home) and adulthood factors, specifically mental health, physical health, qualifications, and socioeconomic status.

Method

Study sample

Data were from the National Child Development Study; a longitudinal cohort of 98% of births across England, Scotland, and Wales during one week in March in 1958 (n=18,558). The cohort have been followed up since birth and this study uses economic activity outcome data collected at age 55 years in 2013. Childhood adversity items were collected at age 7, 11, and 16 from parents, interviewer, teacher and doctor reports and this study uses additional data related to covariates collected at 23, 33, 42, 45 and 50 years from the cohort member. The statistical analyses presented here are based on the

9137 cohort members (48.5% male) who participated in the age 55 survey (79.1% of the approached sample, 49.2% of the original sample). Datasets were obtained from the University of London, Institute of Education, Centre for Longitudinal Studies (2015/2014/2012/2009/2008a/2008b/2008c)

Measures

Labour force participation

A six-category labour force participation and exit variable was created. Participants self-reported their main activity as being in full-time work (self-employed or employed), in part-time work (self-employed or employed for under 30 hours per week), unemployed, permanent sickness or disability, retired, or "homemaker or other" of whom 82% (n=553) were homemakers (defined as looking after home or family) and a small minority were temporary sick (n=31).

Childhood adversity

A number of prospective measures of childhood adversity reported by the cohort member, a parent (usually the mother), medical examiner, or teacher at 7, 11 and 16 years of age were available (see Clark et al. (2010) for a more detailed description of study variables):

- *illness:* any mental and/or physical illness in the home when the child was 7, 11, and/or 16
- *neglected appearance:* medical examiner reported that the cohort member appeared "scruffy or underfed" at age 7 and/or 11 years
- *abuse:* physical and/or sexual abuse by a parent in childhood were retrospectively measured at 45 years using two items ("I was physically abused by a parent—punched, kicked, hit, or beaten with an object or needed medical treatment" and "I was sexually abused by a parent") from the

Australian PATH study (Rosenman & Rodgers, 2004), because it is difficult to assess these adversities prospectively.

- *paternal absence:* any report of the child not living with their natural father at 7, 11, and/or 16 years for any reason
- *maternal absence:* similar indicator to paternal absence
- *parental divorce by age 16 years:* reported by cohort member at age 33
- *in care:* child in care at 7, 11 or 16 years of age.

A cumulative adversity measure which added the number of adversities experienced, similar to the Clark et al. (2010) approach was also created. To account for co-occurrence, paternal and maternal absence were only included in the cumulative score where being in care and parental divorce were not reported. For analytical purposes, this variable was collapsed into three categories (0/1/2+ adversities).

Childhood socioeconomic disadvantage

Paternal socioeconomic position was recorded using an occupation-based allocation of social class based on the British Registrar General Classification (Office of Population Censuses and Surveys, 1980) at the cohort member's birth, age 7, age 11, and age 16. For this study, a cumulative variable indicating the number of times during childhood the cohort member belonged to a manual social class (skilled manual, partly-skilled, and non-skilled occupations) (0, 1, 2, 3, or 4 times) was created, in line with the approach of Stansfeld et al. (2008).

Confounding factors

A number of confounding factors across childhood and adulthood were identified *a priori* from the literature, including gender, internalising symptoms (e.g. symptoms of depression or anxiety) and/or externalising symptoms (e.g. conduct problems) at 7, 11, and/or 16 years of age (see Clark et al. (2007)

for details of these measures) and childhood educational disadvantage (leaving school by 16 or being kept off school to help at home).

The nine-item Malaise Inventory measured adult mental health at 23, 33, 42, and/or 50 years (Rutter et al., 1970) and using the established cut-off of a score of 4 or more to indicate psychological distress, a binary outcome was created indicating "malaise reported at least once 23y-50y". Physical health was measured with a binary variable indicating whether the participant reported a long standing illness (LSI) at 23, 33, or 42 years. The physical health measure at age 50 was not comparable with previous versions and was therefore not included. Qualifications were measured at 33 years (categorised as none, O-levels, and A-levels or higher). Socioeconomic status in adulthood was defined as the frequency of manual social class reported by the cohort member at 33, 42, or 50 years, again using the Registrar General Classification (Office of Population Censuses and Surveys, 1980). The social class variable at age 23 was omitted as some cohort members continued to report their parents' social class while other cohort members reported their own.

