

1 **Abstract**

2 Promoting quality of life (QoL) in later life is an important policy goal. However,  
3 studies using prospective data to explore the mechanisms by which earlier events  
4 influence QoL in older age are lacking. This study is the first to use prospective data  
5 to investigate pathways by which a range of measures of life-course socioeconomic  
6 status contribute to later-life QoL. The study uses data from the Newcastle Thousand  
7 Families Study cohort ( $N=1,142$ ), an early 'baby-boom' birth cohort born in 1947 in  
8 Newcastle upon Tyne, an industrial city in north-east England. Using prospective  
9 survey data collected between birth and later adulthood ( $N=393$ ), a path analysis  
10 investigated the effects and relative contributions of a range of life-course  
11 socioeconomic factors to QoL at age 62-64 measured using the CASP-19 scale.  
12 Strong positive effects on later-life QoL were found for advantaged occupational  
13 status in mid-life and better self-reported health, employment and mortgage-freedom  
14 in later adulthood. Significant positive indirect effects on QoL were found from social  
15 class at birth and achieved education level, mediated through later-life  
16 socioeconomic advantage. Experiencing no adverse events by age five had a large  
17 total positive effect on QoL at age 62-64, comprising a direct effect and indirect  
18 effects, mediated through education, mid-life social class and later-life self-reported  
19 health. Results support a pathway model with the effects of factors in earlier life  
20 acting via later-life factors, and an accumulation model with earlier-life factors having  
21 large total, cumulative effects on later-life QoL. The presence of a direct effect of  
22 adverse childhood events by age five on QoL suggests a 'critical period' and  
23 indicates that policies across the life-course are needed to promote later-life QoL,  
24 with policies directed towards older adults perhaps too late to 'undo the damage' of  
25 earlier adverse events.

26 **Key words:** UK; subjective wellbeing; quality of life; prospective data; life-course;  
27 socioeconomic status; later life; pathways

28

## 29 **Introduction**

30 This study is, as far as the authors are aware, the first to use prospective data to  
31 investigate the effects of socioeconomic status across the life-course on later-life  
32 quality of life (QoL). This study uses data from a UK early 'baby-boom' cohort. It has  
33 been suggested that the post-war 'baby-boom' cohort who, in the UK, lived through  
34 the inception of the welfare state, periods of stable employment, high levels of social  
35 mobility and increasing prosperity, is 'reinventing' older age (Sargent et al., 2013).  
36 On average, this cohort is entering later life healthier and wealthier (Johnson, 2015)  
37 than previous cohorts with, for many, older age an attractive 'third age' stage of the  
38 life-course (Phillipson, 2013b). Increases in older people's incomes and healthy life  
39 expectancy mean that notions of 'ageing well' have progressed beyond the absence  
40 of poverty and poor health (Wiggins et al., 2004, Wiggins et al., 2008) and promoting  
41 broader notions of 'quality' in later life have become important goals (Kendig et al.,  
42 2016).

43

44 Yet, as there are well-documented inequalities in wealth and in life expectancy  
45 (Marmot, 2010), so there are inequalities in QoL. Indeed, later-life QoL has been  
46 found to have an occupational status gradient similar to those found for mortality and  
47 morbidity (Blane et al., 2007). As early 'baby boomers' are often assumed to have  
48 largely lived uniquely fortunate lives, limited attention has been given to the  
49 existence of inequalities, including in QoL, in this cohort (Kendig et al., 2016). This  
50 study explores life-course factors associated with later-life QoL in this 'lucky' cohort.

## 51 **Life-course influences on later-life quality of life**

52 Significant contributions to later-life QoL have been identified from current health  
53 status and both current and mid-life socioeconomic circumstances (Jivraj et al.,  
54 2014, Kendig et al., 2016, Niedzwiedz et al., 2012, Wahrendorf, 2015, Zaninotto et  
55 al., 2009). In addition to these proximal influences, life-course research is  
56 increasingly identifying earlier-life influences on later-life QoL. The life-course  
57 perspective seeks to explain, often neglected, within-group differences among older  
58 adults by highlighting earlier-life circumstances that can result in diverse trajectories  
59 in later life (Dannefer, 2003, O'Rand, 1996). This perspective allows a more dynamic  
60 view of socioeconomic status over a lifetime (Vanhoutte and Nazroo, 2016): From a  
61 life-course perspective, each life stage must be viewed in the context of the  
62 preceding stages and, by the time older adulthood is reached, a complex set of  
63 interacting and competing events will have shaped outcomes. Earlier-life influences  
64 on later-life QoL are less well documented than proximal influences (Platts et al.,  
65 2015). However, retrospective life history data has provided early evidence of the  
66 influence of childhood socioeconomic position on older adults' QoL (Wahrendorf and  
67 Blane, 2014).

68

## 69 **Life-course approaches to measuring determinants of later-life QoL**

70 Accumulation, pathway and critical period models are among the most widely-used  
71 conceptual models for the life-course determinants of later-life QoL (Niedzwiedz et  
72 al., 2012). Accumulation models, such as cumulative (dis-)advantage (Dannefer,  
73 2003) and cumulative inequality (Ferraro and Shippee, 2009), suggest that  
74 inequalities are primarily structurally generated from birth (and even before) and are  
75 perpetuated and amplified over the life-course (Crystal and Shea, 1990). There is

76 evidence for the impact of accumulated (dis)-advantage on later-life QoL, with  
77 exposure to multiple periods of low socioeconomic status across the life-course  
78 associated with reduced later-life QoL (Otero-Rodríguez et al., 2011, Niedzwiedz et  
79 al., 2012).

