



Research paper

A lifecourse approach in examining the association between accumulation of adversity and mental health in older adulthood

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ABSTRACT

Background: There is evidence for a cumulative effect of adversities on mental health, however, less is known on the accumulating duration of exposure to adversity across the lifecourse on mental health in older adults.

Methods: Using data from the 1946 British birth cohort study ($N = 2745$), we examined associations between the accumulation of adversity (birth–63 years) and mental health (emotional symptom, life satisfaction, affective wellbeing) in older adults (63–69 years). Accumulation of adversity was assessed as the number of adversities and duration of exposure (number of lifecourse stages exposed to any, economic, psychosocial, or physical adversity). Linear regression tested their association with mental health, adjusted for sex, childhood cognition and emotional problems, and educational attainment.

Results: Increased number of adversities was associated with increased emotional symptoms ($\beta = 0.08$ [0.06, 0.10]), decreased life satisfaction ($\beta = -0.14$ [−0.16, −0.12]) and decreased affective wellbeing ($\beta = -0.08$ [−0.10, −0.06]). Each additional duration of exposure was associated with a 0.38 [0.12, 0.65] standard deviation (SD) increase in emotional symptoms, and a −0.68 [−0.96, −0.39] and −0.43 SD [−0.68, −0.18] decrease in life satisfaction and affective wellbeing, respectively. Life satisfaction showed stronger associations with economic and psychosocial compared to physical adversity.

Limitations: Some limitations include selective drop-out and lack of ethnic diversity.

Conclusions: Efforts to improve mental health in older adults should focus on reducing the number of adversities, as well as considering previous exposure across different lifecourse stages, to prevent adversities from becoming chronic. Future research should also consider the clustering and co-occurrence of different adversities across the lifecourse.

1. Introduction

Successful mental ageing is commonly defined as the absence of disease and disability, as well as the presence of positive subjective wellbeing (Flicker et al., 2006). Research on the emotional aspect of mental ageing – mental health – has most commonly focused on emotional symptoms or disorders (Almeida et al., 2006; Peel et al., 2004), although some studies have also included subjective wellbeing such as life satisfaction (Peel et al., 2004). There is increasing evidence that emotional symptoms and subjective wellbeing are not simply

opposites of the same construct (Keyes, 2005; Westerhof and Keyes, 2010) and may be associated with different physical and social functioning outcomes, as well as predicted by different individual and environmental factors (Hatch et al., 2010; Patalay and Fitzsimons, 2018; Westerhof and Keyes, 2010). Both are important components of mental health and may be differentially affected by risk exposures across the lifecourse.

There is some evidence for a cumulative effect of risk exposures across the lifecourse on mental health outcomes in adulthood and later life. This has been termed the accumulation model in lifecourse

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epidemiology, which predicts that multiple and persistent exposure to adversity – cross-sectionally and longitudinally – can lead to physiological wear and tear, cumulating in pathology in later life (Berens et al., 2017; Blane et al., 2007; McEwen, 2002; McEwen and Rasgon, 2018; Power et al., 2013). Early evidence for the model came from the 1946 British birth cohort study, which found an accumulation of risk in childhood and adolescence on respiratory disease in adulthood (Mann et al., 1992). Studies investigating the accumulation model in relation to mental health outcomes often used a cumulative adversity index to calculate the number of adverse events, with consistent findings of a dose-response association between the number of adversities experienced and increased emotional symptoms or disorders (Copeland et al., 2018; Hatch et al., 2009; Hughes et al., 2017; Künzi et al., 2022; McKay et al., 2021; Schilling et al., 2008; Shrira, 2012; Turner and Lloyd, 1995) and decreased subjective wellbeing in adulthood (Keinan et al., 2012; Shrira, 2012). There is also some evidence that chronic exposure to the same adversity (i.e. psychosocial adversity) across adulthood is associated in a dose-response manner with loneliness in older age (Ejlskov et al., 2020), suggesting the importance of considering both the number of adversities and duration of exposure (i.e. how long people have been exposed to adversity).

Although a cumulative index has been widely used in the literature, this is often derived at one stage of the lifecourse such as childhood (Hughes et al., 2017; McKay et al., 2021; Schilling et al., 2008) or adulthood (Keinan et al., 2012; Shrira, 2012), or relied on retrospective measures (Schilling et al., 2008; Turner and Lloyd, 1995). Furthermore, both the number of adversities and the duration of exposure can have a detrimental impact on health in later life (Power et al., 2013), although the latter has rarely been investigated in the literature. Chronic exposure to adversity is hypothesised to affect health due to the persistent nature of the adversity and the associated stress which can continually wear down individuals' coping and functioning over time (Pearlin, 1999). Specific types of adversity, such as economic (e.g., financial difficulties), psychosocial (e.g., relationship difficulties) and physical adversity (e.g., illness), are often incorporated within a cumulative adversity index (Hatch et al., 2009; Keinan et al., 2012; Schilling et al., 2008; Shrira, 2012) but rarely tracked across the lifecourse to investigate the duration of exposure in relation to mental health. Furthermore, it remains to be seen whether similar dose-response associations can be found from chronic exposure to any type of adversity, as well as to the same domain of adversity from childhood to adulthood.

