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Life Satisfaction Across the Lifespan: Findings from Two Nationally Representative Panel Studies

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Abstract

Two large-scale, nationally representative panel studies (the German Socio Economic Panel Study and the British Household Panel Study) were used to assess changes in life satisfaction over the lifespan. The cross-sectional and longitudinal features of these studies were used to isolate age-related changes from confounding factors including instrumentation effects and cohort effects. Although estimated satisfaction trajectories varied somewhat across studies, two consistent findings emerged. First, both studies show that life satisfaction does not decline over much of adulthood. Second, there is a steep decline in life satisfaction among those older than 70. The British data also showed a relatively large increase in satisfaction from the 40s to the early 70s. Thus, age differences in well-being can be quite large and deserve increased empirical and theoretical attention.

Keywords

Subjective well-being; Life satisfaction; Aging; Sequential design; Instrumentation effects

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1 Introduction

Subjective well-being reflects an individual's overall evaluations of his or her life.[1] In this paper, we investigate whether there are age differences in these evaluations as this is a topic of on-going debate. Indeed, different theoretical perspectives offer different accounts of the determinants of life satisfaction which translate to different predictions regarding age differences in subjective well-being. According to early theories of subjective well-being, people's happiness results most directly from the objective circumstances of their lives. For instance, to derive a life satisfaction judgment, a person might review the objective conditions of his or her life, weight each condition based on its relative importance, and then sum across those evaluations to create an overall judgment (Campbell et al. 1976). If this model is correct, then a great deal of between-person variation in subjective well-being should be accounted for by demographic variables. Furthermore, as an individual's physical health, financial status, or social relationships change over time, his or her life satisfaction judgments should also change. Because aging tends to be associated with poorer health, less money, and fewer social contacts (Baltes and Mayer 1999), these early models of well-being would predict that average levels of happiness and life satisfaction should decline in old age.

Despite the intuitive appeal of this model of the determinants life satisfaction, recent evidence has led many researchers to question this approach. Although demographic characteristics reliably predict well-being, they account for a relatively small amount of variance (Diener et al. 1999). Therefore, rather than influencing life satisfaction directly, objective circumstances may affect well-being though a variety of subjective processes (Diener and Lucas 1999). Factors such as a person's prior standing in a domain, his or her expectations for the future, and his or her temperament-based reactivity to positive and negative events might moderate the impact that specific experiences have on his or her life satisfaction. In support of this idea, researchers have shown that subjective well-being variables tend to be moderately to strongly correlated with personality characteristics, such as extraversion, neuroticism, and self-esteem (Steel et al. 2008). If life satisfaction is influenced by relatively stable aspects of temperament, then mean levels of well-being may remain stable over the lifespan or largely mimic the patterns observed for these related personality traits.

In contrast to the classical and dispositional (or “essentialist”) perspectives, socioemotional selectivity theory posits that people might actually become happier and more satisfied with their lives as they get older. Carstensen (1995) argued that as people move into their final years of life, they become increasingly conscious of the amount of time they have left to live. This awareness of impending mortality may lead older individuals to focus on ways to make their remaining experiences as enjoyable as possible. For instance, compared to younger individuals, older people tend to place a greater emphasis on emotional aspects of potential social interactions and are more likely to remember the emotional content of their experiences (Carstensen et al. 1999). Older people may also be more adept at regulating their emotions than younger people (Gross et al. 1997). Taken together, these processes should lead to increases in life satisfaction across the lifespan.

[1]Because there are multiple ways that a person could evaluate his or her life, there are multiple variables that could be assessed to capture this overall evaluation. For instance, Diener et al. (1999) suggested that to gain a complete picture of a person's well-being, researchers should assess the related but separable dimensions of positive affect, negative affect, and life satisfaction. Positive and negative affect are emotional dimensions that capture the affective feelings that people experience as they live their lives. Life satisfaction is a cognitive judgment that taps an individual's reflective judgment about the conditions in his or her life. In the current paper, we use these terms (positive affect, negative affect, and life satisfaction) when referring to research that has assessed one of these more specific variables. We use the terms “happiness” or “subjective well-being” when discussing general findings or broad theoretical models that might reasonably apply in similar ways to the more distinct constructs. We should note, however, that the empirical research we present in these studies focuses specifically on life satisfaction, rather than on the affective dimensions.

2 Previous Research

As outlined, a number of competing predictions about age-related changes in life satisfaction can be derived from existing theories of subjective well-being. In short, average levels of life satisfaction may decrease, increase, or remain relatively constant across the lifespan. Previous research provides some empirical support for the prediction that life satisfaction either increases or remains constant across the lifespan. Numerous cross-sectional studies have found stable levels of life satisfaction across different cohorts. For instance, in studies of cross-national samples, Cantril (1965) and Inglehart (1990) found almost no differences across age groups in the percentage of people who indicated that they were “very happy.” Diener and Suh (1998) examined subjective well-being in many nations around the world and found that life satisfaction was quite stable. Similarly, Hamarat et al. (2002) found no differences in life satisfaction scores across groups of people between 45 and 89 years of age.