80

81 Research examining *how* individual life-course histories influence later-life QoL is  
82 under-developed (Platts et al., 2015, Wahrendorf, 2015). Specifically, research into  
83 the *pathways* by which earlier events influence later-life QoL is lacking (Bhatta et al.,  
84 2017, Niedzwiedz et al., 2012, Read et al., 2016). Pathway models stress the  
85 importance of trajectories, exploring the mediating effects of adult circumstances on  
86 earlier exposures. Determining the influence of childhood circumstances on adult  
87 outcomes is complex, requiring attention to both direct and indirect pathways of  
88 influence (Pavalko and Caputo, 2013). There is evidence that earlier-life outcomes  
89 most often *indirectly* influence later-life QoL with their effects mediated (often fully)  
90 by later-life outcomes. For example, as educational attainment is an earlier-life  
91 predictor of QoL that is strongly correlated with later predictors, it is likely that the  
92 direct effects of education on later-life QoL will be reduced. Indeed, in their study of  
93 Australian ‘baby boomers’, Kendig et al. (2016) found the effects of earlier  
94 socioeconomic status, including education, on QoL were largely mediated by later-  
95 life socioeconomic status.

96

97 However, the slate of earlier life is not always ‘wiped clean’ (Schafer et al., 2011) and  
98 early disadvantage can directly impact on later-life outcomes. There is some  
99 evidence for direct effects of childhood circumstances on adult QoL. For example,  
100 the number of books, recorded retrospectively, in the childhood home (a proxy

101 measure of human capital) was found to directly affect later-life QoL (Kendig et al.,  
102 2016). Most recently, Bhatta and colleagues (2017) found a negative direct effect of  
103 parental education on QoL among older adults in India (they theorise that this could  
104 be explained by unrealistic expectations placed on the offspring of highly-educated  
105 parents). Direct effects of earlier-life circumstances can be interpreted as evidence of  
106 a 'critical period' (Bhatta et al., 2017). Critical period (or latent effects) models  
107 suggest that, independent of other life-course exposures, events during a critical  
108 period (where an individual is particularly vulnerable; for example, during growth in  
109 adolescence) have a lasting impact on later-life health (Ben-Shlomo and Kuh, 2002).

110

111 This present study aims to explore pathways through which a range of  
112 socioeconomic factors across the life-course influence later-life QoL. A path analysis,  
113 combining *a priori* theory and statistical testing, is used to decompose the total  
114 estimated effects of each factor into those that influence QoL directly and those with  
115 an indirect effect mediated through 'down-stream' factors. As most birth cohorts are  
116 yet to reach older age and no prospective early-years data available in the surveys  
117 of older adults, a lack of prospective data is a particular challenge for research into  
118 the life-course predictors of later-life QoL. Previous studies of later-life QoL have  
119 been forced to rely either on retrospective (Wahrendorf and Blane, 2014) or on  
120 cross-sectional data (Hyde et al., 2015). These studies are likely to suffer from bias  
121 introduced by limited recall and confounding intervening experiences (Pavalko and  
122 Caputo, 2013) and the inability to correctly model the life-course. Our study, the first  
123 to use prospective data collected from birth and across the life-course, allows us to  
124 overcome these sources of bias, resulting in more robust estimates of the pathways  
125 affecting QoL.

126 **Methods**

127 Path analysis, an extension of multivariable regression, is a model-testing procedure,  
128 with the path model built on theory and existing knowledge. Based on the existing  
129 literature, a range of socioeconomic characteristics found to influence QoL were  
130 identified and modelled. While there are many pathways that could be modelled,  
131 there is a trade-off between completeness and parsimony (Platts et al., 2015). While  
132 theory can guide the selection of characteristics and potential paths, path analysis  
133 allows for the use of goodness-of-fit statistics to provide structure to the selected  
134 variables. Total, direct and indirect effects of life-course predictors of later-life QoL  
135 can then be estimated. Path analysis provides a mediation model, explaining how  
136 variables are related. (In contrast, a moderator model tests whether predictions of an  
137 outcome from an independent variable differ across different levels of a third variable  
138 (Fairchild and Mackinnon, 2009)). Mediator variables are “links in the explanatory  
139 chain” (Shadish et al., 2002:11) and path analysis allows the estimation of several  
140 regression models simultaneously so that a mediator variable can be both an  
141 outcome and a predictor (Litt et al., 2015).

142

143 **Data**

144 The Newcastle Thousand Families Study (NTFS) (Pearce et al., 2009) is a  
145 longitudinal birth cohort study based in Newcastle upon Tyne, a previously (now  
146 post-) industrial city in north-east England. The cohort originally comprised 1142  
147 infants born between May and June 1947 to mothers living within the city  
148 boundaries. The NTFS cohort is among the early wave of the UK’s post-World War II  
149 ‘baby boom’. Arising from increased birth rates in many industrialised countries  
150 between the mid-1940s and mid-1960s, each country had its own distinctive ‘boom’.