1.1. Current research

The overall aim of this study was to comprehensively assess the association between the accumulation of adversity (both the number of adversities and the duration of exposure) across the lifecourse and mental health in older adults, including both emotional symptoms and subjective wellbeing, consistent with the dual-continua model of mental health (Keyes, 2005; Westerhof and Keyes, 2010). We investigated this using the 1946 British birth cohort, which as the oldest British birth cohort allowed the examination of a wide range of adversities spanning four stages of the lifecourse (childhood, young, mid-, late adulthood) in the same individuals.

Three research questions were proposed. First, we examined whether experiencing a greater number of adversities across the lifecourse – using a cumulative adversity index – was associated with poorer mental health in older adults. Second, we grouped adversities by their corresponding lifecourse stage to count the number of lifecourse stages where any adversity was experienced (duration of exposure) and examined its association with mental health. Third, to test for possible specificity in the type of adversity experienced, we examined the duration of exposure to each domain of adversity (economic, psychosocial, physical) separately.

2. Methods

2.1. Sample

The MRC National Survey of Health and Development (NSHD; the British 1946 birth cohort) originally consisted of 5362 male and female singleton births within marriage in England, Wales and Scotland in one week of March 1946 (<http://www.nshd.mrc.ac.uk/nshd>). The latest follow-up period considered in this study was at 68–69 years (2014–2015), where 2816 individuals who were still alive and had a known current address in mainland Britain were invited to complete a postal questionnaire (Kuh et al., 2016). A home visit was also arranged when participants were 69 years (Kuh et al., 2016). Those who participated were more likely to be in non-manual occupations, have higher educational attainment and childhood cognitive ability than non-responders (Kuh et al., 2016). Ethical approval has been obtained from the Greater Manchester Local Research Ethics Committee and the Scotland Research Ethics Committee, and participants provided written informed consent at each data collection. The analytical samples included in this study were those who completed at least one mental health assessment (emotional symptoms, affective wellbeing, life satisfaction) (Fig. 1).

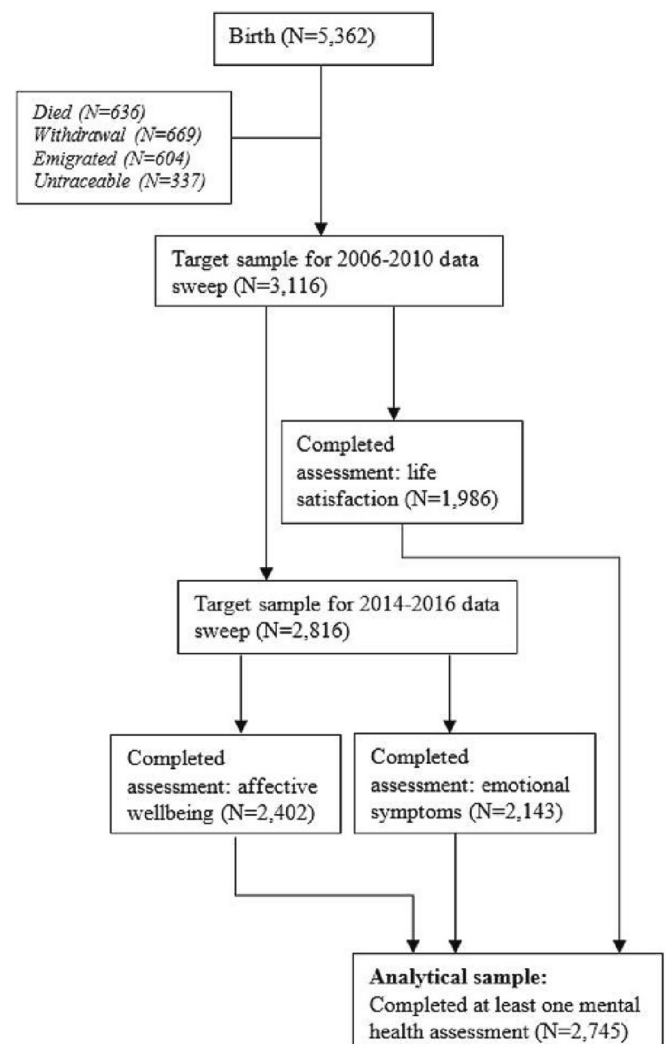


Fig. 1. Sample flow chart.