Other studies have found that certain components of subjective well-being may increase with age. Mroczek and Kolarz (1998), for instance, found that in a large, nationally representative sample of Americans, positive affect increased and negative affect decreased across cohorts (though these effects were moderated by a variety of individual differences including sex and personality). In a study of adults between the ages of 25 and 75 years, Prenda and Lachman (2001) found that age was positively correlated with life satisfaction. Finally, Blanchflower and Oswald (2008) used cross-sectional data from several waves of the General Social Surveys and the Eurobarometers to test the association between age and subjective well-being. They found a significant quadratic effect for age such that levels of happiness seemed to decrease from young adulthood to middle age, reaching a minimum at around age 47, and then increased throughout older adulthood.

Unfortunately, however, additional studies contradict this positive picture of well-being in later life. For instance, Freund and Baltes (1998) found that age was negatively correlated with both life satisfaction and positive affect, and Chen (2001) found that age was negatively related to life satisfaction in a sample of people age 60 and over. Thus, cross-sectional studies have shown that age is related to well-being in complicated (and sometimes contradictory) ways. However, because cross-sectional studies can conflate age-related change with cohort differences, their ability to shed light on enduring controversies is open to debate. Longitudinal studies (particularly longitudinal studies using multiple age cohorts) provide stronger evidence about the relation of age and well-being.

In one of the few existing large-scale longitudinal studies, Charles et al. (2001) used a cohort-sequential design to examine age-related change across four measurement periods spanning 23 years. Consistent with the cross-sectional evidence reviewed above, they found that well-being did not show a simple pattern of decline with age. Negative affect actually declined among all cohorts (though at a slower pace among the oldest cohort), and positive affect was relatively stable, declining only slightly among the oldest cohort. More recently, Mroczek and Spiro (2005) examined life-satisfaction ratings across a 22-year period in a sample of men between 40 and 85 years of age. In contrast to the Charles et al. (2001) study, these researchers found that well-being increased throughout middle age, but then dropped steadily after the age of 65. They also found that the men who eventually died during the course of the study showed the strongest declines in well-being. Thus, although longitudinal designs are a powerful method for research on aging, even these studies have been unable to resolve debates about changes in happiness over the lifespan.

3 Methodological Considerations

To resolve some of the discrepancies that exist in the literature, Pinquart (2001) conducted a meta-analysis of existing research on the affective components of subjective well-being. He found that, on average, results supported the classical models of well-being: positive affect tended to decline over the lifespan, and negative affect tended to increase. However, these effects were moderated by specific characteristics of the studies. For instance, effects varied depending on the representativeness of the sample, with more representative samples providing stronger evidence for declines in well-being over time. Pinquart suggested that non-representative samples may be healthier than the population average and may therefore provide a biased picture of age-related changes in well-being. Pinquart also found that effects varied depending on whether longitudinal or cross-sectional designs were used. Positive affect and affect balance declined more quickly and negative affect increased more quickly in longitudinal studies than in cross-sectional studies.

Because longitudinal studies allow researchers to track within-person changes over time, it is tempting to place more weight on results from these kinds of studies when making inferences about the psychological impact of aging. However, longitudinal designs have some limitations that are sometimes overlooked. In fact, longitudinal studies may be susceptible to particular confounds that can be difficult for researchers to identify (e.g., Robinson et al. 2005). For instance, because of major social or political events that occur over time, the unique historical context in which a study takes place, rather than the aging process itself, might account for observed longitudinal changes (Costa and McCrae 1982). A second problem with longitudinal designs is the potential for participants to be influenced by repeated testing (Baltes 1968; Bell 1953; Schaie 1965; Windle 1954). In other words, the simple act of answering the same questions on multiple occasions might lead people to change their responses over time (Choquette and Hesselbrock 1987; Sharpe and Gilbert 1998). Therefore, to the extent that instrumentation has an impact on self-report measures of well-being, longitudinal studies of well-being may provide a biased picture of age-related change.

Fortunately, these problems can be addressed using carefully designed studies that combine features of traditional cross-sectional and longitudinal research (Bell 1953; Schaie 1965). In the current study, we use a panel design with refreshment samples to isolate the effects that are of primary interest for our investigation—the effects of age—from those that will be considered noise (cohort, history, and instrumentation effects). Ultimately, our analyses will focus on the convergence of estimated trajectories from different age-groups who have been assessed for different lengths of time (Bell 1953). If trajectories from adjacent age-groups (or groups assessed in different years) overlap, then the data can be used to estimate a single longitudinal trend for the entire range of ages that are represented in the sample. However, if curves do not converge, then results based on the full sample will not be an accurate representation of “true” age-related change.