151 The UK experienced two 'baby booms', creating a first wave of early (born between  
152 1945-54) and a second wave of late (born between 1961-65) 'boomers' (Leach et al.,  
153 2008). Set up to investigate the causes Newcastle's high infant mortality rate, the  
154 NTFS continued through the cohort's childhood until age 15 (the end of compulsory  
155 education). During childhood, and unusually for the era, in addition to health  
156 outcomes the study considered the children's social and family circumstances. The  
157 NTFS remained dormant until the cohort was re-contacted as it approached age 50,  
158 resulting in a major follow-up (N=574) between 1997 and 1999 when the cohort was  
159 aged 49-51 years. A second major follow-up (N=437) was conducted between 2009  
160 and 2011 when the cohort was age 62-64 years. In both follow-ups, respondents  
161 completed questionnaires, which included health, social, educational and  
162 occupational histories. Table 1 describes the data collection period for each of the  
163 variables included in this study.

164

165

166

[Table 1]

167

## 168 **Measures**

### 169 **Quality of life**

170 Because of its focus on reflecting the positive, beneficial aspects of later life (Hyde et  
171 al., 2015), the CASP-19 scale is used in this study as a measure of QoL. The CASP-  
172 19 scale, which measures four domains of control (C), autonomy (A), self-realisation  
173 (S) and pleasure (P), was developed specifically to measure eudemonic wellbeing –  
174 operationalised as QoL - in older adults (Hyde et al., 2003). The CASP-19 control  
175 and autonomy domains reflect the extent to which older adults can control their

176 environments (Wiggins et al., 2004). The domains of self-realisation and pleasure  
177 capture the “more active and reflexive dimensions” of ageing in a complex society  
178 (Wiggins et al., 2004:696). CASP-19 is a 19-item scale, ranging over a four point  
179 Likert scale (ranked often, sometimes, not often and never). Each item is summed to  
180 give a total score ranging between 0 and 57, with higher scores indicating better  
181 QoL. Technical details about the CASP-19 scale can be found elsewhere (Howel,  
182 2012, Hyde et al., 2003).

183

### 184 **Predictors of later-life subjective wellbeing**

185 Socioeconomic characteristics that may affect later-life QoL were identified in the  
186 extant literature. Measures of these characteristics, reflecting four life-course stages  
187 (birth to age five, earlier adulthood, mid-life and later life), were then selected from  
188 the NTFS. Independent variables were dichotomised to ensure sufficient numbers of  
189 observations in each group. To simplify interpretation of results, predictor variables  
190 were coded as 1 for the better outcome and 0 otherwise. Based on relationships  
191 proposed in the literature, we expected that proximal measures of advantage would  
192 have strong, positive direct effects on later-life QoL, while earlier-life measures of  
193 advantage were likely to exert weak, indirect positive effects on QoL.

194

### 195 ***Birth to Age Five***

#### 196 **Birth family’s occupational social class**

197 Childhood socioeconomic status is suggested to affect measures of later-life  
198 wellbeing indirectly through its influence on advantage across the life-course and  
199 previous research has identified an association between parental socioeconomic  
200 status and satisfaction with life (Deindl, 2013, Niedzwiedz et al., 2012) and QoL



201 (Wahrendorf and Blane, 2014) in individuals age 50+. Parents' occupational social  
202 class or educational attainment are commonly used as markers of childhood  
203 socioeconomic advantage. The NTFS contains no parental education data; however,  
204 data on father's occupational social class were recorded at birth using the Registrar  
205 General's definition of occupational social class of the head of the household. Social  
206 class at birth was dichotomised to (1) father in social class I or II; for example,  
207 members of the professions such as law and medicine, "lesser business executives,  
208 school teachers and higher clerical workers" (Miller et al., 1960:6) or (0) father in  
209 social classes III, IV or V (skilled workers, such as printers and electricians, lesser  
210 clerical workers, semi- and un-skilled workers such as coal miners and labourers,  
211 and the unemployed).

212

### 213 **Exposure to adverse events in childhood**

214 Childhood adversity may contribute to negative life evaluations in later life (Schafer  
215 *et al.*, 2011) and there is a need for research into the pathways by which adverse  
216 events, such as abuse, in childhood influence measures of later-life subjective  
217 wellbeing, including QoL (Kendig et al., 2016). At the commencement of the NTFS,  
218 in an attempt to measure the children's 'human environment', a summary was made  
219 of each family's circumstances (Miller et al., 1960). Adverse events suffered in the  
220 first five years of life were recorded, examining deficiency of care and social  
221 dependency using five measures of family life: 1. Serious parental debt; 2. Parental  
222 divorce or separation; 3. Parental incapacity through chronic illness; 4. Parental  
223 criminal activity or cruelty; and 5. Death of a parent. This variable was dichotomised  
224 to 'experienced no adverse events by age five' (1) or 'experienced at least one  
225 adverse event by age five' (0).

226 ***Earlier adulthood***

227 **Educational attainment**

228 Previous research has identified a mediating effect of education on later-life QoL  
229 (Kendig et al., 2016).. As the original NTFS followed the cohort until the end of  
230 compulsory schooling at age 15, educational attainment beyond this age was not  
231 recorded. However, highest level of educational qualification attained by mid-life was  
232 recorded in the 1997-99 survey (at age 49-51). The majority of the cohort completed  
233 their education earlier in life (nearly 90 percent of respondents reported having  
234 completed their education by age 25). Educational attainment was dichotomised to  
235 (1) achievement of academic subject-based 'O'-level qualifications (an International  
236 Standard Classification of Education Level 3 upper-secondary education qualification  
237 taken in the UK at age 15-16 at the end of compulsory education until 1988) or  
238 equivalent (for example, technical and commercial qualifications such as the Higher  
239 National Certificate/Diploma) and above, 0 otherwise.