2.2. Measures

2.2.1. Indicators of adversity

Measures broadly corresponding to economic, psychosocial and physical adversities were identified from four lifecourse stages: childhood (birth–16 years), young adulthood (20–36 years), mid-adulthood (43–53 years) and late adulthood (63 years). A total of 18 different measures (each coded as binary representing presence or absence) were identified and are described below as well as in supplementary materials (Table S1).

2.2.1.1. Economic adversity. 1. Overcrowding: >2 people per room (childhood and young adulthood). 2. Missing household amenities: no sole use of kitchen or bathroom (childhood and young adulthood), no running hot water (childhood, young and mid-adulthood), or a lack of central heating or any damp in the property (mid-adulthood). 3. Lower paternal occupational status: father being in unskilled profession or were unemployed in childhood. 4. Financial hardships: going without things needed due to a shortage of money or having difficulty managing on current income (young, mid- and late adulthood), or being unable to pay bills (mid- and late-adulthood). 5. Unemployment: based on current occupation (young adulthood). 6. Work-related crisis: any work disappointment or crisis (young, mid- and late-adulthood), or having lost or feared losing employment (mid- and late adulthood) in the last 12 months.

2.2.1.2. Psychosocial adversity. 7. Separation from mother: for ≥ 28 days up to 6 years of age in childhood, for reasons other than hospitalisation due to serious illness. 8. Affectionless control parenting: low maternal care and high overprotectiveness in childhood, retrospectively reported at age 43 using the Parent Bonding Instrument (Parker et al., 1979). 9. Childhood maltreatment: any maltreatment retrospectively reported at age 43. 10. Parental divorce: reported in childhood before 16 years. 11. Negative peer relationships: not making friends easily or not popular with other children, as rated by the teacher in childhood. 12. Social isolation: never or rarely see friends and family (young, mid- and late-adulthood), or never have people to visit (mid- and late adulthood). 13. Lack of social support: no family or friends to talk to or no one to help during crisis (mid- and late-adulthood). 14. Loss of contact with friends or family: in the last 12 months (mid- and late adulthood). 15. Difficulties with own children: in the last 12 months (mid- and late adulthood). 16. Divorce or separation from partner: based on current marital status in young, mid- and late adulthood.

2.2.1.3. Physical adversity. 17. Any serious illness or disability: requiring periods of hospitalisation (childhood and young adulthood), or new onset in the last 12 months (mid- and late adulthood). 18. Any accident or injury: which affected them for >1 month in the last 12 months (mid- and late adulthood).

2.2.2. Mental health

2.2.2.1. Emotional symptoms (69 years). Emotional symptoms at 69 years were assessed using the 28-item General Health Questionnaire (GHQ-28) (Goldberg and Hillier, 1979). This is self-administered and covers four domains: somatic symptoms, anxiety and insomnia, social dysfunction and severe depression (Goldberg and Hillier, 1979). Each item was rated by participants on a 4-point Likert scale, ranging from 0 (not at all) to 3 (much more than usual). Those with 6 or fewer missing items had their missing score imputed using the mean scores from completed items. A summary score was calculated, ranging from 0 to 84, with higher scores indicating more symptoms.

2.2.2.2. Subjective wellbeing

2.2.2.2.1. Life satisfaction: (63 years). The Satisfaction with Life

Scale (SWLS) measures global satisfaction with one's life (Diener et al., 1985). It contains 5 items, each assessed on a 7-point Likert scale ranging from 1 (strongly agree) to 7 (strongly disagree) and reverse coded so higher scores indicate higher satisfaction. A summary score was calculated, ranging between 5 (low) and 35 (high).

2.2.2.2.2. Affective wellbeing (69 years). The Warwick Edinburgh Mental Wellbeing Scale (WEMWBS) measures hedonic (enjoyment, pleasure) and eudaimonic (meaning, purpose) aspects of wellbeing, and consist of 14 statements on thoughts and feelings over the past 2 weeks (Tennant et al., 2007). Each statement is rated on a 5-point Likert scale ranging from 1 (none of the time) to 5 (all the time). Those with 3 or fewer missing items had their scores imputed using the mean scores from completed items, which has been shown before not to affect the validity of the scale (Stewart-Brown and Janmohamed, 2008; Wood et al., 2021). A summary score was calculated, ranging from 14 (low) to 70 (high).

2.2.3. Covariates

The following covariates were included: sex at birth (with male as the reference group); cognition at 8 years (derived from 4 tests of verbal and nonverbal ability (Pigeon, 1964), standardised to the population), given that cognition and mental health are intertwined across the lifecourse (Hatch et al., 2007; Labouvie-Vief et al., 2010); emotional problems at 13 to 15 years rated by the teacher, to test for possible reverse directionality; and highest educational attainment by 26 years, categorised into ordinary ('O' level or equivalent) or below, and advanced ('A' level or equivalent) or above, with the latter as the reference group.

