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# Aging and Subjective Well-Being in Later Life

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***Objectives.*** This paper examines age-related changes in subjective well-being (SWB) in later life using multiple measures that cover eudemonic, evaluative, and affective dimensions of well-being.

***Method.*** Using data from 5 waves of respondents aged 50 and older from the English Longitudinal Study of Ageing (2002–11), we fit multilevel linear growth curve models to examine the cohort differences and individual aging effects on quality of life, depressive symptomatology, and life satisfaction.

***Results.*** Older cohorts are shown to have equivalent or better SWB than younger cohorts for each well-being measure. Nonetheless, individual aging effects for each well-being measure were observed with deterioration in well-being being greatest in older cohorts, even when adjusting for age-related changes in later life, including widowhood, retirement, and declining health.

***Discussion.*** The results suggest that although older cohorts enjoy higher levels of SWB than their younger counterparts when under similar circumstances, they experience sharper declines, especially in the very oldest cohorts. The findings demonstrate the importance of separating out cohort differences and aging effects and also of taking into account the multidimensionality of SWB to determine the point at which age deterioration begins to occur across different measures.

***Key Words:*** Ageing—Cohort—Growth curve modeling—Subjective well-being.

THE promotion of aging well in later life is a key strategy of public health policy in many developed countries. In the United Kingdom and United States, this is accompanied by a shift from measuring successful aging as the absence of physical and mental health conditions toward assessing what is commonly referred to as subjective well-being (SWB) (HM Government, 2010; National Prevention Council, 2011). There are three broad approaches to the measurement of SWB in the academic literature: eudemonic, evaluative, and affective (Dolan, Layard, & Metcalfe, 2011; OECD, 2011; Tinkler & Hicks, 2011; Waldron, 2010).

The eudemonic approach can be defined as the self-assessed worth of an individual's life, how much control they feel they have over it, and whether they are able to plan for the future (Ryff & Singer, 1998). The evaluative approach is based on a global appraisal of one's life and is measured in its crudest form by simply asking people how satisfied they are with their life. Diener (1994) suggests that although a single question tends to serve well as a measure of life satisfaction, it should be supplemented with multiple indicators. Affective well-being can be defined as the degree of positive or negative affect a person has experienced, including feelings of happiness, sadness, anxiety, or excitement (Tinkler & Hicks, 2011). This could be in terms of frequency or intensity within a given time frame or at a certain point in time. These different dimensions of well-being may have differential associations with aging.

This paper provides a longitudinal analysis of the relationship between cohort and aging, and how aging effects vary with cohort, and the three approaches to the measurement of SWB (eudemonic, evaluative, and affective well-being) in a sample of adults aged 50 and older in England. Such an approach is atypical because most of the existing literature employs specific measures and does not cover the differential effects of cohort and aging on multidimensional constructs of SWB. Moreover, it is relevant to focus on change in SWB in older adults, as it is often assumed that greater deterioration at older ages is associated with a progressive decline in physical and mental capacity (Baird, Lucas, & Donnellan, 2010). The following section reviews literature, which reports cohort differences or cohort changes over time in SWB measures using sample surveys older adults.

Wiggins, Higgs, Hyde, and Blane (2004) and Netuveli, Wiggins, Hildon, Montgomery, and Blane (2006) have both found a significant effect for older age groups on a quality-of-life measure related to eudemonic SWB, when analyzing the relationship using cross-sectional data but controlling for age-related determinants of SWB. Wiggins and colleagues (2004) use a nationally representative sample of surviving members of the 1930s Boyd-Orr study of health and diet. They find that respondents aged 70 and older are predicted to have lower quality of life than those younger. Netuveli and colleagues (2006) use cross-sectional data from the first wave of the English Longitudinal Study of Ageing (ELSA) and find that quality of life increases from age 50 to a peak at 68 years, and from there it declines gradually.

The view that quality of life is lower among older age groups is contradicted by Zaninotto, Falaschetti, and Sacker




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(2009) who have used data from ELSA over three survey waves to predict cohort trajectories in quality of life, using the same eudemonic well-being measure. They use a structural equation growth model and find that once controlling for a range of time invariant and time-varying determinants of SWB, including demographic, health, socioeconomic, and psychological factors, there are no overall cohort differences in quality of life. However, older cohorts are predicted to experience a faster within-individual decline over time. Their study demonstrates the importance of separating out cohort and aging effects on SWB as it shows that cross-sectional age is not related to SWB, but that for those who are older, aging is related to a significant change over time. Zaninotto and colleagues (2009) show that when controlling for these effects, quality of life is lower for men than women and for those with no qualifications than those with qualifications. Factors that had a negative impact on quality of life over time, in addition to aging, were depression, functional limitations, poor wealth, not being in paid employment, not perceiving positive support from one's spouse, children and friends, and having a small social network of close friends and family.

Similar conclusions are drawn by Gerstorf, Lövdén, Röcke, Smith, and Lindenberger (2007), using data from the Berlin Aging Study and an old age-specific multidimensional SWB measure comprising non-agitation, aging satisfaction, and life satisfaction. They analyze change in the composite SWB measure across six waves of data collection, spanning 13 years, with respondents at an average age of 85 at baseline, and find no effect of cohort on initial SWB after adjusting for health constraints, openness to new experiences, and social participation. However, they equally did find a negative effect on the change in SWB over time for cohorts who are older at baseline. This highlights the importance of not only considering the cross-sectional effect across cohorts on SWB but also the change within individuals over time and how this varies by cohort.