4 The Current Studies

Our main objective is to evaluate the pattern of age-related changes in life satisfaction that emerge over the lifespan. We examine these issues in the context of three underlying models that might explain this change. If well-being is influenced primarily by objective circumstances, then it should be negatively associated with age, at least in the oldest old. If well-being is primarily determined by personality traits, then mean levels should be reasonably stable over time and change in ways that are similar to the traits that are most strongly linked with well-being. Finally, if people are better able to regulate their

experiences and emotions as they get older, then well-being should be positively associated with age.

In order to test these predictions, it is important to use data that are derived from appropriately complex designs. First, samples should be large and representative of broad populations so that findings can be generalized (Pinquart 2001). Second, variants of the cohort-sequential design should be used so that age-related changes can be separated from cohort and history effects (Schaie and Caskie 2005; though see Donaldson and Horn 1992, for cautions about this approach). Third, measurements should be obtained on a regular basis so that reliable trajectories of life satisfaction can be estimated. Finally, in order to account for the effects of instrumentation, samples should be refreshed periodically so that same-aged participants can be assessed at the same time, but after participating in the study for different lengths of time. In the current research, we analyzed data from two nationally representative panel studies, one in Germany (Study 1) and one in Great Britain (Study 2), both of which meet these four criteria.

5 Study 1: The German Socio-Economic Panel Study

5.1 Method

5.1.1 Participants—The GSOEP is a nationally representative study of individuals living in Germany that began in 1984. Households in Germany were contacted using a multi-stage random sampling technique and participants were surveyed annually. The full sample (which includes almost 40,000 participants) is composed of seven distinct sub-samples, each of which was added at different points in time (see Haisken-DeNew and Frick 2005, for more details). New participants have continually been added to the study when underage household members reach age 16 and when new individuals enter households that had previously been surveyed. Approximately 51% of the GSOEP participants are women, and Haisken-DeNew and Frick (2005) reported that the demographic characteristics of the samples are similar to those of the general population.

To separate longitudinal, age-related change from cohort effects, it is necessary to follow distinct cohorts of individuals over time. To further separate these effects from history and instrumentation effects, it will be desirable to compare the initial results to those from a comparable group who began the study at a later time. Thus, for the purposes of this study, we selected individuals who were members of either the original West German resident sample or the 1998 or 2000 refreshment samples and who were living in West Germany in 1989 (the year before reunification). Because of the very small number of individuals at very old ages, we also restricted our analyses to those who were 91 years old or younger. A total of 20,696 individuals (12,707 from the initial sample and 7,989 from the refreshment samples) fit our selection criteria. These participants completed an average of 8.12 waves.

5.1.2 Measures—Life satisfaction was assessed with a single item that reads “How happy are you at present with your life as a whole?” Participants responded on an 11-point scale from 0 (“totally unhappy”) to 10 (“totally happy”). Means ranged from 6.82 (in 2004) to 7.45 (in 1984), with average levels generally declining over time. Standard deviations ranged from 1.73 (in 2001) to 2.09 (in 1984), also with a trend towards smaller standard deviations over time.

5.2 Results

We used a series of steps that were designed to clarify the trajectory of life satisfaction over the course of the lifespan. We began with cross-sectional analyses and then moved to more sophisticated techniques that take advantage of the longitudinal data to isolate age-related

change from cohort, calendar-year, and instrumentation effects. One important criterion for evaluating our confidence in the estimated trajectories is the extent to which these trajectories converge across different samples, cohorts, and analytic techniques.

We first investigated age differences in life satisfaction using cross-sectional data. We included all participants (from the three selected sub-samples), but we restricted the analysis to each person's first wave of data, regardless of the calendar year in which that first wave took place. These results are presented as a line with solid square markers in Fig. 1. As this figure shows, the trajectory is relatively flat from age 16 to age 74, with satisfaction scores hovering around 7.5. After this point, there is a somewhat sharp decline, with participants in their eighties generally reporting scores between 6.0 and 6.5.[2] To put this drop in perspective, the standard deviation of life satisfaction scores for all participants who are in their first wave of assessment is 1.89. Thus, a 1-point decline in life satisfaction represents an effect size of .52, and a 1.5-point decline represents an effect size of .79. These analyses suggest that age differences in life satisfaction are most evident when contrasting the oldest participants in the sample with the other age groups.

Next, we constructed a similar plot using all available data, ignoring the fact that each person contributed to multiple data points (though this fact was taken into account when calculating standard errors for the 95% confidence intervals). If cohort or testing effects are negligible then these aggregated analyses should converge well with the simpler cross-sectional analyses. These results are presented as a line with solid-circle markers in Fig. 1.