2.3. Statistical analysis

Statistical analyses were performed in R 3.6.2. Two accumulation models – one testing the number of adversities and one the duration of exposure – were specified for each mental health outcome, with unadjusted estimates reported first followed by estimates adjusted for all covariates.

2.3.1. Primary analyses

2.3.1.1. Model 1: Number of adversities. A cumulative adversity index was derived to count the total number of adversities experienced across the lifecourse (birth–63 years), which ranged from 0 to 18. In order to reduce the effect of outliers, the index was winsorized at the 5th (score of 1) and 95th (score of 8) percentile, which is a common method for mitigating the effect of outliers in the literature (Ghosh and Vogt, 2012; Nyitrai and Virág, 2019; Yang and Berdine, 2016). The final index thus ranged between 1 (0–1 adversity) and 8 (8+ adversities), and linear regression models examined its association with each mental health outcome.

2.3.1.2. Model 2: Duration of exposure. Second, we grouped adversities by their corresponding lifecourse stage (childhood, young, mid-, late adulthood) and counted the number of lifecourse stages where any adversity was experienced, which ranged from 0 (no exposure) to 4 (exposed to any adversity across all 4 lifecourse stages). Using linear regression models, the duration of exposure was treated as an ordered variable and tested for linear trend with each mental health outcome. We further examined this as a categorical variable and compared each level of exposure to the reference group (no exposure) to investigate possible non-linear effects.

2.3.1.3. Specificity of adversity. We separately derived measures on the duration of exposure to each domain of adversity (economic, psychosocial, physical) across the lifecourse (range 0–4). Due to the small proportion (<1 %) of study members who scored 4 on physical adversity, this was combined with the previous group, thus the duration of

exposure to physical adversity ranged from 0 (no exposure) to 3 (exposed to physical adversity at least 3 times).

2.4. Sensitivity analyses

Both accumulation models (number of adversities and duration of exposure) were repeated using a sub-sample of participants who had complete data on all three mental health outcomes to check the robustness of findings.

2.4.1. Additional exploratory analyses

To investigate whether the effect of the number of adversities and duration of exposure on mental health were independent of each other, we additionally included both measures in the same regression model, controlling for all covariates. An interaction term between them was also specified to examine possible multiplicative effects.

2.4.2. Missing data

Missing data was handled using multivariable imputation by chained equations (MICE) in R (Buuren and Groothuis-oudshoorn, 2011), with 20 imputed datasets generated. Individual indicators of adversity across each lifecourse stage were included as auxiliary variables, along with all covariates and mental health outcomes. Any derived adversity variables used in the analyses were constructed post imputation. The proportion of missing data on for each indicator of adversity ranged from 0.1 % to 14.61 % (supplementary materials, Table S1). Imputation was performed up to the maximum sample size available for each mental health outcome, and estimates were combined and pooled post-imputation together using Rubin's rule (Buuren and Groothuis-oudshoorn, 2011).

3. Results

3.1. Sample characteristic

A total of 2745 study members had completed assessments on at least one mental health measure (emotional symptoms: $N = 2143$; life satisfaction: $N = 1986$; affective wellbeing: $N = 2402$). Correlations between the three mental health outcomes were small to moderate, with the largest between emotional symptoms and affective wellbeing ($r = -0.44$) (supplementary materials, Table S2). Table 1 shows a description of the sample. The most frequently reported adversity was missing household amenities (64 %), followed by financial hardships (40 %) and work-related crisis (37.5 %). Across the lifecourse, 3.4 % of study members were not exposed to any adversity, and 20.1 % were chronically exposed to any type of adversity across all four lifecourse stages (Table 1).

3.2. Primary analyses

3.2.1. Model 1: Number of adversities

Experiencing a greater number of adversities (scoring higher on the cumulative adversity index) was associated with higher scores on emotional symptoms and lower scores on life satisfaction and affective wellbeing in older adults. For each additional adversity experienced across the lifecourse, there was on average a 0.09 standard deviation (SD) increase in emotional symptoms (roughly corresponding with a 0.7-point increase on GHQ-28), a 0.14 SD decrease in life satisfaction (0.8-point decrease on SWLS) and a 0.09 SD decrease in affective wellbeing (0.7-point decrease on WEMWBS) (Table 2). Effect sizes remained unchanged even after adjusting for covariates in the model.

3.2.2. Model 2: duration of exposure

A linear trend was found between the duration of exposure to any adversity across the lifecourse and increased emotional symptoms, decreased life satisfaction and decreased affective wellbeing in older adulthood (Table 2, Fig. 2). On average, each additional duration of

Table 1
Sample characteristics ($N = 2745$).