To date, few studies have considered the multiple approaches to the measurement of SWB (i.e., eudemonic, evaluative, and affective) using the same sample, which makes it difficult to compare the effect of cohort, aging, and other determinants across measures. Exceptions are Demakakos, McMunn, and Steptoe (2010), Hansen and Slagsvold (2012), and Steptoe, Demakakos, and De Oliveira (2012), which each use a variety of SWB measures to compare the longitudinal relationship between eudemonic, evaluative, and affective well-being and their known determinants, including age. Steptoe, Demakakos, and De Oliveira (2012) find—using the same data from ELSA that is used in this study—that longitudinally, there is a lower level of positive affect and a greater level of negative affect, for those aged 80 and older, and particularly for women. There is a similar relationship between cohort and change in eudemonic well-being. The change in evaluative well-being is more complex with those in the youngest cohort (age 52–59 at baseline) progressively increasing their average life satisfaction score compared with a decline for older cohorts (aged 70 and older at baseline). Steptoe and colleagues (2012) do not control for other effects in their analysis of change in SWB.

Hansen and Slagsvold (2012) conduct multivariate analysis of the longitudinal affect of cohort on SWB using a Norwegian panel study of people aged 40–85. They find that across different approaches to measuring SWB, change is more negative in old-old than in young-old age. This effect is partially explained by age-related changes such as loss of health and partner.

In this study, we use three measures covering the eudemonic, evaluative, and affective approaches to examine the relationship with cohort and aging. We adjust for age-related changes in later life, to ensure cross-sectional differences in age are a result of cohort effects, as well as other factors associated with well-being in the older population, to determine whether these explain lower levels of SWB in older cohorts and an accelerated decline at the oldest age. The longitudinal modeling approach described below adds a new dimension to previous studies by Steptoe and colleagues (2012) and Hansen and Slagsvold (2012). Our first hypothesis is that cohort differences in SWB will reduce after controlling for mediating effects that are known to be associated with SWB and age. We suppose that the bivariate relationship between poorer SWB and older age is a result of the poorer health, partnership status, and economic position of older cohorts. Our second hypothesis is that the oldest cohorts will experience a faster longitudinal deterioration in each measure of SWB, even after adjusting for the mediating time-varying effects of retirement, marital, and health status, as well as other known associates of SWB in the older age population. This is because many people experience multiple psychosocial losses in the final period of their life, including bereavement of close friends and family. This may trigger a realization of one's own mortality and result in a loss of coping mechanisms to maintain high levels of SWB (Hansen & Slagsvold, 2012).

## Method

### *Data*

This study uses data from the ELSA collected over five waves during an 8-year period. ELSA is a panel study of people aged 50 and older, which began data collection in 2002 and has continued to track the same individuals every 2 years (Steptoe, Breeze, Banks, & Nazroo, 2012). The ELSA sample was refreshed at Waves 3 and 4 to ensure a representative cross-sectional sample of the population aged 50 and older. Only core sample members who were present at Wave 1 are included in the analysis in this study. The original ELSA sample was drawn from 18,651 respondents to the Health Survey for England in 1998, 1999, or 2001 and are interviewed face to face as well as asked to complete a

self-completion questionnaire. There were 10,331 sample members who completed both a computer-assisted personal interview and a self-completion questionnaire in 2002–03 at Wave 1; 8,256 respondents at Wave 2; 7,103 respondents at Wave 3; 6,261 respondents at Wave 4; and 5,913 respondent at Wave 5. Respondent attrition results in the number of waves completed by sample members ranging from 1 to 5, with a mean of 3.1. The details of the ELSA sample are described in more depth by Cheshire, Hussey, Phelps, and Wood (2012).

*Outcome Measures*

Eudemonic SWB is measured using a revised 15-item version of the CASP-19 scale developed by Wiggins, Netuveli, Hyde, Higgs, and Blane (2007). CASP-19 was specifically designed to measure quality of life in later age covering four domains of individual needs: control, autonomy, self-realization, and pleasure. In the original CASP-19 scale, tested using data from Wave 1 of ELSA, three domains had five items with the control domain having four (Hyde, Wiggins, Higgs, & Blane, 2003). A quality-of-life index is constructed by summing the scores to 4-point Likert scale responses (often, sometimes, not often, and never) for each item. In a revised 15-item scale suggested by Vanhoutte (2012), four items are removed that either have low factor loadings to the substantive domain (i.e., shortage of money and family responsibility) or have moderate loadings across multiple substantive domains (i.e., my age prevents me from doing things and my health stops me from doing things). The resultant 15-item CASP scale reflects a three-factor solution where the control and autonomy domains form one factor and each domain includes five items. The summed scores for the revised 15-item scale range from 0 to 45 where a higher score indicates better quality of life. The items that form the revised CASP-15 scale are asked in the self-completion questionnaire in ELSA.

Evaluative SWB is measured using the Satisfaction With Life Scale (SWLS) developed by Diener, Emmons, Larsen, and Griffin (1985). This scale, which consists of five items about overall life satisfaction, is a widely used measure of SWB in academic research (Pavot & Diener, 2008). Similarly to CASP, SWLS has Likert scale responses, which are summed to provide an overall score. The responses range from strongly agree to strongly disagree on a 7-point scale, which result in summary scores from 5 to 35, with higher scores indicating greater life satisfaction. The SWLS items were asked in the self-completion questionnaire in ELSA from Wave 2 onwards.