240 ***Mid-life***

241 **Occupational social class**

242 Reflecting mid-life socioeconomic advantage, the NTFS contains data on mid-life  
243 household occupational social class, income and savings. Occupational status was  
244 used here to measure advantage at age 49-51 as earlier advantaged occupational  
245 social status may have a long-lasting influence on QoL (Pinquart and Sorensen,  
246 2000). High-status employment is linked to extrinsic benefits such as the  
247 accumulation of financial resources required for leisure and better living  
248 environments in older age (Pinquart and Sorensen, 2000, Blane et al., 2007),  
249 perhaps accompanied by a sense of intrinsic satisfaction with career  
250 accomplishments and status, even after work exit (Pinquart and Sorensen, 2000).  
251 Occupational social class at age 49-51 was derived from the occupational details of

252 the main wage earner (almost 90 percent male in the NTFS cohort) and coded  
253 according to the 1990 UK Registrar General's Standard Occupational Classification.  
254 Mid-life occupational social class was dichotomised to (1) social class I or II (e.g.  
255 professional, managerial and technical occupations) or (0) social class III, IV or V  
256 (skilled manual/non-manual, semi-, partly- and un-skilled).

### 257 ***Later-life***

#### 258 **Home-ownership**

259 Associations between socioeconomic status and later-life QoL vary according to the  
260 socioeconomic status measure used (Niedzwiedz et al., 2012). Because by age 62-  
261 64 a large proportion of the NTFS cohort had retired, occupational social class at this  
262 age was considered a less reliable measure of advantage. Income, too, was likely to  
263 be influenced by employment status: retired households may have lower incomes  
264 than those still working but this does not, necessarily, reflect financial adequacy. It is  
265 suggested that 'new' inequalities (beyond occupational social class) are evident  
266 among the early 'baby-boom' cohort, including in housing status (Phillipson, 2013a).  
267 Here, home-ownership status was chosen as a measure of advantage that may be  
268 equally (or more) relevant to older adults than occupational social class or income  
269 (Knesebeck et al., 2007). Economic strain, perhaps due to housing costs, has been  
270 associated with lower wellbeing (Pearlin et al., 1990) perhaps because it limits  
271 control and autonomy. There may also be a reflexive dimension to freedom from  
272 housing costs: previous studies found favourable perceptions of financial position to  
273 be associated with improved QoL (Netuveli et al., 2006, Webb et al., 2009).  
274 Ownership status (owned-outright, owned-mortgaged, or renting) was recorded in  
275 the NTFS at age 62-64 and was dichotomised into 1 if living mortgage-free, 0 if  
276 renting or living in a mortgaged home.

#### 277 **Employment**

278 It has been suggested that 'socially productive' activities in later life, such as paid  
279 employment, are associated with increased wellbeing, perhaps because they  
280 increase self-esteem through a sense of contributing to society or because they  
281 provide social contact (McMunn et al., 2009). Further, as many members of the  
282 NTFS cohort had retired by age 62-64, employment at this age may be indicative of  
283 financial necessity. Employment status at age 62-64 was dichotomised into full-,  
284 part- or self-employment (1) and 0 otherwise.

### 285 **Self-reported health**

286 Current health status has been found to contribute strongly to later-life QoL (Wiggins  
287 et al., 2004). However, it appears to be the effect of a health problem rather than its  
288 presence or absence that impacts on QoL (Blane et al., 2004, Netuveli et al., 2006,  
289 Webb et al., 2009). Self-rated health was included as a measure of current health  
290 status. This subjective measure is likely to capture the impact of health on an  
291 individual's QoL (for example, their ability to realise their potential and enjoy a 'third  
292 age'). Self-reported general health at age 62-64 was dichotomised into 1 if reported  
293 excellent or very good health and 0 otherwise.

294

### 295 ***Confounding variables***

296 Due to the sample size, separate gender analyses were not possible. Gender  
297 (1=female, 0 otherwise) was included as a control variable. Because relationship  
298 status is relatively highly correlated with later-life employment status and with home-  
299 ownership status, marital status at age 62-64 (dichotomised into married or  
300 cohabiting=1, 0 otherwise) was also included as a control variable.

301

302

### 303 **Analyses**

304 All statistical analyses were carried out using Stata, version 14 (StataCorp, USA).  
305 Over time, the NTFS data has suffered attrition due to individuals being lost to the  
306 study through movement or death. This has led to two particular problems: firstly,  
307 that the 2009-11 data may not be representative of the initial cohort; and secondly: a  
308 reduction in sample size. To investigate representativeness, characteristics of the  
309 sample used in the estimation were compared to cohort characteristics in the earlier  
310 waves (Appendix Table 1A). Proportions of individuals in each category of variables  
311 recorded in earlier and mid-life were relatively similar across all data collection  
312 periods. However, by 2009-11 respondents had slightly higher-than-average levels  
313 of educational attainment and mid-life occupational social class. These differences  
314 may reflect a 'healthy survivor' effect leading to underestimates of the effects on QoL  
315 of potential life-course factors.