As can be seen, the results do not converge with the simpler cross-sectional analyses. Satisfaction drops quite steeply from the mid-teen years to the late-teen years and then very slowly from the early 20s until the mid 50s. Satisfaction then rebounds slightly until the mid 70s. Finally, consistent with the cross-sectional analyses, life satisfaction drops from the mid 70s until the late 80s. However, the drop is not quite as steep as it is in the cross-sectional analyses. Participants drop from approximately 7.25 in their 60s to about 6.60 in their late 80s. This .65-point drop represents an effect size of about one-third of a standard deviation. Thus, the cross-sectional and aggregated analyses provide somewhat different pictures of the changes in life satisfaction that take place over the course of the lifespan.

Next, we constructed a multilevel model that describes within-person age-related changes in life satisfaction. The level-1 model included centered age (centered at 44.91) along with a series of higher-order polynomials describing curves of increasingly complex shapes. Although polynomials up to the sixth power were tested, the curves did not change much after the cubic term was entered. Therefore, we fit a cubic model and plotted predicted satisfaction scores from this model as a line with open-triangle markers in Fig. 1. As can be seen in this figure, satisfaction scores are predicted to start around 7.75 at age 16 and to drop steadily until around age 30. After this, the curve flattens out until approximately age 60. Finally, predicted scores drop steeply from this age until late life. Notably, this model predicts that life satisfaction will decline more than a full standard deviation over the course of the lifespan, a much larger drop than suggested by either of the other two approaches. Thus, there does not appear to be clear convergence across these three techniques for investigating age differences in life satisfaction. For this reason, we used additional procedures to investigate possible confounding factors.

[2]Participants who were 88 or 89 reported slightly higher levels of satisfaction. However, the confidence intervals for each data point are quite large among the oldest groups, and this is the only age group that did not follow the general trend of lower life satisfaction among the very old.

First, to evaluate the influence of cohort effects, we compared first-wave cross-sectional results from those who entered the study in 1984 to the results from the combined sample of participants who entered the study in 1998 and 2000. This analysis compares same-aged participants from different cohorts in a way that does not confound these differences with instrumentation effects (as both groups have only participated for one wave). Results for both samples were quite consistent with the overall cross-sectional findings. An ANOVA testing the effects of age (in 2-year cohorts), sample (treated as a random factor), and their interaction showed that neither the main effect of sample nor the age by sample interaction was significant, $F(1, 251.39) = 3.23$, ns, and $F(37, 15516) = 1.19$, ns, respectively. When the interaction was removed from the model, the effect of sample was significant, $F(1, 15{,}553) = 4.84$, $p < .05$. However, the overall difference between groups was .07, an effect size of just .04. Furthermore, when the two samples were compared within each of 38 2-year age cohorts, only 3 comparisons were significantly different from zero at $p < .05$ (and the largest of these had an effect size of .34). Thus, the lack of convergence in Fig. 1 does not appear to be due to cohort effects.

Next we examined instrumentation effects using a multilevel model that predicted within-person life satisfaction from length of time in the study. Specifically, the level-1 part of this model includes a single predictor variable (ranging from 0 to 20) that indexes how long the person has been in the study at the time of the measurement. The estimates from this model confound repeated assessment with actual age-related change. Thus, to determine whether instrumentation effects are present, we estimated separate curves for individuals who started the study at different ages and then evaluated the convergence of these curves both with adjacent age groups and with the overall cross-sectional effect. Specifically, we separated participants into 2-year age groups and then included dummy variables for these age groups as level-2 predictors of the level-1 trajectory. We then plotted the separate within-person trajectories for each age group. If there are no instrumentation effects, then the estimated trajectories will reflect developmental change and the trajectories from adjacent groups should converge. In addition, the within-person trajectories for the various age groups should converge with the cross-sectional results. The results of this analysis are presented in Fig. 2 (with the first-year cross-sectional effects plotted for comparison).

As can be seen in this figure, among almost all age groups, there is a consistent downward trend in life satisfaction as the study progressed. On average, life satisfaction dropped approximately .04 points per year, which would translate into a .84-point drop in life satisfaction over the course of the 21-year study. This would also suggest that people drop approximately 3 full scale-points from age 16 to age 91, an effect that seems unreasonable given the size of the cross-sectional effects and previous research in this area.

Figure 2 also shows that the lines from the 38 age groups do not converge. This lack of convergence means that two individuals who are the same age will vary in their reported life satisfaction depending on how long they have been in the study. This finding, combined with the lack of evidence for cohort effects, suggests that the observed “developmental” decline is due to an instrumentation effect rather than a true age-related process. This also means that a multilevel modeling analysis that ignores this instrumentation effect would overestimate the age-related decline in satisfaction that occurs in this sample. Furthermore, because participants of different ages tend to participate for different lengths of time, this instrumentation effect may affect life satisfaction estimates differently for different ages. For instance, because participants cannot enter the study until they are age 16, 16-year-old participants are always in their first year of participation. Thus, if instrumentation effects are not taken into account, 16-year-olds may appear substantially more satisfied than other age groups (as seen in Fig. 1).