Affective SWB is not measured directly in this study. Rather, we use a shortened 8-item version of the Center for Epidemiologic Studies-Depression (CES-D) scale (Radloff, 1977) to measure a broader concept of negative affect. CES-D provides an indication of negative affect during the last week through questions which ask about depressive symptoms experienced. The items are answered using binary yes/no responses, which can be summed to give summary scores ranging from 0 to 8. Those with higher scores are considered to show more depressive symptoms. Steffick (2000) suggests dichotomizing the CES-D scores at the point of four or more symptoms to indicate those most at risk of depression. A continuous measure is used in the analysis in this paper to make it easier to compare the results from the other SWB measures. Modeling CES-D with a binomial distribution did not alter the substantive findings (data not shown here). The items that form CES-D are asked during the face-to-face interview in ELSA.

*Marital Status*

Marital status is measured at each survey wave using a four-group categorization based on individuals' current and previous relationships: single and never been married nor in a civil partnership; married, in a civil partnership or cohabiting; separated or divorced; and widowed.

*Economic Activity*

Economic activity is grouped into three categories: employed, retired, and other inactive (i.e., unemployed, permanently sick or disabled, or looking after family) and measured at each survey wave.

*Health Status*

Limiting long-standing illness is recorded if the respondent reports a long-standing illness that is likely to affect them over a period of time in a way that limits their activities. The number of limitations in activities of daily living (ADLs) and instrumental activities in daily living (IADLs) reported by the respondent provide an indication of disability. ADLs comprise dressing, walking, bathing, eating, getting out of bed, and using the toilet. IADLs comprise preparing a hot meal, shopping for groceries, making telephone calls, taking medication, doing work around the house, and managing money. Chronic conditions are measured by the number of the following health problems a respondent reports having ever been diagnosed with: heart disease, a stroke, diabetes, cancer, lung disease, or arthritis. The health status characteristics are measured at each survey wave.

*Additional Control Variables*

We include a number of additional variables that have been shown to be associated with SWB, but are not highly correlated with age, and are measured at each survey wave unless stated otherwise.

*Demographic.*—Gender and ethnicity are measured at baseline (Wave 1). Ethnicity is dichotomized into white and non-white.

*Social support.*—The receipt of social support is measured by the number of close contacts an individual has and the level

of support they receive from these contacts. Close contacts are defined as children, other immediate family, and friends that an individual has a close relationship with. The level of support from these contacts is measured by a positive support score calculated from three items that ask how much they understand the way the respondent feels about things, how much they can be relied on if the respondent has a serious problem, and how much the respondent can open up to them to talk about worries. Responses are summed for support from children, other immediate family, and friends and range from 0 to 27, with a high score indicating greater social support.

*Volunteering.*—Volunteering is measured by whether a respondent has volunteered in the last month.

*Socioeconomic.*—Socioeconomic status is measured using wealth, occupational class categorized using the National Statistics Socio-economic Classification (NS-SeC), and time spent in education. Wealth is measured at each survey wave by grouping individuals into quintiles based on non-pension family wealth. NS-SeC is used as a six-group categorization, which classifies occupations according to the structure of employment in modern society (Rose & Pevalin, 2005). Respondents are classified by their current or most recent job at baseline into the following categories: managerial and professional occupations, intermediate occupations, small employers and own account workers, lower supervisory and technical occupations, semiroutine and routine occupations, and other.

Education is measured at baseline using the age an individual first left full-time education. Individuals are grouped into three categories: those who left at or before the compulsory school-leaving age that applied in the United Kingdom to their cohort (referred to as 'low' education), those leaving school after compulsory school-leaving age but before age 19 (referred to as 'mid' education), and those leaving at or after age 19 (referred to as 'high' education).

### *Statistical Analysis*

We use a multilevel linear growth curve model to predict SWB scores in ELSA at baseline and change in well-being over time, conditional on cohort (age at baseline) and survey wave (giving the effect of aging). The measurement of SWB at Waves 1–5 provides clustered data where repeated measures of the outcomes at Level 1 are clustered within individuals at Level 2. Longitudinal data in this form lend itself to analysis using multilevel modeling to take account of its hierarchy (Goldstein, Healy, & Rasbash, 1994; Steele, 2008). The multilevel modeling procedure can estimate the amount of variability within individual trajectories over time and the amount of variability between individuals.

The first model fitted is a simple variance components model, with no predictor variables, to examine how the total variance is partitioned between individuals and within individuals over time. A subsequent base model is estimated that includes cohort-age at baseline at Level 2, survey wave at Level 1, and a cross-level interaction between these effects. This model shows the cross-sectional cohort effect (reflecting cohort differences in SWB), the longitudinal aging effect (denoted by wave), and how aging effects depend on baseline cohort-age.

It might be expected that the linear growth rate measured by the survey wave will vary from individual to individual, rather than be fixed, and therefore a random effect for survey wave could be added. This would take account of the different direction of trajectories in SWB that each individual follows over time. However, in the interest of parsimony and due to the fact that the inclusion of random effects on survey wave and baseline cohort-age did not alter the substantive findings, only a linear growth model is reported. The model is therefore equivalent to a random intercept model in multilevel modeling terminology. Survey wave is fitted as a linear effect rather than using dummy variables to save on degrees of freedom. The inclusion of a linear effect for survey wave does not alter the substantive findings. The model is specified as follows:

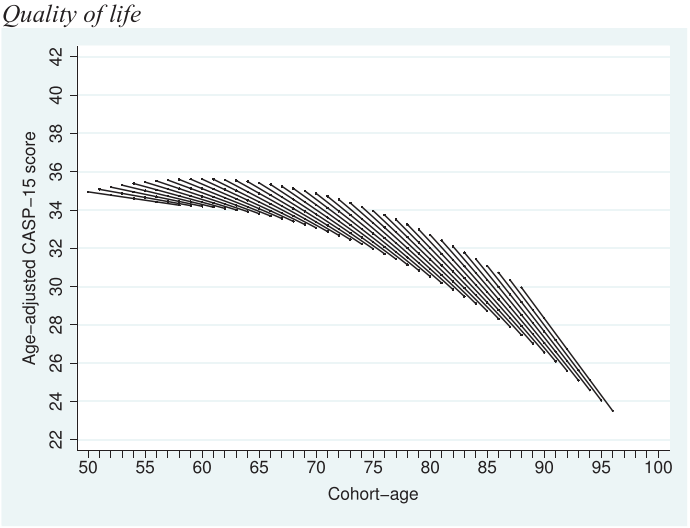
$$Y_{tj} = B_{0tj} + B_1\left(\text{wave}_{tj}\right) + B_2\left(\text{cohort}_j\right) + B_3\left(\text{cohort}_j\right)^2 + B_4\left(\text{wave}*\text{cohort}_{tj}\right)$$

$$B_{0tj} = B_0 + u_{0j} + e_{0tj}$$

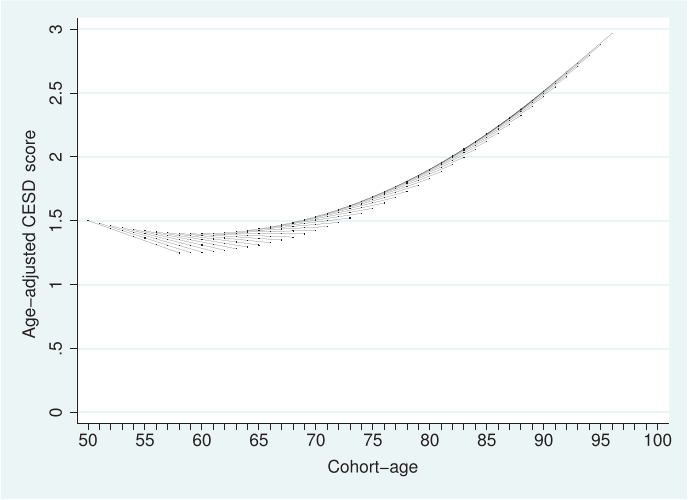
where $t$ ($t = 1,\ldots,T_j$) indicates the Level 1 units (survey wave) within $j$ ($j = 1,\ldots,n$) Level 2 units (individuals); $Y_{tj}$ is the SWB score at time $t$ of an individual $j$; $B_1$ is a coefficient for the survey wave; $B_2$ is a coefficient for an individuals' cohort-age at baseline centered to a mean of 65; $B_3$ is a quadratic term for cohort-age at baseline to take account of the nonlinear relationship expected between age and SWB; $B_4$ is a cross-level interaction between survey wave and baseline cohort-age, which indicates the change in SWB by cohort over survey waves. The fixed effect of the intercept $B_0$ indicates the mean SWB score at Wave 1 for an individual aged 65 at baseline. The individual level residuals, or random intercept effect ($u_{0j}$), and the survey wave level residuals ($e_{0tj}$) are assumed to be normally distributed, that is, $e_{0tj} \sim N(0, \sigma^2_{e0})$ and $u_{0j} \sim N(0, \sigma^2_{u0})$.

Marital status, economic activity, and health status variables as well as controls for demographic, social support, volunteering, socioeconomic, and education effects are added to the base model, including interactions with the survey wave to determine the effect over time of each variable. The fit of the final model, including all variables, is assessed by the reduction in the −2 log likelihood compared with the base model specified above. The results of the base model and the final model are presented graphically using age vector plots for each 1-year cohort, which show the baseline score for each SWB outcome, at the origin of each line, and the change over each survey wave represented by the slope of each line (see Figure 1).

a) *Quality of life*




b) *Depressive symptoms*




c) *Life satisfaction*

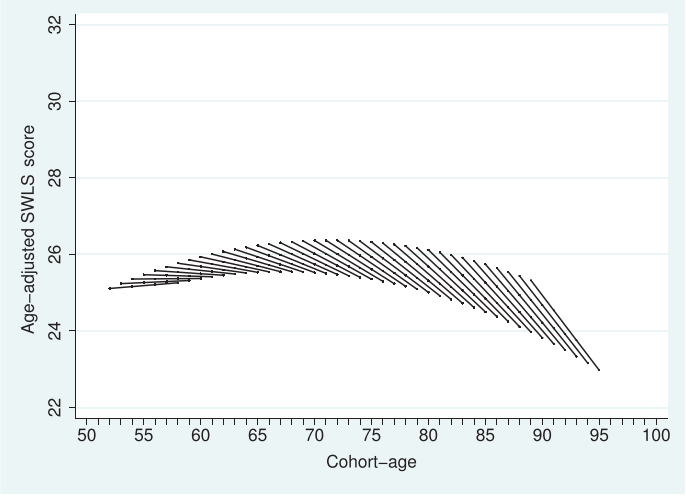



Figure 1. Age-adjusted vector graphs for predicted subjective well-being scores by single year of age from Waves 1 to 5, 2002–11. (**a**) Quality of life; (**b**) depressive symptoms; and (**c**) life satisfaction. See Table 3 for base model coefficients. CES-D = Center for Epidemiologic Studies-Depression; SWLS = Satisfaction With Life Scale.