Data analysis

Attrition

Poorer mental health in childhood and adulthood, being male, socioeconomic disadvantage, and fewer qualifications were associated with non-participation at 55 years. Similar to associations between adversity and attrition at age 45 (Clark et al. 2010), all adversity variables were associated with increased odds of attrition (ranging from OR=1.34, 95%CI [1.22,1.49] for reported parent illness in the home to OR=2.40, 95%CI [2.16,2.68] for reported parental divorce in childhood.

Missing data

Unimputed prevalence and missing data rates for the outcomes and covariates were examined: missing values ranged from 0.0% to 55.7% (highest for medic reported neglected appearance; median

missing data=19.0%). Multiple imputation by chained equations was used to address missing data in this study, patterns of missing data were explored, under the "Missing At Random" (MAR) assumption (Rubin, 1987), and 60 imputed datasets were created. To enable examination of gender interactions in the imputed data, we imputed the data separately by gender using the *mi impute* command in Stata version 14 (StataCorp, 2015). All variables in method were included in the imputation model. Socioeconomic disadvantage variables and mental health variables at each wave were included and derived variables were created post-imputation.

Statistical modelling

A series of crude and adjusted multinomial logistic regression analyses were carried out. Economic activity at 55 years was regressed on each of the individual childhood adversity variables, and on the cumulative adversity variable. First, unadjusted models were run, and then analyses were adjusted for gender and mental health in childhood. Finally, analyses were further adjusted for educational disengagement (being kept off school to help in the home and leaving school by 16) and adulthood factors, specifically, mental and physical health, qualifications, and social class. Tests of gender interactions with childhood adversity were examined and analyses were stratified where evidence for a gender interaction ($p<=0.05$) was observed.

Results

At 55 years, 38.5% of participants were not in full-time work (Table 1). This included 19.7% of the sample who were in part-time work, 2.8% unemployed, 5.2% on permanent sickness or disability pension, 3.3% retired and 7.5% in "homemaking/other" activities.

One in ten (9.8%) appeared neglected in childhood, while 6.3% reported childhood physical and/or sexual abuse by a parent. Females were less likely to appear neglected, but more likely to report physical or sexual abuse by a parent. Being in care at least once during childhood was reported by 5.0% of the sample and 10.1% reported parental divorce by age 16. Odds of reporting parental divorce and parental absence were greater among females compared to males.

One adversity was reported by 23.1% and 7.4% reported two or more adversities. There was no significant gender difference observed in reports of cumulative adversities. Finally, 21% of the sample was never in a manual social class in childhood, while 51.8% of the sample reported manual social class at all four time-points in childhood.

Table 1

After adjusting for gender and childhood mental health, with the exception of maternal absence, all childhood adversity and socioeconomic disadvantage factors were associated with at least some of labour force statuses at 55 years (see Supplementary Online Table 1). A gender interaction was observed in associations of being in care, reporting physical or mental illness in the childhood home, and cumulative adversity with labour force participation at 55 years. Therefore, throughout the rest of this results chapter, analyses have been stratified by gender for each of these four factors.

Neglect, physical/sexual abuse, parental divorce, paternal absence, and three/four reports of manual social class were each associated with increased risk of reporting permanent sickness relative to full-time employment. Among males only, being in care and reporting a physical/mental illness in the home was associated with increased risk of reporting permanent sickness. For both males and females, those who reported one or two or more adversities had an increased risk of reporting permanent sickness with larger effect sizes observed for males compared to females.

In addition, physical/sexual abuse and manual social class throughout childhood were associated with increased risk of reporting unemployment relative to full-time employment. Males in care had an increased relative risk of reporting part-time work while those who reported parental divorce had a reduced relative risk of reporting retirement by age 55. Finally, we did not find evidence for an association between any childhood factors and reports of being 'homemaker or other' at age 55 relative to being in full-time employment in the models adjusted for gender and childhood mental health.

Following additional adjustment for educational disengagement during adolescence (being kept off school to help in the home and leaving school by age 16) and adulthood factors including mental health, physical health, qualifications, and social class, all childhood adversity variables except for maternal and paternal absence remained associated with some labour force statuses, particularly with permanent sickness (relative to full-time employment), at 55 years (see Table 2).

In the fully adjusted model an increased risk of reporting permanent sickness at age 55 was sustained among those who were neglected and those who reported physical or sexual abuse. In the gender stratified models where an interaction was observed, males who reported being in care, males who reported illness in the home, and males who experienced two or more adversities during childhood had an increased risk of reporting permanent sickness at 55 years.