	N (%)
Indicators of adversity	
Overcrowding	528 (19.3)
Missing household amenities	1748 (64.0)
Paternal occupational status	224 (9.3)
Financial hardships	1065 (40.0)
Unemployment	504 (20.8)
Work-related crisis	999 (37.5)
Separation from mother	118 (4.8)
Affectionless control parenting	708 (30.2)
Maltreatment	142 (6.0)
Parental divorce	161 (5.9)
Negative peer relationships	167 (6.8)
Social isolation	881 (33.0)
Lack of social support	279 (10.5)
Loss of contact with friends or family	433 (16.4)
Difficulties with own children	801 (33.2)
Divorce/separation from partner	540 (19.8)
Any serious illness or disability	927 (33.8)
Any accident or injury	502 (19.0)
Derived measures on the accumulation of adversity	
Cumulative adversity index (M; SD)	3.91 (2.09)
Duration of exposure to any adversity across the lifecourse	
0 (No exposure)	92 (3.4)
1 (Once)	357 (13.0)
2 (Twice)	751 (27.4)
3 (Three times)	994 (36.2)
4 (Four times)	551 (20.1)
Duration of exposure to any economic adversity across the lifecourse	
0 (No exposure)	329 (12.0)
1 (Once)	832 (30.3)
2 (Twice)	937 (34.1)
3 (Three times)	520 (18.9)
4 (Four times)	127 (4.6)
Duration of exposure to any psychosocial adversity across the lifecourse	
0 (No exposure)	634 (23.1)
1 (Once)	898 (32.7)
2 (Twice)	753 (27.4)
3 (Three times)	366 (13.3)
4 (Four times)	94 (3.4)
Duration of exposure to any physical adversity across the lifecourse	
0 (No exposure)	1535 (55.9)
1 (Once)	884 (32.2)
2 (Twice)	272 (9.9)
3+ (Three or four times)	54 (2.0)
Covariates	
Sex (Female)	1408 (51.3)
Educational attainment (26 years; O-levels or below)	1589 (61.4)
Childhood emotional problems (13–15 years)	
0 (Absent)	1261 (51.6)
1 (Mild)	918 (37.6)
2 (Severe)	264 (10.8)
Mental health	
Emotional symptoms (GHQ-28, max = 84; $N = 2143$) (M; SD)	15.19; 7.90
Life satisfaction (SWLS, max = 35, $N = 1986$) (M; SD)	26.69; 6.00
Affective wellbeing (WEMWBS, max = 70; $N = 2402$) (M; SD)	53.24; 8.33

exposure to any adversity was associated with a 0.4 SD increase in emotional symptoms (3-point increase on GHQ-28), a 0.7 SD decrease in life satisfaction (4-point decrease on SWLS), and a 0.5 SD decrease in affective wellbeing (4-point decrease on WEMWBS). These effect sizes remained of similar magnitudes even after adjusting for all covariates.

When duration of exposure was examined as a categorical variable, compared to those who were never exposed, those who were chronically exposed (exposed to any adversity across all four lifecourse stages) showed the largest difference on mental health, particularly for life

Table 2

Linear regression models examining the association between the accumulation of adversity (number of adversities and duration of exposure) across the lifecourse and mental health in older adults.

	Emotional symptoms		Life satisfaction		Affective wellbeing	
	β [95%CI]	<i>p</i> -Value	β [95%CI]	<i>p</i> -Value	β [95%CI]	<i>p</i> -Value
Number of adversities (cumulative adversity index)						
Unadjusted	0.09 [0.07; 0.12]	<0.001	-0.14 [-0.16; -0.12]	<0.001	-0.09 [-0.11; -0.07]	<0.001
Adjusted	0.08 [0.06; 0.10]	<0.001	-0.14 [-0.16; -0.12]	<0.001	-0.08 [-0.10; -0.06]	<0.001
Duration of exposure to any adversity across the lifecourse						
Unadjusted [Linear trend]	0.43 [0.17; 0.69]	0.001	-0.66 [-0.95; -0.38]	<0.001	-0.46 [-0.71; -0.21]	<0.001
Adjusted [Linear trend]	0.38 [0.12; 0.65]	0.004	-0.68 [-0.96; -0.39]	<0.001	-0.43 [-0.68; -0.18]	0.001
[Reference: None]						
Once	-0.05 [-0.47; 0.38]	0.827	-0.04 [-0.50; 0.43]	0.878	-0.07 [-0.47; 0.33]	0.724
Twice	0.13 [-0.28; 0.53]	0.545	-0.25 [-0.70; 0.20]	0.274	-0.27 [-0.65; 0.12]	0.174
Three times	0.26 [-0.15; 0.68]	0.207	-0.48 [-0.93; -0.03]	0.038	-0.34 [-0.73; 0.05]	0.087
Four times	0.45 [0.05; 0.86]	0.029	-0.84 [-1.29; -0.40]	<0.001	-0.55 [-0.94; -0.15]	0.007

Adjusted for sex, childhood cognition, childhood emotional problems, and educational attainment at 26 years.