316

317 The final sample, including only individuals with complete cases for all variables, was  
318 267. A simulation-based method (Thoemmes et al., 2010) was implemented to  
319 investigate power for each parameter and for a test comparing the final model to a  
320 simple pathway. For a 5% level of significance, with this sample, power ranges from  
321 0.44 - 0.95. To improve power, multiple imputation was applied, which increased the  
322 sample size to N=393 (90% of cases in the 2009-11 data collection period) (Rubin,  
323 2004). As a robustness check, the complete-case analysis (included in Appendix  
324 Figure A1) was compared to an analysis using multiple imputation. Results from the  
325 two analyses were qualitatively similar; however, the effects of employment and  
326 mortgage-freedom are reduced in the imputed data model. A correlation matrix was  
327 constructed and, in the initial model, paths with correlations of  $p < .1$  were modelled

328 (Mann et al., 2011). To counteract potential problems in making multiple  
329 comparisons, a Holm-Bonferroni adjustment was applied (Holm, 1979). Model fit was  
330 assessed using chi-square ( $\chi^2$ ), goodness-of-fit index (GFI), comparative fit index  
331 (CFI) and root mean square error of approximation (RMSEA). Adequate fit was  
332 defined as a  $\chi^2$  *p* value over 0.05, GFI and CFI over 0.95 and RMSEA under 0.05.  
333 As recommended by Preacher and Hayes (2008), significance of indirect effects was  
334 tested using 95% confidence intervals (CI) derived from biased-corrected  
335 bootstrapped estimates. Indirect effects are considered significant when zero is not  
336 included in the 95% CI

337

## 338 **Results**

### 339 **Sample characteristics**

340 Table 2 reports descriptive statistics for the sample. The mean CASP-19 score was  
341 44.0 (S.E. 0.46). Characteristics of the sample included in this analysis were not  
342 significantly different to those of the whole cohort.

343

### 344 **Bivariate correlations**

345 Table 2 also reports bivariate correlations among the variables that formed the basis  
346 of the estimated path model. The strongest correlations were found between later-life  
347 self-rated health, mid-life occupational social class and adverse events in childhood.

348

### 349 **Path analysis results**

350 Figure 1 illustrates explanatory factors directly and indirectly associated with CASP-  
351 19 score. Model-fit criteria were all satisfied:  $\chi^2$  for the model was 0.27, GFI=0.986,  
352 CFI=0.985 and RMSEA=0.027. Significant effects ( $p<.05$ ) are represented by arrows

353 and labelled with  $\beta$  coefficients. The arrow direction indicates the hypothesised  
354 direction of causal flow. Direct effects are represented by solid arrows running  
355 straight from the explanatory variable to CASP-19 score without mediation through  
356 another independent variable (for example, excellent/very good health -> CASP-19  
357 score). Indirect effects (dashed arrows) are pathways mediated through at least one  
358 intermediate variable. Each indirect pathway is equal to the product of each  
359 component path; for example, from mid-life socioeconomic status -> self-reported  
360 health \* the direct effect of self-reported health on quality of life ( $.202 * 7.68 = 1.55$ ).  
361 The total effect for each variable is the sum of the direct and indirect effects (the total  
362 effect value is shown beneath the variable name). For example, the total effect of  
363 mid-life socioeconomic status on CASP-19 score is 3.72; this value is the sum of the  
364 direct effect of socioeconomic status on CASP-19 score and the indirect effect ( $2.17$   
365  $+ 1.55 = 3.72$ ). Potentially confounding variables (marital status at age 62-64 and  
366 gender), error terms and co-variances are omitted from the diagram for simplicity.  
367 The variance in QoL explained by the variables included in the path model is 24  
368 percent.

369

370 [Table 2]

371

### 372 **Mid- and later-life factors associated with QoL**

373 Occupational social class in mid-life made a direct positive contribution to QoL at age  
374 62-64 ( $\beta=2.17$ , 95% CI .382, 3.96) and had an indirect effect mediated through self-  
375 reported health at age 62-64. Self-reported excellent or very good health at ages 62-  
376 64 made the largest contribution to later-life QoL ( $\beta=7.68$ , 95% CI 5.99, 9.37). Later-

377 life mortgage-freedom ( $\beta=1.76$ , 95% CI .103, 3.42) and employment ( $\beta=2.14$  95% CI  
378 .473, 3.82) made significant positive contributions to later-life QoL.

379

### 380 **Earlier-life factors associated with QoL**

381 Being born to a father in the professional and managerial occupational classes had  
382 no direct effect on later-life QoL; however, it made a significant total contribution to  
383 QoL ( $\beta=1.05$ , 95% CI .575, 1.90), with indirect effects through achieved educational  
384 level, mid-life social class and later-life health (95% CI .027, .200). A lack of  
385 exposure to early adversity had the second largest total effect (among distal and  
386 proximal explanatory variables) on later-life QoL. This total effect can be  
387 decomposed into a significant direct effect ( $\beta=2.11$ , 95% CI .348, 3.88) and a  
388 significant indirect effect with pathways through achieved educational qualifications,  
389 occupational status in mid-life and self-reported health in later life (95% CI .038,  
390 .241). Educational attainment at or beyond O-level (or equivalent) had no significant  
391 direct effect on later life QoL; however, it made a significant indirect contribution, with  
392 a pathway through mid-life social class and later-life health (95% CI .201, 1.11) and  
393 through mortgage freedom at age 62-64 (95% CI .031, 1.24).

394

395 [Figure 1]

396

397

### 398 **Discussion**

399 This study adds to the limited existing knowledge of life-course predictors of QoL in  
400 older age (Blane et al., 2004) by exploring pathways through which socioeconomic  
401 advantage across the life-course contributed to later-life QoL in an early 'baby-boom'  
402 birth cohort.