Therefore, as a final step in these analyses, we isolated developmental change from instrumentation effects by including both age and length of time in the study in a single multilevel model. In addition, we included calendar year to address concerns about history effects. This analysis takes advantage of the fact that age, calendar year, and wave are not confounded in a panel design with refreshment samples (though we need to make the assumption that cohort effects are minimal to estimate these effects; Donaldson and Horn 1992). To construct the model, we included 20 dummy variables representing the various years of the study and 20 dummy variables representing the various waves of the study. We then added centered age, along with various higher-order polynomials reflecting increasingly complex curves.[3] Polynomials as high as age to the sixth power were significant (though depending on which of the higher-order polynomials were included in the model, some of the lower-level polynomials became non-significant); but after including age to the fourth power, the curve did not change very dramatically. Therefore, we included a model with centered age, age squared, age cubed, and age to the fourth power (see Table 1). Because of the large number of dummy variables, estimated regression coefficients for these variables are not presented, though they are available from the authors on request.

This combined model confirmed that there is an instrumentation effect in the GSOEP. Even after controlling for within-person changes in age and year-specific effects, life satisfaction dropped with each additional wave of participation in an approximately linear fashion. This resulted in a total drop of .81 points from initial levels by Wave 21. In addition, the model showed that there were calendar-year-specific effects, even after controlling for age and wave effects. Although most were not large, there was tendency for scores to be elevated around the time of German reunification. Specifically, life satisfaction ratings in 1990, 1991, and 1992 were .14, .27, and .16 points higher than they would otherwise be expected to be.

The solid line with open triangles in Fig. 3 shows the predicted age-related trajectory of life satisfaction from this final multilevel model. The solid line with solid squares shows the first-wave cross-sectional results from Fig. 1 for comparison. As can be seen in this figure, after controlling for calendar year and wave effects, the within-person age-related trajectory converges very well with the first-wave cross-sectional data. According to both the cross-sectional analysis and the adjusted multilevel model, life satisfaction remains almost perfectly stable from the mid-teens until the early 70s, but then drops quite dramatically after this point. For instance, the life satisfaction scores of 90-year-old participants are predicted to be around 6.13, a drop of .73 of a standard deviation from the starting level (using the standard deviation from the cross-sectional results to standardize).

5.3 Discussion

Study 1 showed that complex designs and sophisticated analyses are needed to separate true developmental change in the GSOEP dataset from confounding factors such as instrumentation. Once instrumentation effects are removed, however, a relatively clear picture of age-related changes in life satisfaction emerges. Average levels of life satisfaction in the GSOEP are quite consistent from the late teens to the early 70s and then decline quite steeply (almost three-quarters of a standard deviation) until the end of life. Of course, no matter how large a sample, and no matter how ideal a research design, no single study is definitive. There could be features of the questionnaire, the interview technique, or the socio-historical context of Germany that could influence both the substantive and confounding effects described in this study. For instance, Deaton (2007) showed that age

[3]Because there is an overall level-2 intercept in this model, there are only 20 dummy variables for the 21 calendar years and 20 dummy variables for the 21 waves. This contrasts with the instrumentation effect analyses from the previous model where there was no overall intercept. In this earlier model there were 38 dummy variables for the 38 age groups because we estimated separate intercepts and slopes for each group. Centered age was divided by 10 before calculating the higher-order powers.

trends in life satisfaction varied considerably across nations. Therefore, the goal of Study 2 is to replicate these analyses in a separate nationally representative panel study to determine whether similar age trajectories and confounding effects emerge.

6 Study 2: The British Household Panel Study

6.1 Method

6.1.1 Participants—The BHPS (University of Essex, Institute for Social and Economic Research 2006) is a nationally representative panel study of British households that began in 1991. Participants were selected using a multi-stage probability design with systematic sampling. Like the GSOEP, additional sub-samples were added at various points in the study, including samples from Scotland and Wales in 1999, and a sample from Northern Ireland in 2001. Additional participants were added to the study each year as individuals entered existing households. In all, over 24,000 individuals have participated in at least one wave of the study. For the purposes of our research, we selected individuals who were (a) between the ages of 16 and 91 and (b) were part of the initial sample or the new samples from 1999 and 2001. A total of 21,448 participants (53% women) fit our selection criteria, and these individuals participated in the study for an average of 5.19 years following the first administration of the life satisfaction measure.

6.1.2 Measures—In eight of the nine most recent years of the BHPS (starting in 1996), participants were asked “How dissatisfied or satisfied are you with your life overall?” Responses were given on a scale from 1 (“not satisfied at all”) to 7 (“completely satisfied”). Means ranged from 5.19 (in 2000) to 5.33 (in 1998). Standard deviations ranged from 1.24 (in 1998) to 1.34 (in 1999). Unlike the GSOEP, there were no obvious cross-year trends in either the means or standard deviations.