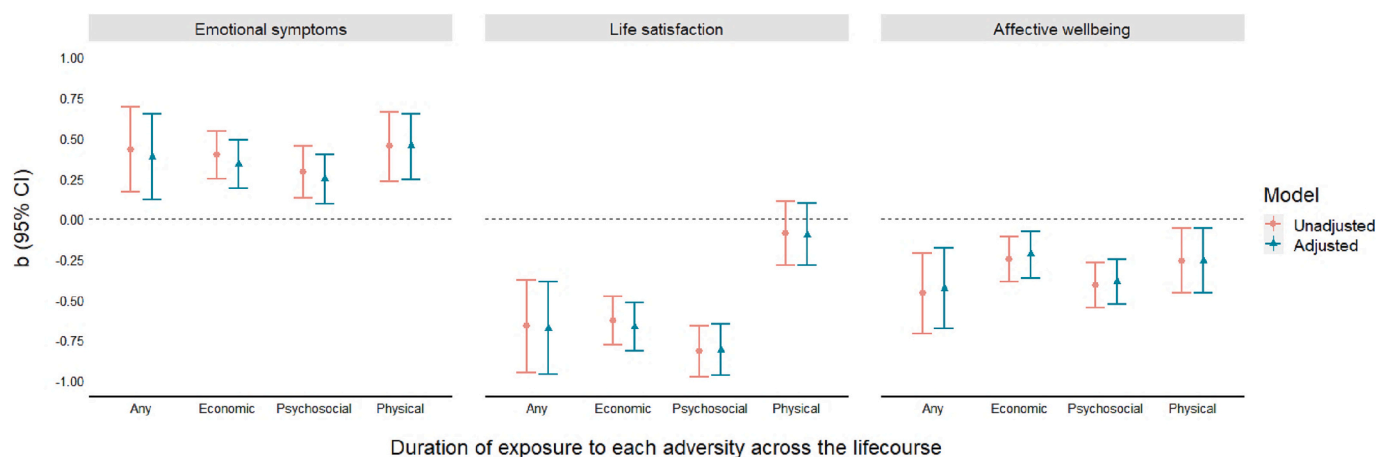


Fig. 2. Standardised effect sizes showing the linear dose-response associations between duration of exposure to each adversity (any, economic, psychosocial, physical) across the lifecourse and mental health outcomes in older adults.

satisfaction, with on average a 0.8 SD (5-point) decrease on the life satisfaction scale (SWLS) at 63 years (Table 2).

3.3. Specificity of adversity

Linear dose-response associations were found between the duration of exposure to each domain of adversity (economic, psychosocial, physical) and increased emotional symptoms as well as decreased affective wellbeing at 69 years (Fig. 2; supplementary materials, Table S3). However, only economic ($\beta = -0.67 [-0.82, -0.52]$) and psychosocial adversity ($\beta = -0.81 [-0.97, -0.65]$), but not physical adversity, were associated with life satisfaction, corresponding to a 4- to 5-point decrease on life satisfaction, respectively (Fig. 2). Physical adversity was only associated with emotional symptoms and affective wellbeing; each additional duration of exposure was associated with a 0.5 [0.24, 0.65] SD increase in emotional symptoms and a -0.3 [-0.46, -0.06] SD decrease in affective wellbeing (Fig. 2, supplementary materials, Table S3).

3.4. Sensitivity analyses

Steps from primary analyses were repeated in those with complete data on all three mental health outcomes ($N = 1548$). Findings remained similar although with some reduced effect sizes due to the smaller sample size (supplementary materials, Table S4).

3.4.1. Additional exploratory analyses

When both the number of adversities and duration of exposure were

included in the same regression model, only experiencing a greater number of adversities was associated with each mental health outcome, with some reduced effect sizes (Table 3). The dose-response effect of the duration of exposure was completely attenuated, and those who experienced adversity more frequently across the lifecourse were also more likely on average to experience a greater number of different adversities (supplementary materials, Table S5). No interactions were found between them (tested at $p < 0.10$; Table 3).

4. Discussion

Altogether, findings from this study suggest that experiencing a greater number of adversities as well as chronically experiencing any form of adversity consistently across the lifecourse, are both associated with mental health difficulties in older adults. Further investigation revealed stronger associations from chronic (exposed all four times) rather than intermittent (once or twice) exposure. Stronger associations were also found from economic and psychosocial adversity to life satisfaction, suggesting some specificity in the association between lifecourse accumulation of adversity and different components of mental health (emotional symptoms and subjective wellbeing).