403 *Advantages of prospective data*

404 This is the first study to use prospective longitudinal data to explore life-course  
405 factors associated with later-life QoL, allowing us to better estimate the effects of  
406 early life events on QoL. Prospective data overcomes two problems that affect  
407 retrospective data and lead, potentially, to either over-estimates or under-estimates  
408 of the effects of early-life events. Over-estimates from retrospective data may occur  
409 through recall and justification bias, which lead to respondents over-stating the  
410 impact of early-life events in order to explain their later-life situation (Wahrendorf and  
411 Blane, 2014). Under-estimates may occur if early-life events are measured with  
412 error, leading to attenuated regression estimates. With prospective data these issues  
413 are less problematic. For example, in this study, childhood adversity was measured  
414 objectively by researchers contemporaneously. This has the advantage that the  
415 measure of adversity is relevant for the time in which this cohort was born, rather  
416 than being constructed later based modern notions of adversity.

417

418 Previous research finds weak and indirect effects on later-life QoL from early-life  
419 circumstances (Blane et al, 2012), our paper is the first to find a significant direct and  
420 relatively strong effect of adverse childhood events on later-life QoL. This finding  
421 builds on the conclusions of Schafer et al. (2011) who found, using retrospective  
422 data, that the 'long arm' of childhood adversity (Schafer et al., 2011) had a lasting  
423 association with negative 'life evaluations' (measured on a scale ranging between 0  
424 (worst possible life) and 10 (best possible life)) in later life. They use the concept of  
425 'biographical structuration' to explain the relationship between childhood adversity  
426 and later-life evaluation, arguing that "early adversity is fundamentally rooted in  
427 concrete social conditions and meaningfully incorporated into human narrative"

428 (Schafer et al., 2011:1082). The life-pervading effects of a 'rough start' in childhood  
429 may influence negative life evaluations through a process of past negative  
430 experiences being treated as indicative of present or future negative experiences  
431 (Schafer et al., 2011). Indeed, it has been suggested that individuals who have not  
432 experienced early adversities may subjectively view life more positively, regardless  
433 of objective outcomes, than those who suffered stresses in childhood (Ferraro and  
434 Shippee, 2009). However, Schafer et al.'s results, based on retrospective data,  
435 cannot distinguish this explanation from recall bias. Our results, which are free from  
436 recall bias, support their assertions.

437

438 Our results have important policy implications. With previous studies concluding that  
439 as earlier life factors have no direct effect on later-life QoL, policies that address  
440 later-life inequalities can act in older age to 'undo the damage' of earlier  
441 disadvantage (Hyde et al., 2015). Our results, with evidence of a potential 'critical  
442 period' of exposure to adverse events by age five, suggests that much earlier  
443 intervention may be needed to tackle inequalities in later-life QoL.

444

#### 445 *Pathways of influence*

446 To-date, few studies have explored the pathways through which earlier events  
447 influence QoL in older age (Niedzwiedz et al., 2012, Read et al., 2016). Identifying  
448 mediating pathways is an important endeavour as it reveals mechanisms through  
449 which the influence of early disadvantage may be 'switched off' (Ferraro et al., 2016).  
450 This study does not directly measure accumulated advantage (that is, a 'dose-  
451 response' effect is not calculated). However, using Merton's (1988) idea of  
452 cumulative (dis)advantage as the ways in which initial comparative advantage makes

453 for successive advantage over time, evidence of accumulated (dis-)advantage can  
454 be found in pathways of influence. As Ferraro *et al.* (2016:125) observe: “early  
455 disadvantages also shape the very resources that could help assuage their effects”.  
456 In this present study, a lack of childhood adversity had an indirect effect on later QoL  
457 partly mediated through education. Blane (2006) suggests that a lack of childhood  
458 adversity may positively influence educational attainment both subjectively through a  
459 child’s positive assessment of their ability to achieve educationally and objectively  
460 through parental interest in their child’s education. The mediating effect of later-life  
461 self-reported health in the pathway from adverse events in childhood to later-life QoL  
462 is likely to operate by similar mechanisms: viewing life more positively may result in  
463 greater subjective positivity about health.

464

465 A previous study found no association between parental social class and later-life  
466 QoL (Blane *et al.*, 2004). However, findings presented here demonstrate that  
467 although being born to a father in the professional and managerial occupational  
468 classes had no direct effect, it made a significant total contribution to improved later-  
469 life QoL, with indirect effects via educational attainment and advantaged mid-life  
470 social class. This provides evidence of the pathways by which advantage  
471 accumulates: In 1947, the year the NTFS cohort was born, two important education  
472 reforms were enacted: the introduction a tri-partite schooling system, comprising  
473 grammar, secondary modern and technical schools, and the IQ-test based 11-plus  
474 exam, which selected children into type of schooling at age eleven. These reforms  
475 aimed to create a ‘meritocracy’ with children’s educational opportunities dependent  
476 on their academic ability rather than their social class. However, for most children  
477 from less advantaged backgrounds the new education system entrenched class

478 divisions: disadvantaged children remained disadvantaged and advantaged children  
479 remained advantaged through childhood and into adulthood (Todd, 2014).

480

481 Similarly, the up-stream effects of education on QoL operated indirectly with a path  
482 through mortgage freedom. Though measured in later life, outcomes such as  
483 mortgage-freedom tend to reflect accumulated advantage across the life-course. For  
484 example, the pathway between education and mortgage-freedom may indicate  
485 higher earnings among the better educated that, independent of occupational social  
486 class, enabled them to make mortgage payments. Alternatively, the  
487 education/mortgage-freedom relationship may reflect higher 'discount rates' (a  
488 higher value placed on the future than the present) among better-educated  
489 individuals: those who invest in education for future gains may also be more likely to  
490 invest in their homes for similar future gains. This finding suggests that assistance  
491 with financial planning earlier in life may have benefits beyond the purely financial.