Associations between experience of physical or sexual abuse or reporting manual social class at all time-points during childhood and unemployment at 55 years of age were not sustained following adjustment for adulthood factors. Following adjustment for adulthood factors those who reported physical or sexual abuse and those who reported manual social class at all four time points during childhood had a reduced risk of reporting part-time employment. For males only, those who reported

being in care had an increase in risk of reporting part-time work at 55 years of age. Those whose parents divorced during childhood remained at reduced risk of reporting retirement by age 55 following adjustment for adulthood factors.

Table 2

Discussion

In line with our primary hypothesis, the results of this study suggested a significant association between childhood adversity and employment in later adulthood (particularly via permanent sickness). The success of the EWL agenda depends on identifying risk and protective factors shaping labour force participation and exit among older workers. While there is considerable literature illustrating the influence of adulthood circumstances including physical and mental health, working conditions, employer characteristics, and type of employment on early labour force exit (Månsson & Råstam, 2001; Mein et al., 2000; Mykletun et al., 2006), there is limited research focusing on the potential influence of more distal, childhood factors. This paper examined associations between childhood adversity and socioeconomic disadvantage and labour force participation and exit among 55 year olds in England, Scotland, and Wales. The main contribution of this paper is the longitudinal cohort analysis which shows that experiences of adversity in childhood are associated with reduced labour force participation at 55 years, particularly via permanent sickness, even after taking account of gender, childhood mental health, educational disengagement, qualifications, adulthood mental and physical health, and socioeconomic position in adulthood.

To compare the NCDS with another data source, we ran corresponding figures using the Annual Population Survey (APS) 2013 (Office for National Statistics Social Survey Division, 2017). This showed higher rates of full-time and part-time employment in NCDS compared to the APS (56% and 17%

respectively in APS). In contrast, NCDS figures indicated a lower rate of homemaker/other (12% in the APS). Differences may be attributable to the self-report NCDS employment question, to attrition related to socioeconomic status in the NCDS, and lack of individuals who migrated to the UK post age 16 in the NCDS. Rose et al. (2014) reported higher rates of sexual abuse (12%), physical abuse (16%). This may be attributable to question wording as the NCDS data exclusively refers to physical or sexual abuse by a parent. In addition, Harkonmäki et al. (2007) found that 33% of their sample reported no adversities, considerably lower than the 70% reporting no adversities in our study. This may be attributable to country differences between the UK, Finland, and the USA, to biases due to retrospective versus prospective recall, and to cohort age ranges which are wider in other studies relative to the one year limit in a birth cohort such as the NCDS.

In this study, children who experienced neglect, abuse, parental divorce, paternal absence, or socioeconomic disadvantage three/four times during childhood had one and a half to three times the risk of permanent sickness relative to full-time employment at 55 years after adjusting for gender and childhood mental health compared to those who did not experience these adversities. Even after further adjusting for educational disengagement, qualifications, adulthood mental and physical health, and socioeconomic position throughout adulthood the association between abuse and neglect and an increased risk of permanent sickness at 55 years of age was sustained. Physical/sexual abuse by a parent and experiencing neglect during childhood are extreme forms of adversity and may have a more direct influence on capacity for labour force participation later in life while associations between parental divorce, paternal absence, and childhood socioeconomic disadvantage and later life permanent sickness may be explained by adulthood circumstances including adulthood health, socioeconomic disadvantage, and qualifications.

In line with our findings, Rose et al. (2014) also reported a stronger association between experience of abuse and disability pension compared to associations between experience of family dysfunction and disability pension. In this cross-sectional study, Rose et al. (2014) suggested an association between retrospective reports of exposure to abuse (five sexual, emotional, and physical abuse items) and household dysfunction (six items related to domestic violence, incarceration, substance abuse, parent illness, parental divorce) in childhood and permanent sickness among adults over 18, independent of health. In addition, Harkonmäki et al. (2007) found evidence for a direct pathway between cumulative childhood adversity (parental divorce, long-term financial difficulty, serious family conflict, frequent fear of a family member, severe illness in family, and alcohol-related problems in the family) and permanent sickness in adulthood among Finnish workers, independent of adulthood circumstances suggesting a detrimental effect of experiencing cumulative adversities. A plausible interpretation of our findings is that a direct association may be restricted to the most severe adversities including neglect and abuse while the pathway may be indirect for other adversities including parental divorce, paternal absence, and socioeconomic disadvantage. Future studies may benefit from further examination of specific adversities to identify whether there are particular adversities which underpin associations with early exit from the workforce, via permanent sickness in particular.