Consistent with previous research which has largely focused on using a cumulative adversity index to capture the number of adversities experienced, we first sought to replicate this by deriving a similar index using mostly prospective measures of adversity spanning over six decades. Similar dose-response associations were found between the number of adversities experienced and increased mental health difficulties in older adults (Hatch et al., 2009; Hughes et al., 2017; Keinan

Table 3

Additional exploratory analyses: linear regression models examining the accumulation of adversity (number of adversities and duration of exposure, adjusted for each other, with added interaction between them) and mental health in older adults.

	Emotional symptoms		Life satisfaction		Affective wellbeing	
	β [95%CI]	<i>p</i> -Value	β [95%CI]	<i>p</i> -Value	β [95%CI]	<i>p</i> -Value
Number of adversities (cumulative adversity index)	0.06 (0.03, 0.09)	<0.001	-0.10 (-0.13, -0.07)	<0.001	-0.06 (-0.09, -0.03)	<0.001
Duration of exposure to any adversity across the lifecourse	0.14 (-0.14, 0.44)	0.329	-0.26 (-0.57, 0.05)	0.106	-0.17 (-0.45, 0.11)	0.227
Interaction	0.09 (-0.51, 0.70)	0.763	-0.08 (-0.62, 0.46)	0.777	-0.06 (-0.61, 0.49)	0.826

Adjusted for sex, childhood cognition, childhood emotional problems, and educational attainment at 26 years.

et al., 2012; Schilling et al., 2008; Shrira, 2012; Turner and Lloyd, 1995), where for every increased number of adversities experienced, there was on average a 0.7-point increase on scores on emotional symptoms, and a 0.7- to 0.8-point decrease on subjective wellbeing scores. This offers further support for the accumulation model, which remains one of the most tested and supported models in lifecourse epidemiology (Blane et al., 2007; Kuh et al., 2003).

However, the use of a cumulative adversity index only allows the examination of the number of adversities experienced, without taking into account the duration of exposure across different lifecourse stages (Blane et al., 2007; Power et al., 2013), especially as many indicators of adversity were assessed over multiple decades. There was therefore an opportunity to expand on existing research by additionally measuring the duration of exposure to adversity across the lifecourse. Moderately strong dose-response associations were found for each mental health outcome in older adults: for every additional lifecourse stage where any adversity was experienced, study members on average scored 3-point higher on emotional symptoms, and 4-point lower on life satisfaction and affective wellbeing, with the strongest associations found from chronic exposure (exposed 3 or 4 times across the lifecourse). This is consistent with one study which showed that chronic exposure to the same adversity (e.g., psychosocial) across adulthood is associated with loneliness (Ejlskov et al., 2020), and extends this by being the first study to our knowledge to show the dose-response effect of duration of exposure to both any type of adversity, as well as to each specific type of adversity (economic, psychosocial, physical), on both emotional symptoms and subjective wellbeing in older adults.

Consistent with the conceptual framework of the accumulation model, any adversity – whether independent of each other or being of the same type – if persistently experienced across the lifecourse, can gradually accumulate and damage biological systems, leading to adverse functioning in later life (Kuh et al., 2003). Different adversities may also be correlated or clustered with each other, with exposure to one increasing the likelihood of being exposed to another (Rutter, 1995, 1999). Indeed, when both the number of adversities and duration of exposure were included in the same model, the cumulative effect of the duration of exposure to any adversity was weakened, which may be explained by those who chronically experienced adversity also being more likely to experience a greater number of different adversities. Although the clustering of different adversities was not examined in the current study, nonetheless, these findings point to the importance of accounting for a history of adversities (related or independent) across different lifecourse stages, on top of considering the total number of adversities within the same lifecourse stage. Reducing the number of different adversities experienced, as well as preventing further exposure to adversity among those who already experienced some type of adversity at previous lifecourse stages, may both show a small to moderate improvement in mental health in older adults.

There is increasing evidence for the dual-continua of mental health, which consists of both the absence of emotional symptoms and the presence of subjective wellbeing, and although related, they represent separate constructs with unique predictors and outcomes (Hatch et al., 2010; Patalay and Fitzsimons, 2018; Westerhof and Keyes, 2010). Although emotional symptoms and affective wellbeing showed similar findings in the current study, this may be attributed to the overlap in the

underlying construct of these measures (GHQ-28 and WEMWBS) (Böhne and Croudace, 2016). However, some differences were found for life satisfaction, which is a cognitive (rather than affective) evaluation of global satisfaction with one's life (Diener et al., 1985). While no association was found between increased exposure to physical adversity across the lifecourse and life satisfaction, both economic and psychosocial adversity showed the strongest associations with life satisfaction compared to other mental health outcomes. This is also consistent with some research showing a weaker effect of physical health on life satisfaction (Puvill et al., 2016) but a stronger effect on emotional symptoms (Loren et al., 2017). Findings here further expand on these by showing that chronic experiences of physical illness or disability may affect emotional aspects of mental health more than the cognitive-judgemental process of how well one's life is going, suggesting differential effects of adversity on mental health. Given that research on the two-continua model of mental health identified a proportion of people who scored high on life satisfaction but also showed clinically significant emotional symptoms (Keyes, 2007; Pavot and Diener, 2008; Renshaw and Cohen, 2014; Westerhof and Keyes, 2010), future research should routinely assess both aspects of mental health to identify similar and unique contributors, in order to improve mental health in older adults.