492

493 The pathway found here from O-level and equivalent educational qualifications to  
494 QoL via mid-life occupational social class is likely to be specific to individuals in this  
495 cohort in the UK. In an era characterised by very high levels of upward social  
496 mobility, achieving O-levels or their technical/commercial equivalents granted access  
497 to professional 'middle-class' employment or to highly skilled and well-paid manual  
498 employment for working-class men and women (creating a new class of 'affluent  
499 workers' (Goldthorpe et al., 1969)). The recent 'hollowing-out' of middle-class jobs  
500 and the huge increase in university attendance means that this pathway is unlikely to  
501 remain for subsequent cohorts. The continuation for subsequent UK cohorts of a  
502 pathway from educational attainment to mortgage freedom is also in doubt, with high

503 house prices and the introduction of fees for higher education breaking this link for  
504 many.

505

506 *Contributions of later-life factors to QoL*

507 Although proximal influences on later-life QoL are relatively well-documented, it is  
508 worth noting a couple of points arising from this study: firstly, the effect of mortgage-  
509 freedom on QoL. The association between mortgage-freedom and later-life  
510 subjective wellbeing is not well-researched; however, it is likely to be increasingly  
511 salient for future generations: increasing numbers of people are entering later life  
512 with mortgage debt, with 20 percent of 60-64 year olds in the UK having outstanding  
513 mortgage borrowing (International Longevity Centre, 2013). Rates of homeownership  
514 in the UK increased hugely in this cohort's lifetime: in 1961, 42% of households were  
515 homeowners, increasing to 68% in 1991 (Belfield et al., 2015). As homeownership  
516 has become more widespread, it is likely to have taken on cultural significance and  
517 owner-occupancy, in contrast to renting, has been associated with 'prestige' and  
518 increased self-esteem (Hiscock et al., 2003). Out-right homeownership may further  
519 increase self-perceptions of success. Secondly, it is worth noting the association  
520 between later-life employment and QoL in this cohort as, due to their age, many had  
521 retired. The positive contribution of employment to QoL life suggests that individuals  
522 working at age 62-64 were doing so through choice rather than necessity. Measures,  
523 such as the increasing state pension age, that are part of the extending working lives  
524 agenda (a response to population ageing) are likely to result in many older adults  
525 working longer whether they wish to or not. This has implications for future cohort's  
526 QoL in older age.

527

528 *Limitations*

529 The main limitation of this study is the sample size, which may result in Type II  
530 errors. However, it is the authors' opinion that the use of prospective data will  
531 produce more robust estimates of the effects of socioeconomic characteristics  
532 through the life-course than those produced by larger samples of recalled data  
533 (Pearce et al., 2012). Attrition due to failure to follow-up is a potential weakness of  
534 any longitudinal study; however, the composition of the sample used in this study is  
535 similar to the composition of the population sample in each wave. Differential  
536 mortality between groups may also affect our estimates. If individuals from more  
537 deprived backgrounds die earlier they will not be included in the final wave of the  
538 data, leading to a potential underestimate of any effect. This is a problem inherent in  
539 the life-course approach, affecting both prospective and retrospective studies. The  
540 impacts of childhood events on later life cannot be modelled for those individuals  
541 who do not reach later life. However, with prospective studies we can examine the  
542 characteristics of individuals who die prior to measurement of the outcome of  
543 interest. Of the 213 recorded deaths from the NTFS, 25% occurred before age five  
544 (21% in the first year of life). We have no measurement of adverse events for  
545 individuals who died before age five because this measure was only collected at age  
546 five. However, as 95% of individuals who experienced adverse events were born to  
547 fathers in social classes III, IV or V, we can use father's social class as a proxy for  
548 adverse events. At age five (age 61), 91% (89 %) of deaths occurred among children  
549 with fathers in social classes III, IV or V, suggesting that, with mortality most affecting  
550 the least advantaged, our results may be downwardly biased.

551

552 As the cohort only represents births in one city in north-east England, the extent to  
553 which they are generalisable to the wider population is an important consideration.  
554 However, comparisons between the NTFS cohort and the ELSA cohort, which is  
555 representative of the UK population, have shown the two cohorts to be similar along  
556 key criteria such as gender composition, labour-market activity and home-ownership  
557 status. However, the social class and self-reported health compositions of the two  
558 cohorts differed, with the NTFS cohort having more members in the most  
559 advantaged classes and more members in excellent or very good health than the  
560 ELSA cohort (unpublished doctoral thesis). The experiences of this early ‘baby-  
561 boom’ cohort are likely to be similar to those in other developed economies that have  
562 undergone similar changes to those experienced by UK ‘baby boomers’.