An advantage of using a multilevel model to analyze change over time is that the number of Level 1 units clustered at Level 2 does not need to be even. Unevenness often occurs with repeated measures, where attrition means that data are missing for some individuals at a later survey wave. Providing the attrition is missing at random, no further adjustment is required and the data can be combined from individuals with different measurement patterns (Steele, 2008). Therefore, no imputation procedure is applied to the final model of interest in this study. A multiple imputation procedure was applied to a more parsimonious version of the final model for quality of life (CASP), which shows that imputation does not alter substantive conclusions drawn from nonimputed data (results available from authors). The imputation procedure treated attrition, wave-specific attrition, and item nonresponse in the same way. Imputation was not applied to those who did not respond due to mortality.

Moreover, most of the missing data are due to missing values in the outcome SWB scores during Waves 2–5, which means imputing across waves for individuals with only one observed value at Wave 1 would produce estimated values that are likely to have a large degree of uncertainty by Wave 5. Spratt and colleagues (2010) suggest that when only the outcome variable is missing, complete case analysis is likely to be unbiased providing the data missingness is unrelated to the outcome. A logistic regression model with missing or not at Waves 2–5 as the outcome shows that CES-D and SWLS are not related to attrition when controlling for the other variables (measured at baseline) in the final model. However, lower CASP scores are associated with a higher likelihood of attrition (results available from authors).

To adjust for nonresponse at Wave 1, the survey weights produced for ELSA respondents at Wave 1 are used at Level 2 in the model. These weights bring the sample in line with the 2002–03 population aged 50 and older in England (see Cheshire et al., 2012). All statistical analysis is carried out using the runmlwin command in Stata v12 (Leckie & Charlton, 2011), to fit multilevel models in MLwiN v2.25 (Rasbash, Charlton, Browne, Healy, & Cameron, 2009).

## Results

Table 1 shows the weighted baseline characteristics in 2002–03 (Wave 1). The mean SWB scores are 34.9 for CASP, 1.6 for CES-D, and 26.1 for SWLS (first measured at Wave 2, 2004–05). The average age of a respondent at baseline is 65 and almost half are male. The vast majority of respondents in the sample are white and more than two-thirds are living with a partner. The sample is evenly distributed across wealth quintiles. Almost half are classified as working or previously working in a routine or manual occupation level and more than half had a low level of education when leaving school. Half of respondents are retired, a third are employed, and the remaining sixth are economically inactive (i.e., unemployed, permanently sick or disabled, or looking after family). More than a third have a limiting long-standing illness and, on average, a respondent has 0.6 limitations in ADLs and IADLs, and 1.2 chronic conditions. The average respondent has almost seven close contacts and a mean support score of 15.7. Around 1 in 10 volunteered in the last month.

Table 1. Baseline Characteristics of ELSA Respondents at Wave 1, 2002–2003

| Variable | Mean |
|---|---|
| Subjective well-being scores | |
| CASP-15 | 34.9 |
| CES-D | 1.6 |
| SWLS[a] | 26.1 |
| Demographic | |
| Age | 65.1 |
| Male | 46.5% |
| Non-white | 2.6% |
| Marital status | |
| Single | 5.1% |
| Partnered | 69.6% |
| Separated | 8.0% |
| Widowed | 17.3% |
| Wealth | |
| Quintile 5 | 20.1% |
| Quintile 4 | 20.2% |
| Quintile 3 | 20.1% |
| Quintile 2 | 20.0% |
| Quintile 1 | 19.5% |
| Occupational level | |
| Managerial and professional | 28.8% |
| Intermediate | 23.9% |
| Routine | 47.3% |
| Education | |
| High | 12.1% |
| Mid | 31.8% |
| Low | 56.1% |
| Economic activity | |
| Retired | 49.7% |
| Employed | 33.0% |
| Other inactive | 17.3% |
| Health | |
| Limiting long-standing illness | 34.2% |
| Limitations in ADLs or IADLs | 0.6 |
| Chronic conditions | 1.2 |
| Social support | |
| Close contacts | 6.8 |
| Support score | 15.7 |
| Carer | 9.5% |
| Volunteer | 11.4% |
| Total sample size | 10,331 |

*Notes*. ADLs = activities of daily living; CES-D = Center for Epidemiologic Studies-Depression; ELSA = English Longitudinal Study of Ageing; IADLs = instrumental activities in daily living; SWLS = Satisfaction With Life Scale.

[a]SWLS baseline scores were first measured at Wave 2 (2004–05).

Table 2 presents the model results for each SWB outcome from the variance components models, without any predictor variables. It shows that there is a significant variation ($p < .001$) in each SWB measure within individuals over time (Level 1) and between individuals (Level 2), which provides a

strong justification for the multilevel modeling approach. The variance partition coefficient is 0.69 for CASP, 0.53 for CES-D, and 0.68 for SWLS, which means 31%, 47%, and 32% of the variance in SWB scores is due to differences within individuals over time. This suggests considerable change in the SWB scores of individuals during ELSA Waves 1–5.

Table 3 displays the results from the base and final linear growth curve models for CASP, CES-D, and SWLS.

Table 2. Variance Components Multilevel Models for Quality-of-Life, Depressive Symptom, and Life Satisfaction Scores

| | Variance | | |
|---|---|---|---|
| | Level 2 | Level 1 | VPC |
| CASP | 36.75 | 16.18 | 0.69 |
| CES-D | 1.98 | 1.73 | 0.53 |
| SWLS | 27.00 | 12.48 | 0.68 |

*Note*. CES-D = Center for Epidemiologic Studies-Depression; SWLS = Satisfaction With Life Scale; VPC = variance partition coefficient.