6.2 Results

As in Study 1, we began by conducting cross-sectional analyses using data from all individuals during their first wave of participation. Results from this analysis are presented as a line with solid-square markers in Fig. 4. As can be seen in this figure, life satisfaction declines across age groups rapidly at first and then more steadily from age 16 to the mid 40s. The decline across these age groups is approximately .40 points, which represents an effect size of about .30 standard deviations (using the combined-sample, first-wave standard deviation of 1.35 to standardize). After the mid 40s, life satisfaction appears to increase, reaching a maximum of around 5.65 in the early 70s. This increase from the mid 40s to the early 70s represents an effect size of approximately .48 standard deviations. Finally, there is a slight decline of life satisfaction with respect to the late life age groups.

We next plotted life satisfaction against age using all available data, ignoring the fact that the same person contributes data to multiple points on the graph. Again, this aggregated analysis provides a crude test of convergence because it determines whether combining data across multiple waves and cohorts changes the shape of the curve. Results are presented as a line with solid-circle markers in Fig. 4. Unlike the data from the GSOEP, this aggregated analysis converges quite well with the simple cross-sectional trajectory, and the lines overlap almost perfectly. There appears to be a slightly steeper decline at the very end of life when examining the aggregated data than when examining just the first wave. However, even at this point in the curve, the discrepancy is not large.

Next, we tested a single multilevel model that ignores cohort, instrumentation, and calendar-year effects and only includes centered age and a series of higher-order polynomials of age. Again, we tested polynomials as high as the sixth power, and in this case, even the addition

of the final term resulted in meaningful change to the shape of the curve. Therefore, we retained this fairly complicated curve for the final model. Estimated parameters are presented in Table 1 and predicted satisfaction scores are presented as a line with open triangles in Fig. 4.

Even without adjusting for any potentially confounding effects, the estimated trajectory from the multilevel model converges quite well with both the cross-sectional data and the aggregated results, at least until very late in life. In all three lines, life satisfaction starts out around 5.50 in the late teens, drops to around 5.00 in the mid 40s (with a slight leveling off in the 20s), increases to about 5.60 in the early 70s and then drops somewhat in late life. However, the drop in the predicted scores from the multilevel model is markedly steeper than the drop in the aggregated data, which in turn, is slightly steeper than the drop in the cross-sectional data.

To investigate this issue further, we used the strategies employed in Study 1. First, we investigated potential cohort effects. Because the three refreshment samples entered the study relatively soon after the first wave in which life satisfaction was included (and thus, the length of time between assessments is not large), we did not use the strategy of comparing different sub-samples (though we do address this issue below). Instead, we used the logic of the cohort sequential design to compare different cohorts at the same age. Specifically, we created 5-year birth cohorts (e.g., 1905–1909, 1910–1914) and then plotted life satisfaction against age for each of the cohorts who had data from the period. To simplify this figure and to focus more precisely on the parts of the lifespan that seemed to have the least convergence across methods, we plotted from age 60 to age 90. To increase the reliability of each data point and to smooth the graph, we aggregated into 2-year age groups. In addition, we eliminated any data point with fewer than 20 participants.

As can be seen in Fig. 5, cohort effects do not appear to be large. Among all cohorts examined, the age differences appear to be consistent with the results found using the first-wave cross-sectional data. Life satisfaction appears to increase slightly from age 60 to the mid 70s and then decline slightly until late life. Thus, cohort effects do not seem to be responsible for the lack of convergence across the analyses presented in Fig. 4.

Next, we assessed whether there was evidence of instrumentation effects using the same multilevel modeling technique that was employed in Study 1. Specifically, we tested a model predicting within-person changes in life satisfaction from a within-person wave variable that indicated the current wave of the study.[4] The level-1 part of the model included a random intercept and a fixed wave slope. Both the intercept and slope were predicted from 38 level-2 dummy variables representing the different 2-year age groups from age 16 to 91. We then concatenated the results in a single figure. If there is convergence across age groups (and with the cross-sectional results), then this would suggest that the within-person trends reflect developmental change. If, on the other hand, there is no convergence (and change is similar across different age groups), then this would suggest the existence of instrumentation effects (as seen in the GSOEP). Results from this analysis are presented in Fig. 6. The first-wave cross-sectional effects from Fig. 4 (the line with the open triangles) are also included for comparison. A number of features of this analysis are noteworthy.