563

## 564 **Conclusion**

565 The CASP-19 scale was developed to move beyond a focus on decline and  
566 dependency in older age and reflect the positive and beneficial aspects of the ‘third  
567 age’ (Hyde et al., 2015). Now that older-age is no longer necessarily characterised  
568 by poverty and poor health, policies have focused on promoting broader notions of  
569 ‘quality’ in later life. This study is the first to use prospective data to address the  
570 ‘fundamental question’ of whether the mechanisms by which advantage earlier in life  
571 influences later-life QoL are direct or indirect and, if indirect, which paths are  
572 potentially modifiable via ‘down-stream’ policy interventions (Bhatta et al., 2017,  
573 Myrskylä et al., 2014). In support of previous studies, we find current employment,  
574 mortgage-freedom and good self-reported health and mid-life advantaged  
575 occupational status all have strong positive effects on QoL in a UK early ‘baby-boom’  
576 cohort of adults aged 62-64. Our results support a pathway model, whereby the

577 effects of social class at birth and education were mediated by later-life  
578 socioeconomic advantage. Previous studies using retrospective data have identified  
579 an indirect effect of adverse childhood events on later-life QoL. Using prospective  
580 data, we find that childhood adversity directly affected QoL in older age, suggesting  
581 the need for policies operating across the life-course to improve later-life QoL.

582

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Figure 1: Path diagram showing direct and indirect indicators of CASP-19 score at age 62-64

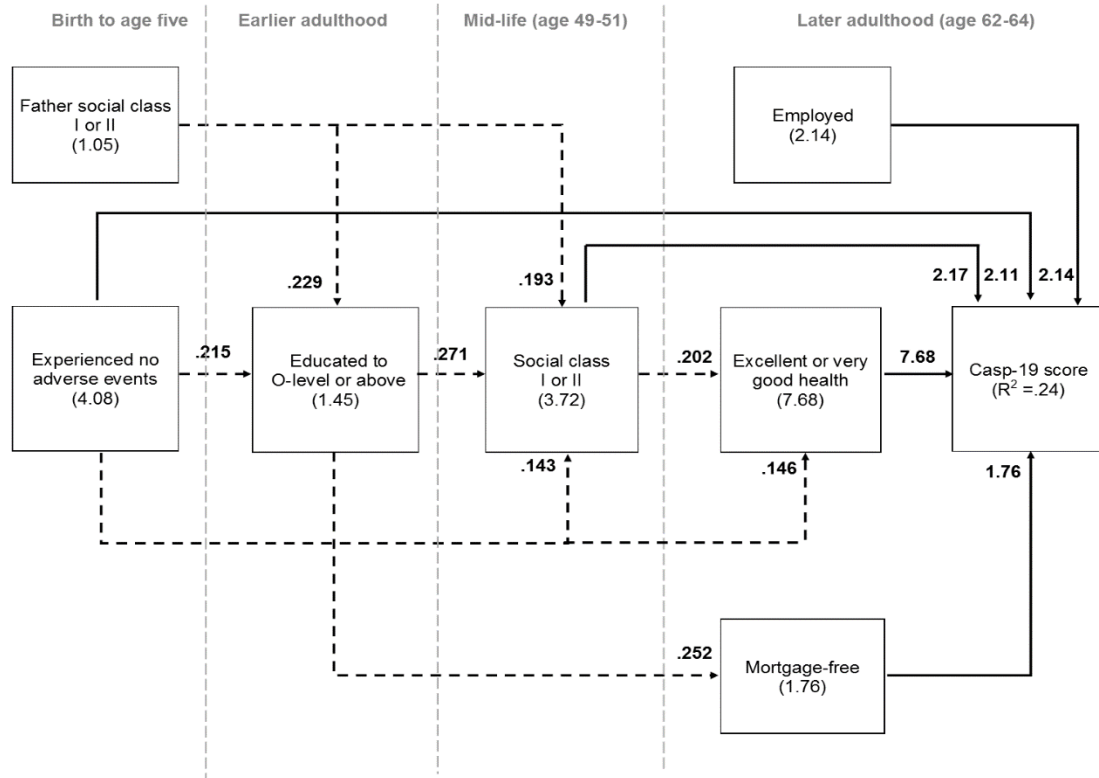


Table 1: Data collection periods for variables included in this study

Data collection period	Data collected
May-June 1947 (birth)	Gender
	Father's social class
1947-1952 (birth to age 5)	Adverse events in first five years' of life
1997-1999 (age 49-51)	Highest educational qualification to-date
	Household occupational social class
2009-2011 (age 62-64)	Employment status
	Self-reported health
	Owner-occupancy status
	CASP 19 score
	Marital status

Table 2: Proportions, mean and standard deviation (SD), and bivariate correlations for model constructs

	M (SE)	1	2	3	4	5	6	7
1. Social class I or II at birth	0.12 (0.02)	-						
2. Experienced no adverse events by age five	0.62 (0.03)	0.10	-					
3. Educated to O-Level or equivalent or above	0.68 (0.02)	<b>0.19</b>	<b>0.23</b>	-				
4. Social class I or II at age 49-51	0.55 (0.03)	<b>0.19</b>	<b>0.22</b>	<b>0.31</b>	-			
5. Excellent or very good health at age 62-64	0.65 (0.02)	0.11	<b>0.19</b>	<b>0.17</b>	<b>0.25</b>	-		
6. Living in a mortgage-free home at age 62-64	0.66 (0.02)	0.06	0.12	<b>0.24</b>	0.10	0.09	-	
7. In employment at age 62-64	0.33 (0.02)	-0.02	-0.02	0.02	0.06	0.09	<b>-0.16</b>	-
8. CASP-19 score at age 62-64	44.0 (0.46)	0.13	<b>0.22</b>	<b>0.23</b>	<b>0.26</b>	<b>0.47</b>	<b>0.14</b>	<b>0.14</b>

Note. M = mean, SE = standard error, correlations in bold are significant at 10% level