The fixed effect of baseline cohort-age in the base model is inconsistent across SWB measures. Individuals who are in older cohorts at Wave 1 are likely to indicate that they have a poorer quality of life and more depressive symptoms than those in younger cohorts. However, older cohorts at Wave 2 (the first wave SWLS is measured) are likely to have higher life satisfaction than those that are younger at baseline. The effect of the quadratic term for cohort is consistent across SWB measures and suggests that at baseline, the oldest cohorts in the sample are likely to have progressively lower CASP and SWLS scores and higher CES-D scores.

The fixed estimates of survey wave in the base model show that there is a drop in quality of life and life satisfaction over time. CASP and SWLS scores are predicted to decline for an individual aged 65 by 3.4 points and 1.2 points, respectively, over 8 and 6 years, respectively. There is not a significant effect over time on an individual of average age for the number of depressive symptoms.

Table 3. Base SWB Multilevel Linear Growth Curve Models

| | | Base model | | Final model | |
|---|---|---|---|---|---|
| | | Estimate | *SE* | Estimate | *SE* |
| CASP | Fixed part | | | | |
| | Constant | 35.537*** | 0.101 | 40.338*** | 0.223 |
| | Wave | −0.666*** | 0.022 | −0.483*** | 0.072 |
| | Age | −0.047*** | 0.008 | 0.018 | 0.009 |
| | Age 2 | −0.007*** | 0.001 | −0.005*** | 0.001 |
| | Wave × Age | −0.038*** | 0.002 | −0.034*** | 0.003 |
| | Random part | | | | |
| | Level 1 variance | 15.024*** | 0.303 | 14.725*** | 0.286 |
| | Level 2 variance | 36.516*** | 0.762 | 22.516*** | 0.499 |
| | Log likelihood | −94,904 | | −92,761 | |
| | *N* | 9,629 | | | |
| CES-D | Fixed part | | | | |
| | Constant | 1.416*** | 0.025 | 0.395*** | 0.058 |
| | Wave | 0.01 | 0.006 | −0.021 | 0.021 |
| | Age | 0.009*** | 0.002 | −0.020*** | 0.002 |
| | Age 2 | 0.001*** | 0 | 0.001*** | 0 |
| | Wave × Age | 0.006*** | 0.001 | 0.003*** | 0.001 |
| | Random part | | | | |
| | Level 1 variance | 1.717*** | 0.03 | 1.684*** | 0.029 |
| | Level 2 variance | 1.936*** | 0.05 | 1.182*** | 0.034 |
| | Log likelihood | −62,591 | | −60,624 | |
| | *N* | 9,917 | | | |
| SWLS | Fixed part | | | | |
| | Constant | 26.202*** | 0.099 | 28.774*** | 0.230 |
| | Wave | −0.227*** | 0.027 | 0.012 | 0.087 |
| | Age | 0.047*** | 0.008 | 0.114*** | 0.010 |
| | Age 2 | −0.003*** | 0.001 | −0.001 | 0.001 |
| | Wave × Age | −0.023*** | 0.003 | −0.021*** | 0.004 |
| | Random part | | | | |
| | Level 1 variance | 12.366*** | 0.256 | 12.224*** | 0.241 |
| | Level 2 variance | 26.962*** | 0.606 | 19.261*** | 0.462 |
| | Log likelihood | −65,616 | | −64,500 | |
| | *N* | 7,430 | | | |

*Notes*. See *Method* section for a discussion of the variables included in the final model. CES-D = Center for Epidemiologic Studies-Depression; SWB = subjective well-being; SWLS = Satisfaction With Life Scale.

***$p < .001$.

The interaction term of survey wave by cohort shows that in the base model for all three outcome measures, SWB deteriorates faster for individuals that are in older cohorts at baseline. For example, a 60-year old in 2002–2003 is predicted to see their CASP score fall by almost 2 points between Waves 1 and 5, whereas an 80-year old is predicted to see their CASP score fall by just over 5 points.

Figure 1 shows this accelerated decline for older cohorts graphically in the base model using age-vectors of change in SWB scores from Wave 1 (or Wave 2 in the case of SWLS) to Wave 5 for each single year of cohort-age. A decline, shown by the negative slope for each single year of age, in CASP scores is consistent across all ages, although this is small up to age 55 and at an ever increasing rate thereafter. For those aged 52–63, SWLS scores increase over time, indicating improved life satisfaction, whereas for those at older ages, SWLS scores decline at an increasing rate. CES-D scores decline up to age 62, indicating fewer depressive symptoms by Wave 5. There is an increase in depressive symptoms over time for those aged older than 65, which increases dramatically after age 70. For example, an individual aged 78 at baseline is predicted to have a CES-D score that is 20% higher by Wave 5.

The estimates from the final model in Table 3 show that the fixed effect of cohort-age at baseline is reversed when including all of the time-varying and non–time-varying covariates for CASP and CES-D. This means that older cohorts at baseline will have higher quality of life and fewer depressive symptoms when all other covariates are held constant. The inclusion of marital status and health status variables has the greatest effect on the cohort coefficient for both of these outcomes. The effect of cohort-age at baseline on SWLS scores is twice as strong in the final model compared with the base model and suggests that older cohorts at baseline will have even higher life satisfaction when other influences, related to age, are held constant. The effect becomes notably stronger when marital status and health status variables are added. The cohort-age–squared term in the final model suggests that quality of life in the oldest cohorts will be lower and more depressive symptoms will be experienced. The effect on life satisfaction becomes insignificant in the final model.