First, for much of the life-span, there is remarkable convergence both across adjacent age groups and with the overall cross-sectional effect. This suggests that at least until the 60s,

[4]Because life satisfaction was only added to the study in the fifth wave, we needed to decide whether to count the first wave of data collection or the first wave of life satisfaction data as Wave 0. To ensure that this variable had a similar meaning in all sub-samples, we decided upon the latter. However, results are the same regardless of the coding that is used.

there is no instrumentation effect and the longitudinal change for each age group maps onto what would be expected from analyses based on only the first wave of participation. Figure 6 also shows, however, that there is less convergence across adjacent age groups from the 60s onward. Starting with the group of individuals who entered the study at age 58, the within-person slopes become negative, even though the cross-sectional results show life satisfaction increasing until the early 70s and even though our previous cohort analyses showed no cohort effects. Comparing the different age groups from age 60 onward it is evident that the starting point for all groups is quite similar; however, the slopes are negative and much steeper than would be expected based on the cross-sectional results and the intercepts for adjacent groups. This exception withstanding, the various techniques for estimating age effects converge quite well for most of the lifespan. For that reason, it is not necessary to control for instrumentation effects when estimating the final multilevel model that takes into account both cross-sectional and longitudinal effects.[5]

As a final test of the robustness of these effects, we estimated a multilevel model using sample membership as a moderator. This analysis can determine whether the general pattern of age-related change in the BHPS replicates across the four different samples. Predicted satisfaction scores are presented in Fig. 7. As these lines show, very similar curves emerged in all four samples. There is a larger late-life increase among the Northern Ireland sample than in the other three samples; but otherwise the effects are quite consistent.

6.3 Discussion

The BHPS provides a different picture of age-related change in life satisfaction than does the GSOEP. In the British data, life satisfaction declines early in adulthood, increases from mid to late adulthood, and then declines again at the very end of life. Also in contrast to the results from the GSOEP, there appear to be no instrumentation effects in the BHPS. With the exception of the estimated trajectories for the oldest participants, results from the various analytic techniques converged. For these oldest groups, however, within-person modeling of longitudinal change suggested steeper declines in life satisfaction than did cross-sectional results.

There are at least two explanations for these effects. First, it is possible that there is an instrumentation effect similar to that found in the GSOEP, but that this effect only emerges among older adults. Although this explanation is certainly plausible, it is unclear why such an interaction between age and wave of assessment would occur. We believe that a more likely explanation is that there is a selection effect whereby the initially selected sample becomes less and less representative of typical people among older and older age groups. For instance, an individual who entered the study at age 81 is somewhat unusual in terms of longevity (as of 2001, women born in Britain are expected to live 80.4 years whereas men are expected to live 75.7 years; Hébert 2004). It is reasonable to assume that someone who is above average in life expectancy would also be above average in other characteristics including health and perhaps even emotional well-being (see Hofer and Sliwinski 2006). The point is that the oldest members of a sample are a select group because the “typical” person of that age would be deceased. Thus, cross-sectional analyses may show stable or even increasing levels of life satisfaction among the oldest age groups because these oldest individuals are select cases.

In fact, those who agree to participate in very old age may not even be representative of those who are still alive at that age. Because health problems and other age-related changes

[5]We did run these analyses, and as we suspected, the wave and calendar-year effects were very small. More importantly, the estimated age trajectory did not change once these effects were controlled.

may present barriers to participation, only the healthiest older adults may choose to participate in an on-going study like the BHPS. However, once contact has been made and participation has begun, respondents may feel obligated to continue participating even if they would not have agreed to begin participation at that time. Thus, an 80-year-old who began the study at age 70 may be less healthy than an 80-year-old who began the study that same year. Although we cannot determine using the available data whether this explanation is correct, this type of effect could explain the pattern of results shown in Fig. 6. This, of course, would have implications for the interpretation of age-related changes that are typically found using cross-sectional designs. In this sample, cross-sectional analyses of the oldest old show a much more optimistic picture of age-related changes in life satisfaction than do longitudinal analyses.

7 General Discussion

The goal of the current studies was to examine age-related trends in life satisfaction. We examined these in the context of three perspectives: the classical perspective, the essentialist perspective, and socioemotional selectivity theory. We accomplished these goals using two very large, nationally representative panel studies with refreshment samples with larger age ranges than are typically examined. Although there were some consistent findings across the two studies, there were also some substantial differences. We first discuss the similarities and then point out the differences that emerged.

In terms of similarities, both studies showed that for much of the lifespan, there is little evidence for a trend of declining life satisfaction. The GSOEP showed no declines until late life; the BHPS showed moderate declines early in adulthood, but these declines were reversed from middle-age until the mid 70s (also see Blanchflower and Oswald 2008). These results provide a relatively optimistic picture of life satisfaction from early to late adulthood. The picture is less rosy, however, for those in very late life. Both studies suggest that life satisfaction levels begin to decline after the mid 70s, and these declines can be quite substantial. These declines may be related to increasing health problems, the loss of social support, or even impending death. For instance, Gerstorf et al. (2008a) used data from those individuals in the GSOEP who died during the study to show that life satisfaction declines rapidly as people approach death (also see Gerstorf et al. 2008b; Mroczek and Spiro 2005).