Our findings also suggested a moderating effect of gender in associations between being in care, experiencing illness in the home, and experiencing multiple adversities and permanent sickness at 55 years. Males in care and males experiencing illness in the home had an increased risk of permanent sickness at 55 years relative to full-time employment, even after fully adjusting for adulthood factors, while the association was not statistically significant among females, even in the models adjusted for childhood mental health only. In addition, while experiences of one or two or more adversities were associated with increased risk of permanent sickness among both males and females in the models

adjusted for childhood mental health, following adjustment for adulthood circumstances, males experiencing two or more adversities remained at increased risk of reporting permanent sickness while the other associations were attenuated. These findings build upon previous research emphasising the potentially detrimental impact of cumulative adversity on adulthood outcomes (Clark et al., 2010; Rose et al., 2014; Rosenman & Rodgers, 2004). The attenuation of this effect among females, however, suggests that adulthood circumstances may be particularly important in determining labour force participation outcomes related to adversity among females. This study provides some evidence in support of a remaining association between childhood adversity and labour force participation at 55 years, particularly among males. However, models were adjusted for malaise in adulthood but not externalising symptoms in adulthood, as this data was not available in the NCDS. The associations between childhood adversity and permanent sickness among males might be attenuated if externalising problems such as antisocial behaviour and substance misuse were included. In addition, the risk ratios presented here represent the risk of different types of labour force exit relative to those in full-time employment. Notably, however, while full-time employment represents the dominant form of labour force participation among males, this is not the case for females for whom part-time employment dominated. Based on the gender differences observed here, it is also plausible that pathways differ for sub-groups of the population and as such a single intervention may not be appropriate to support older adults to extend their working lives.

Additionally, our findings indicated an increased risk of permanent sickness among children whose fathers reported manual social class at all four childhood time-points, similar to previous findings of Bowen and González (2010). However, following additional adjustment for adulthood circumstances, our associations were attenuated. Thus, adulthood circumstances, including educational engagement and qualifications, may explain associations between childhood socioeconomic disadvantage and labour force participation in adulthood which emphasises the importance of supporting young people from

disadvantaged backgrounds who may experience challenges and barriers to remaining in education (Archer et al., 2005) and employment. A previous study by Henderson et al. (2009) suggested that childhood temperament was associated with long-term sickness absence at 50 years of age. However, the items measuring temperament asked whether the child often complained about aches and pains or appeared miserable or unhappy. It is plausible that these items may have actually been proxy measures for experiences of adversity or severe disadvantage in the home rather than indicative of the child's temperament: these items may also have been precursors to physical illness. Future studies may benefit from a more systemic view of children's experiences of adversity at home as the family environment influences children's ability to thrive (Turner et al. 2012). In addition, previous research has suggested modest genetic contributions to socioeconomic status and education which may also point toward potential adversity-related genetic vulnerabilities for adult labour force participation status (Marioni et al, 2014).

In terms of labour force participation other than permanent sickness, after accounting for adulthood factors, those who experienced parental divorce still reported a reduction in risk of retirement relative to full-time employment by 55 years. In addition, the association between abuse and unemployment was attenuated in the fully adjusted model which suggests that associations between childhood factors and retirement and unemployment at 55 years may be explained by adulthood factors. Notably, homemakers have received much less research attention and as such represent a poorly understood group (Alavinia & Burdorf, 2008). The results of this study did not provide evidence to suggest an increased risk of being homemaker/other for those who experienced childhood adversity or socioeconomic disadvantage in childhood. This may be attributable to the heterogeneity of this homemaker/other group which may have included, for example, those caring for sick or elderly relatives, those looking after children or grandchildren, those engaged in volunteering, and those on temporary sickness.

Associations related to part-time employment were inconsistent following adjustment for adulthood factors. Experiences of abuse or socioeconomic disadvantage were associated with a reduction in risk of part-time employment while males in care continued to be at increased risk of part-time employment relative to full-time work. Where older workers' capacity for work is in decline, part-time employment, flexible work or gradual retirement are often desirable but may only be a viable option for those in financial positions to avail of them or those working in sectors and roles which allow such flexibility (Vickerstaff, 2010). A reduction in risk of reporting part-time work among those who experienced adversity during childhood may be a marker of lack of flexible options and lower financial resources available to this population. This should be monitored in future waves of the NCDS as lack of flexible work-options may place this group at higher risk of labour force exit going forward.