The effect of linear time on CASP scores, represented by the survey wave, becomes weaker in the final model, although the effects remains significant and negative, suggesting individuals will, on average, experience deterioration in the quality of life over time. The effect of survey wave remains insignificant for depressive symptoms and becomes insignificant for life satisfaction in the final model.

The accelerated deterioration in each SWB outcome for individuals who are in older cohorts at baseline, represented by the negative effect of the cohort-age by wave interaction, remains stable in the final model for each SWB outcome. This is despite controlling for time-varying and non–time-varying individual characteristics related to age and SWB in later life.

The addition of the time-varying and non–time-varying effects in the final model compared with the base model for each SWB outcome reduces the random variance in the intercept at Level 2 (i.e., variation between individuals) by 38% for CASP, 39% for CES-D, and 29% for SWLS. This shows that the full model explains a considerable proportion of the variance in SWB between individuals at baseline. The same cannot be said for the difference in the explained variance at Level 1 between the base model and the full model. The addition of the same control variables has very little effect on the proportion of variance explained for the intercept at the survey wave level. The proportion of the within-individual variance explained at Level 1 is 2% for CASP, 2% for CES-D, and 1% for SWLS. The significant reduction ($p$ value < .001) in the −2 log likelihood suggests better model fit for the final model compared with the base model for each SWB outcome when taking into account the added degrees of freedom.

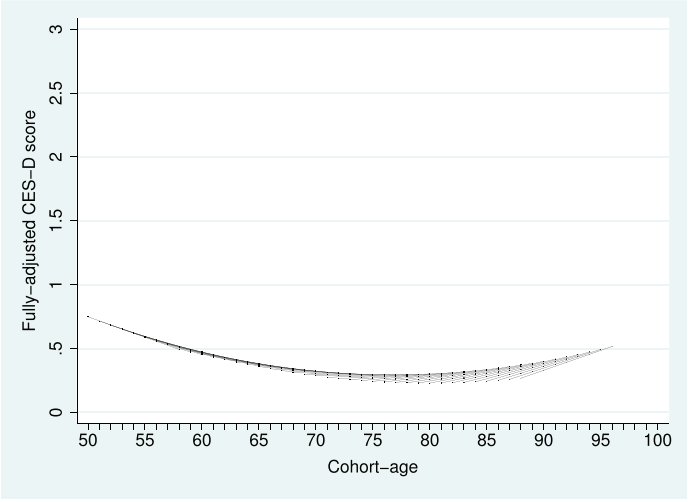
Figure 2 shows the predicted baseline score and trajectory over time for each single year of age from the final model. The predicted baseline value of CASP scores, represented by the starting position of each cohort-age vector, is flat across each single year of age. However, the steeper downward slopes for vectors of older cohorts represent an accelerated decline in quality of life compared with those in younger cohorts. Depressive symptoms are predicted to be lower for individuals in older cohorts in the full model, however, the oldest cohorts are predicted to experience a faster increase in the number of depressive symptoms over time. This is represented by the upward slopes in each age vector after 72. Life satisfaction is shown to be higher for each single year of cohort-age at baseline. However, there is an accelerated decline in SWLS scores after age 65.

## Conclusions

This paper has explored the longitudinal relationship between multiple approaches to the measurement of SWB, cohort-age and aging in a sample of older adults in England. We find that there is a positive relationship between SWB and cohort-age when taking into account the factors associated with increased baseline age and SWB. This suggests that factors such as poor health and widowhood, which are associated with older age, are able to explain poorer SWB in older cohorts. Cohort differences in SWB are not significant, except in the very oldest cohorts for eudemonic well-being. Individuals have fewer depressive symptoms, up to age 67 and remain constant thereafter. Individuals have higher evaluative well-being, measured by a life satisfaction index, up to the age of 75 and remain constant thereafter. These findings provide mixed support for our first hypothesis that SWB does not vary by cohort when controlling for

a) *Quality of life*


b) *Depressive symptoms*




c) *Life satisfaction*

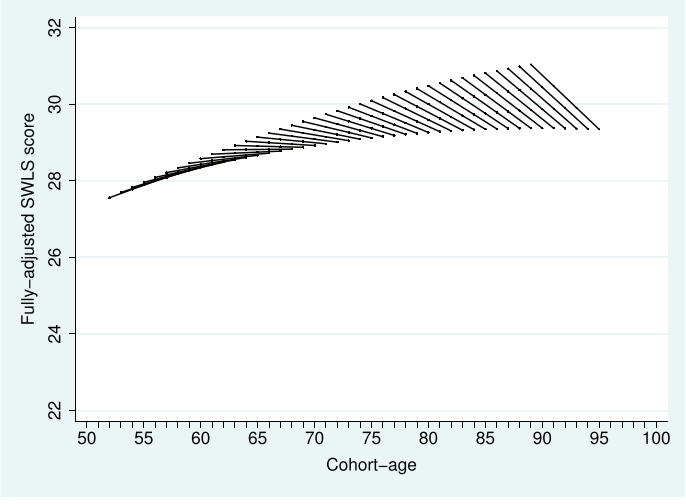



Figure 2. Fully adjusted vector graphs for predicted subjective well-being scores by single year of age from Waves 1 to 5, 2002–11. (**a**) Quality of life; (**b**) depressive symptoms; and (**c**) life satisfaction. Predicted values refer to an individual who is female, white, in the richest wealth quintile, in a managerial and professional socioeconomic class, has a high education level, is volunteering, has a mean number of close contacts and support score from social contacts, has no limitations in activities of daily living, chronic conditions, or limiting long-standing illness, is retired, and has a partner. See Table 3 for full model coefficients. CES-D = Center for Epidemiologic Studies-Depression; SWLS = Satisfaction With Life Scale.

age-related drivers and other known associates of SWB in the older age population.