4.1. Strengths and limitations

A key strength of this study lies in the use of the oldest British birth cohort study that has followed the lives of the same individuals for 70 years. This allowed us to look across multiple lifecourse stages from childhood to late adulthood, which is often not investigated in the literature. Measures of adversity were mostly prospective, which is an advantage as many studies to date have relied on retrospective assessments (Künzi et al., 2022; Schilling et al., 2008; Turner and Lloyd, 1995). Given the large number of data collected over time, we were able to examine both the duration of exposure to any adversity, as well as to three domains of adversity (economic, psychosocial, physical) within the same study. The assessment of both emotional symptoms and subjective wellbeing (which additionally included two measures) also allowed a holistic examination of mental health in older adults.

There are also some limitations: first, certain indicators of adversities may be experienced differently across different lifecourse stages. For example, economic adversity in childhood such as missing household amenities were relatively common in the current cohort, given they were born during a period of significant economic changes in a post-war Britain (Short, 2021). However, as conditions improved over time, those who still experienced economic adversity may now find themselves in the minority and experience more stigma (Patel et al., 2018). These different experiences of the same adversity may therefore not be accurately captured using a cumulative adversity index alone. Second, caution is needed to interpret the larger effect sizes found for life satisfaction, as this was assessed at 63 instead of 69 years. The stronger effect sizes found may therefore reflect a recency effect, where proximal exposures have a larger effect on an outcome than distal exposures (Shanahan et al., 2011). Third, there is a lack of ethnic diversity in this cohort. Recent research using more ethnically representative populations found that those from ethnic minority backgrounds were more likely to experience chronic adversity (Adjei et al., 2022), and further

research is needed on whether they may also be disproportionately affected by the accumulation of adversity across the lifecourse. Fourth, although we investigated both the number of adversities and duration of exposure to adversity, we did not examine whether those chronically exposed to adversity were also more likely to experience certain combinations of adversity. Different types of adversity may form a “chain of risk”, where prior exposure to certain types of adversity may increase the likelihood of experiencing another in the future (Rutter, 1995, 1999), or proliferate into chronic adversities (Pearlin et al., 1997). Given that in the current study, those who chronically experienced adversity were also more likely to experience a greater number of different adversities, further research is needed on the co-occurrence and clustering of adversity across the lifecourse to better understand specific pathways to mental health in older adults.

5. Conclusion

Experiencing a greater number of adversities as well as chronically experiencing any adversity across the lifecourse are both associated with mental health difficulties (increased emotional symptoms, decreased life satisfaction, and decreased affective wellbeing) in older adults. While certain types of adversity (i.e., physical adversity) appeared to be strongly associated with emotional symptoms, others (i.e., economic, psychosocial adversity) are implicated across all mental health outcomes, with particularly strong effects on the cognitive evaluation of life satisfaction. Efforts to improve mental health should therefore adopt a lifecourse approach by considering prior exposure to adversity across previous lifecourse stages, to prevent past experiences of adversity from becoming chronic, as well as to consider the differential effect of specific types of adversity on emotional symptoms and wellbeing. Disentangling the processes and mechanisms involved in the association between lifecourse adversity and mental health remains a challenge, and future research should account for the clustering of adversities at the same time and across time – for example, by investigating whether those chronically experiencing adversity were also more likely to experience certain types of adversity – to identify complex exposures and risk chains across different lifecourse stages.

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CRedit authorship contribution statement

Yiwen Liu: Conceptualization, Methodology, Formal analysis, Writing – original draft, Writing – review & editing. **Stephani L. Hatch:** Conceptualization, Methodology, Writing – review & editing. **Praveetha Patalay:** Methodology, Writing – review & editing. **Jonathan M. Schott:** Funding acquisition, Writing – review & editing. **Marcus Richards:** Conceptualization, Methodology, Funding acquisition, Writing – review & editing.

Declaration of competing interest

None

Data availability

The data that support the findings of this study are available to bona fide researchers upon request to the NSHD Data Sharing Committee. For more information see: <http://www.nshd.mrc.ac.uk/data>.

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Appendix A. Supplementary data

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