There are a number of study limitations which need to be considered. Study attrition may have led to biases in analyses, particularly as those experiencing the most adverse childhood conditions were less likely to be retained in the study cohort. However, while adversity was linked to attrition, we still observed significant associations between adversity and employment outcomes at 55 in our dataset. It is plausible that the associations we have reported are conservative estimates of the true association, underlining the need for future research in this area. Though loss to attrition meant that we only had data for approximately 50% of the original NCDS cohort, this is still a very rich data set as birth cohorts for this age group are incredibly rare. Even studies with shorter follow-up in adulthood report significant attrition. Harkonmäki et al. (2007) reported an impressive 80% response rate, albeit only over a seven-year follow-up. In addition, measures of mental health differed across the life-course and reflect only symptoms of mental illness rather than clinical diagnoses so there may still be some residual confounding of mental health, particularly given the lack of data available in adulthood on externalising symptoms and length of time between reports. We are limited by the self-report nature of the study data, including the self-reporting of labour force participation. Data related to severity, context, or

duration of exposure to adversity were also not available in this dataset and experiences of adversity later in life have not been taken into account. Another limitation is that the cohort members are still relatively young for retirement and while 38.5% of this sample was not in full-time employment, only 3% of cohort members had retired – this is expected to grow considerably over the coming decade. The generalisability of the findings of this study to older adults up to and beyond traditional retirement age should be examined in future. Those not participating in the labour force were considered to have "exited the labour force". It is possible that some of these individuals will return to work, however, transitions back into the labour force are more difficult and less common among older workers (Loretto et al., 2006). In terms of measurement, experience of abuse by a parent and parental divorce by 16 years were reported retrospectively at ages 45 and 33, respectively. Prospective measurement of sexual and physical abuse is difficult as children may be reluctant to disclose this out of fear or parental coercion. While experiences of abuse and parental divorce are not measured prospectively, these are life events which are unlikely to be forgotten and are so sensitive that retrospective accounts represent a key source of information (Maughan & McCarthy, 1997). In addition, though measured retrospectively, the items were measured ten years prior to outcome measurement at 55 years.

Despite these limitations, this study builds upon the literature in several ways. Strengths of this study include the prospective cohort which offers a unique opportunity to improve our understanding of the labour force participation sequelae of childhood experiences of adversity; the long follow-up period of 55 years which extends previous research; the use of multiple imputation to address biases related to missing data; the conceptualisation of labour force participation and exit more broadly to allow for examination across a range of outcomes in a single study; the inclusion of a wide range of adversities including severe adversities as well as adversities more widely experienced; and the adjustment for adulthood factors including mental health, physical health, qualifications, and socioeconomic position suggesting that many of the associations observed were not fully explained by these adulthood

circumstances. While it was not possible to test for mediation in the study analyses given the categorical nature of the variables of interest, these analyses do suggest that childhood adversity may represent a marker for early exit from the labour force, particularly via permanent sickness and as such, children experiencing adversity represent a population of interest when designing pro-active interventions to maximise participation in the labour force up to and beyond traditional retirement age.

The findings of this study suggest distal factors in the life-course may play a role in shaping labour force participation and exit. It is important to consider young peoples' experiences in the home and family which may influence capacity and opportunities for labour force participation across the life-span. Crucially, employers should be aware that employees who experienced adversity and socioeconomic disadvantage during childhood may be at an additional risk of early labour force exit, particularly via permanent sickness. Interventions to maximise labour force participation among older adults should focus on the whole life-course, particularly as childhood adversity may represent a marker for early labour force exit. In addition, the associations reported in this study provide some evidence to suggest a causal link between experiences of adversity in childhood and early exit from the labour force in adulthood, particularly via permanent sickness. This further emphasises the importance of intervention to reduce childhood exposure to adverse experience. Experiences of growing up in adversity may alter neurobiological development in early life which may have a sustained and direct impact on susceptibility to illness and also on the development of an individual's self-concept, coping skills, emotion regulation, decision-making, and ability to form trusting relationships (Pechtel & Pizzagalli, 2011; Wolfe, 1999). Via these mechanisms, childhood adversity may directly influence capacity for labour force participation among older adults who experienced adversity and socioeconomic disadvantage in childhood. It is also plausible that the observed gender differences in associations between adversity and labour force participation outcomes may be attributable to different neurodevelopmental trajectories for males and females (Pechtel & Pizzagalli, 2011).