In comparison with the earlier studies that find a negative or no association between cohort and indicators of SWB when adjusting for other effects (Gerstorf et al., 2008; Netuveli et al., 2006; Wiggins et al., 2004; Zaninotto et al., 2009), this study illustrates that for different indicators of SWB, different relationships with cohort-age exist. Controlling for possible correlates, the relationship between cohort and eudemonic well-being is curvilinear in shape, illustrating that autonomy and self-actualization initially increase and then decline among the oldest cohorts. Depressive symptoms on the other hand do not necessarily increase in older cohorts, but are fewer providing there is partnership support and an absence of poor health. Satisfaction with life on the other hand seems to increase in older cohorts and increase at a faster rate when controlling for marital and health status. This is probably due to the adaptive nature of evaluative measures of SWB, and shows that as people age, their health declines and they have less partnership support, they nevertheless become more satisfied with their circumstances, and are happier in their situation than they would have been if they had been younger. Therefore, it is important to consider the multidimensionality of SWB when analyzing its relationship with cohort and to consider appropriate SWB measures related to theory.

Our growth curve model shows there is considerable variation in measures of eudemonic, evaluated, and affective SWB within individuals over time (as well as between individuals). We find that aging of older cohorts is consistently associated with an accelerated deterioration in SWB across each outcome. This effect cannot be explained by changes in retirement, marital, and health status as well as other factors associated with SWB. This supports our second hypothesis and findings from previous studies using ELSA (Zaninotto et al., 2009), the Berlin Aging Study (Gerstorf et al., 2007), and the Norwegian NorLAG study (Hansen & Slagsvold, 2012). The accelerated decline in the oldest cohorts may reflect entry into the final years of life when, despite the presence of partners and the absence of measurable health conditions, it is argued that individuals experience deteriorating SWB that is related to a closeness to death (Gerstorf et al., 2008). This may be brought on by declines in health and social support that are imperfectly measured by social survey instruments. In practice, most people older than 70 will experience some loss in health that may not have been diagnosed or that they feel does not restrict their daily activities. Moreover, the oldest old might experience deterioration in their SWB because their partner is not able to offer the same level of physical, emotional, and financial support. This is because their partners are more likely to be ill, or becoming ill, as compared with a younger person. Testing the effect of changes in the health status of partners would be a fruitful extension to this paper and measurable using ELSA.

The findings of this paper should be set against a number of potential limitations that we have tried to address. First, the attrition of the ELSA sample over time means it is difficult to know whether if respondents who have dropped out were included, the findings would remain the same. This is heavily dependent on the selectivity of the attrition and the reason for drop out. Our methodology allows for an uneven sample across time points and is known to provide unbiased estimates providing attrition is not related to the outcome. This is the case for the depressive symptoms and life satisfaction outcome variables, but not the quality-of-life measure. Attempts to impute missing data for quality-of-life scores did not produce substantively different findings. The data have also been adjusted using sample weights created to ensure the sample is representative at baseline.

Second, it is unclear to what extent the results are affected by panel condition rather than genuine cohort differences in change in SWB over time. Baird and colleagues (2010) suggest that answering the same questions on multiple occasions might lead people to change their response over time. The discontinuity in the age-vectors (see Figures 1 and 2), which shows that a person aged 65 at baseline is predicted to have lower life satisfaction at age 70 than an individual who was 70 at baseline, could be a result of panel conditioning. More data are required over a longer period of time, including refreshment sample members who have participated for more than two occasions to test this effect. This would enable an assessment of the effects for different cohorts over time but at the same ages to see whether there is an effect specific to a particular cohort or a consistent change across cohorts that is only dependent on the number of times they are asked the same questions.

Third, there could be an effect of the distribution of the SWB scale on the findings in the paper, which explain why older people who have higher SWB at baseline experience a faster decline over time. This is because those that start with higher SWB have much further to fall than those that start with low SWB. For example, for depressive symptoms, a CES-D score of zero indicates no depressive symptoms, and therefore people in this situation cannot become any less likely to be depressed. Clouston (2011) have explored this effect for grip strength in older age and suggest using an outcome of proportional decline. However, using this approach to predict CES-D scores did not alter the substantive finding of accelerated within-individual decline in the oldest cohorts shown in this study.

In summary, this paper suggests that cohort differences are not a definitive cause of low levels of SWB. In fact, people who are in older cohorts can expect to have higher SWB of different forms than those that are younger when account is taken of their poorer health and greater likelihood to be widowed. However, people in older cohorts are more likely to experience a faster decline in their SWB over time. This might be related to events and feelings that the oldest old experience in their final years of life that are not

related to economic activity, partnership status, or health status and are unobserved in this study. These experiences might be brought on by a realization that one cannot live forever which itself is brought home by the onset of one's own frailty and the frailty and bereavement of close partners, siblings, and friends (Baird et al., 2010; Gerstorf et al., 2008). This does not mean that the final period of life is a time when people have no control over their lives and are inevitably unhappy and depressed as this study finds that during 8 years of aging in ELSA, those in the oldest cohorts are no less happy than those in the youngest cohorts.

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