Psychosocial educational interventions based on a life-course perspective with consideration of gender differences in both experiences of adversity and labour force participation may be most effective. These may include mentorship programmes which identify significant others as points of support for young people experiencing adversity for whom the family unit may not provide sufficient support or role models. Given that impairments to affective functioning associated with experience of adversity seem to last longer than cognitive impairments (Pechtel & Pizzagalli, 2011), proactive interventions which promote the development of affective functioning skills including the formation of a positive self-concept, improved reward-directed decision-making, positive coping strategies, and support to build trusting relationships may be most successful. Future studies should examine exposure and response to stressors in the work place and in the home among those who experienced adversity during childhood as this may represent the mechanism via which adversity directly influences early exit from the labour force.

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Ethics Approval

The National Child Development Study has been running since 1958 and current ethical approval has been granted by the Research Ethics Committee of London - Central (12/LO/2010). The NCDS Ethical review and consent report can be found here:

http://www.cls.ioe.ac.uk/Publications.aspx?sitesectionid=93&sitesectiontitle=Reports

Research highlights

- Childhood neglect and abuse increase risk of permanent sickness at 55 years
- Adversity associated with permanent sickness among males in particular
- Effects sustained when adjusted for adult health, qualifications, & social class
- Childhood circumstances important to success of extending working lives agenda
- Distal predictors of labour force exit may inform proactive EWL interventions

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Table 1: Descriptive statistics – childhood adversity and economic activity at 55y by gender

	Total		Male (n=4433)		Female (n=4704)		Gender differences[b, c]
	N	%[a]	N	%	N	%	
Economic Activity at 55y (n=9000)							**RRR [95%CI]**
Full-time work	5535	61.5	3438	78.6	2097	45.4	1.00
Part-time work	1776	19.7	322	7.4	1454	31.5	**7.40 [6.48,8.44]**
Unemployment	256	2.8	152	3.5	104	2.3	1.12 [0.87,1.45]
Permanent sickness/disability	464	5.2	210	4.8	254	5.5	**1.99 [1.65,2.41]**
Retirement	295	3.3	141	3.2	154	3.3	**1.79 [1.41,2.26]**
Homemaker/other	674	7.5	114	2.6	560	12.1	**8.06 [6.54,9.93]**
Neglected appearance (n=4048)							**OR [95%CI]**
No reports of neglected appearance	3652	90.2	1542	87.1	2110	92.7	1.00
Appeared neglected at least once	396	9.8	229	12.9	167	7.3	**0.58 [0.48,0.71]**
Physically or sexually abused by parents in childhood (n=7626)[R]							**OR [95%CI]**
No	7413	93.7	3478	94.4	3665	93.0	1.00
Yes	483	6.3	208	5.6	275	7.0	**1.24 [1.03,1.49]**
In care (n=5535)							**OR [95%CI]**
No reports of being in care 7-16y	5257	95.0	2551	95.4	2706	94.6	1.00
In care at least 7-16y	278	5.0	122	4.6	156	5.5	1.20 [0.95,1.52]
Parent divorce by 16 (n=7968)							**OR [95%CI]**
No parent divorce by 16y	7161	89.9	3447	90.6	3714	89.2	1.00
Parental divorce by 16y	807	10.1	358	9.4	449	10.8	**1.18 [1.02,1.36]**
Paternal absence (n=7057)							**OR [95%CI]**
Always lived with natural father	6028	85.4	2965	86.9	3063	84.0	1.00
Not living with father at least once	1029	14.6	446	13.1	583	16.0	**1.23 [1.08,1.41]**
Maternal absence (n=6967)							**OR [95%CI]**
Always lived with natural mother	6554	94.1	3171	94.1	3383	94.0	1.00
Not living with mother at least once	413	5.9	197	5.9	216	6.0	1.04 [0.85,1.28]
Illness in household (n=6684)							**OR [95%CI]**
None reported	84.9	84.9	2733	84.6	2940	85.2	1.00
Physical or mental illness in home	15.1	15.1	499	15.4	512	14.8	0.93 [0.81,1.08]
Cumulative adversity(n=1903)							**RRR [95%CI]**
None reported	1596	69.5	679	69.8	917	69.4	1.00
1 adversity reported	530	23.1	214	22.0	316	23.9	0.99 [0.88, 1.12]
2 or more adversities reported	169	7.4	80	8.2	89	6.7	1.00 [0.83, 1.20]
Freq. of manual SC (n=5310)							**RRR [95%CI]**
Never	1115	21.0	555	21.6	560	20.4	1.00
Once	503	9.5	255	9.9	248	9.1	1.03 [0.86,1.23]
Twice	361	6.8	167	6.5	194	7.1	1.18 [0.96,1.45]
Three times	583	11.0	269	10.5	314	11.5	**1.19 [1.02,1.40]**
Four times	2748	51.8	1323	51.5	1425	52.0	1.10 [0.99,1.23]

[a]Proportions based on complete record data

[b]tests based on imputed data, reference group=males
[c]RRRs in bold indicate statistical significance at the p<0.05 level
[R]retrospective item (45y)

Table 2: RRRs and 95% CIs for associations between childhood adversity and economic activity at age 55: Fully adjusted for gender, childhood mental health, educational disengagement and adulthood factors

	PT work RRR [95%CI]	Unemployment RRR [95%CI]	Permanent sick RRR [95%CI]	Retired RRR [95%CI]	Homemaker/ other RRR [95%CI]
Neglected appearance	0.82 [0.58,1.17]	1.24 [0.69,2.21]	**1.93 [1.22,3.05]**	0.39 [0.13,1.14]	1.01 [0.64,1.58]
Abused	**0.75 [0.56,1.00]**	1.47 [0.90,2.41]	**1.52 [1.04,2.23]**	1.06 [0.62,1.83]	0.97 [0.67,1.39]
In care					
Males:	**2.47 [1.37,4.43]**	1.77 [0.77,4.09]	**2.07 [1.04,4.11]**	1.53 [0.54,4.33]	0.60 [0.13,2.85]
Females:	0.73 [0.50,1.06]	1.64 [0.65,4.15]	0.86 [0.47,1.60]	0.53 [0.13,2.24]	1.06 [0.63,1.80]
Parental divorce	0.94 [0.76,1.15]	0.82 [0.50,1.35]	1.04 [0.74,1.45]	**0.58 [0.34,0.98]**	0.82 [0.60,1.11]
Paternal absence	0.95 [0.79,1.14]	0.80 [0.53,1.20]	1.91 [0.89,1.59]	0.89 [0.58,1.37]	0.80 [0.61,1.06]
Maternal absence	0.96 [0.74,1.25]	0.84 [0.45,1.56]	1.08 [0.71,1.66]	0.62 [0.32,1.22]	0.76 [0.51,1.15]
Illness					
Males:	1.23 [0.83,1.80]	0.94 [0.54,1.62]	**1.85 [1.18,2.89]**	1.01 [0.56,1.82]	1.05 [0.56,1.99]
Females:	0.88 [0.69,1.11]	1.03 [1.06,2.71]	1.01 [0.64,1.61]	0.96 [0.55,1.69]	0.86 [0.62,1.18]
Cumulative adversity[a]					
Males:					
1	1.09 [0.78,1.53]	0.96 [0.58,1.57]	1.56 [0.99,2.48]	0.77 [0.44,1.35]	1.28 [0.72,2.29]
2 or more	1.42 [0.83,2.45]	1.12 [0.54,2.35]	**2.57 [1.43,4.61]**	0.88 [0.33,2.37]	1.24 [0.54,2.87]
Females:					
1	0.86 [0.70,1.05]	1.45 [0.84,2.52]	1.28 [0.85,1.94]	0.69 [0.40,1.18]	0.87 [0.67,1.14]
2 or more	**0.70 [0.50,0.98]**	1.41 [0.58,3.46]	1.48 [0.89,2.46]	0.58 [0.24,1.43]	0.74 [0.46,1.18]
Freq. of manual SC[b]					
Once	0.93 [0.73,1.18]	0.88 [0.46,1.72]	0.89 [0.49,1.64]	0.93 [0.57,1.53]	0.97 [0.68,1.39]
Twice	0.85 [0.65,1.13]	1.53 [0.80,2.92]	1.21 [0.68,2.14]	1.05 [0.60,1.85]	0.91 [0.60,1.37]
Three times	0.91 [0.73,1.14]	1.38 [0.79,2.40]	1.02 [0.62,1.68]	0.95 [0.59,1.52]	0.78 [0.55,1.12]
Four times	**0.83 [0.70,0.97]**	1.40 [0.92,2.13]	1.38 [0.94,2.04]	1.06 [0.77,1.46]	0.87 [0.68,1.11]

Notes:

1. *Outcome reference group: Full-time employment*
2. *Exposure reference groups: [a]No adversities; [b]Never in manual social class*
3. *Adjusted for gender (where analyses are not stratified by gender in cases where there was a significant interaction observed), childhood mental health, childhood educational disengagement (kept off school to help at home, left school by 16), and adulthood factors (mental health, LSI, qualifications, social class)*
4. *RRRs in bold indicate statistical significance at p<0.05 level*

Supplementary Online Table 1: Childhood adversity and economic activity at 55 years – Adjusted for gender (except where analyses are presented separately by gender) and childhood mental health

	PT work RRR [95% CI]	Unemployment RRR [95% CI]	Permanent sick RRR [95% CI]	Retired RRR [95% CI]	Homemaker/ Other RRR [95% CI]
Neglected	0.85 [0.60,1.20]	1.46 [0.85,2.53]	**2.96 [1.99,4.41]**	**0.31 [0.11,0.91]**	1.18 [0.77,1.81]
Abused	0.76 [0.57,1.00]	**1.70 [1.05,2.77]**	**2.41 [1.71,3.39]**	1.03 [0.60,1.76]	1.11 [0.78,1.58]
In care					
Males	**2.31 [1.33,4.00]**	1.96 [0.88,4.40]	**2.74 [1.58,4.75]**	1.24 [0.46,3.38]	0.66 [0.14,3.02]
Females	0.76 [0.52,1.10]	1.91 [0.80,4.58]	1.63 [0.94,2.80]	0.48 [0.12,1.96]	1.32 [0.80,2.17]
Parent divorce	0.92 [0.75,1.12]	0.92 [0.57,1.49]	**1.40 [1.04,1.88]**	**0.53 [0.32,0.90]**	0.90 [0.67,1.22]
Paternal absence	0.95 [0.79,1.13]	0.89 [0.60,1.34]	**1.60 [1.24,2.06]**	0.81 [0.53,1.24]	0.89 [0.69,1.16]
Maternal absence	0.94 [0.72,1.23]	0.90 [0.49,1.65]	1.41 [0.97,2.05]	0.58 [0.30,1.13]	0.82 [0.54,1.23]
Illness in home					
Males	1.17 [0.80,1.71]	1.01 [0.59,1.73]	**2.35 [1.63,3.39]**	0.95 [0.53,1.71]	1.09 [0.59,2.02]
Females	0.88 [0.70,1.11]	1.02 [0.52,2.00]	1.27 [0.84,1.94]	0.87 [0.50,1.52]	0.93 [0.68,1.26]
Cumulative adversity[a]					
Males:					
1	1.05 [0.75, 1.47]	1.08 [0.67, 1.75]	**2.09 [1.37, 3.20]**	0.69 [0.39, 1.20]	1.38 [0.78,2.41]
2 or more	1.37 [0.81, 2.32]	1.40 [0.69, 2.84]	**4.26 [2.59, 7.01]**	0.74 [0.28, 1.93]	1.46 [0.65,3.26]
Females:					
1	0.89 [0.73, 1.08]	1.57 [0.91, 2.69]	**1.83 [1.26, 2.66]**	0.65 [0.38, 1.11]	0.99 [0.76,1.28]
2 or more	0.73 [0.53, 1.01]	1.60 [0.69, 3.72]	**2.99 [1.91, 4.68]**	0.50 [0.21, 1.22]	0.95 [0.61,1.49]
Freq. of manual SC[b]					
Once	0.92 [0.72,1.17]	0.91 [0.47,1.76]	1.05 [0.58,1.88]	0.86 [0.52,1.41]	0.97 [0.68,1.39]
Twice	0.85 [0.64,1.12]	1.61 [0.85,3.06]	1.69 [0.99,2.87]	0.90 [0.52,1.57]	0.95 [0.63,1.43]
Three times	0.90 [0.72,1.12]	1.51 [0.88,2.58]	**1.69 [1.08,2.66]**	0.75 [0.47,1.19]	0.84 [0.60,1.19]
Four times	**0.82 [0.70,0.95]**	**1.57 [1.07,2.31]**	**2.58 [1.83,3.62]**	0.77 [0.57,1.04]	0.97 [0.78,1.22]

Notes:

1. *Outcome reference group: Full-time employment*
2. *Exposure reference groups: [a]No adversities; [b]Never in manual social class*
3. *Adjusted for gender (where analyses are not stratified by gender in cases where there was a significant interaction observed) and childhood mental health.*
4. *RRRs in bold indicate statistical significance at p<0.05 level*
5.