This robust evidence for a late-life decline provides some support for the classical model of subjective well-being and refutes a strong reading of socioemotional selectivity theory. At the time of life when health, income, and social support are declining (Baltes and Mayer 1999) and individuals are approaching the end of life, life satisfaction drops quite steeply. It is possible that the processes described by socioemotional selectivity theory do counteract some declines in objective circumstances, and the combined effects of these countervailing forces result in stable or even increasing levels of life satisfaction among the middle-aged and older adults in these samples. But even if these effects contribute to stability among the young old, they are not strong enough to protect the oldest participants from a substantial drop in happiness at the end of life once objective circumstances become particularly negative and particularly salient.

The main substantive difference across studies concerned the existence of a *U*-shaped curve from the late teens to the early 70s in the BHPS but not in the GSOEP (a pattern identified by Blanchflower and Oswald 2008). As we noted above, this pattern replicates across the various subsamples of the BHPS, and it shows up in both the cross-sectional and longitudinal analyses. This pattern could be due to the processes described in socioemotional selectivity theory (though the increase in satisfaction begins decades before people reach their life expectancy), or it could be due to changes in some objective circumstances that

begin in middle age and continue until late life. For instance, research shows that relationship satisfaction among couples often drops after the birth of a child and this decline lasts through the child's teenage years (for a review, see Myers 1999). The rebound that occurs during the empty nest years may contribute to an overall increase in life satisfaction among middle-aged and older adults. In any case, it is unclear why this *U*-shaped trajectory emerges in one of our studies but not the other, but subtle cultural differences across nations may be responsible. In support of this idea, Deaton (2007) found that age-related differences in life satisfaction varied a great deal across nations. In nations from Eastern Europe and the former Soviet Union, life satisfaction declined steadily with age, whereas in wealthy English-speaking countries, life satisfaction was *S*-shaped across the lifespan. Deaton (2007) argued that some of this cross-nation variation was due to differences in national income.

Results such as this suggest that there may be no simple answer to the question of how life satisfaction changes with age. The diverse results reviewed in the introduction to this paper may not simply represent the effects of sampling error or differences in methods. Instead, this may reflect the true state of this association—the links between age and life satisfaction may vary depending on important contextual factors (Deaton 2007). Both of the studies included in our analyses used extremely large representative samples collected using rigorous procedures and analyzed with a variety of complex analytic techniques; yet the conclusions from these two studies differ in important ways. It is clear that future research will examine the potential contextual factors [some of which have been identified by Deaton (2007) and Pinquart (2001)] that might explain these cross-study differences.

Overall, support was weakest for the pure temperament or “essentialist” perspective, which often asserts that life satisfaction is simply an inborn individual difference that varies widely between individuals but not within individuals over time. Although average levels of life satisfaction were stable across most of the lifespan in the GSOEP, they declined substantially at the very end of life. Because personality change is limited at this stage of the lifespan (Roberts et al. 2006), these changes appear to be an effect of life circumstances rather than personality development. Moreover, the actual lifespan changes that occur in particular temperament/personality traits (e.g., Donnellan and Lucas 2008; Lucas and Donnellan 2009; Roberts et al. 2006; Srivastava et al. 2003) are difficult to reconcile with the observed changes in life satisfaction.

To be sure, our results do not rule out the possibility of a moderate to strong influence of personality factors on subjective well-being. In fact, there is strong evidence that personality processes lead to considerable rank-order stability of life satisfaction even over very long periods of time (see Lucas and Donnellan 2007, for evidence regarding the stability of life satisfaction in the GSOEP). However, these personality influences are not so strong as to prevent mean-level age-related changes from occurring. This point underscores the difference between differential and absolute stability (see Roberts et al. 2006) and points to the need for additional research on the processes that link personality traits like extraversion and neuroticism to judgments of life satisfaction and happiness.

7.1 Methodological Implications

These studies also have important methodological implications for future work that examines the association between age and subjective well-being, and for work that uses the GSOEP and BHPS data. Most notably, these studies confirm that neither cross-sectional nor longitudinal designs on their own can provide an unambiguous picture of the changes that occur across the lifespan. In the GSOEP, instrumentation effects appear to lead to an overestimation of the decline that occurs over the course of the lifespan when unadjusted longitudinal modeling techniques are used. In this case, the cross-sectional data probably provide a more accurate picture of the changes that occur over the course of the lifespan. In

the BHPS, the estimates from the longitudinal data converged well with the cross-sectional trajectories, at least until late life. Among the oldest adults, convergence was less clear, as life satisfaction levels dropped more quickly than would be suggested by the cross-sectional data or by the starting level of satisfaction among older groups. We believe that the best explanation for this late-life effect is that there is a selection bias in which the oldest adults who agree to participate in an intensive study like the BHPS may be less representative than younger participants who agree to take part. If so, then the cross-sectional data may overestimate the life satisfaction of these oldest adults. Ultimately, it is necessary to have data from sufficiently complex designs to rule out possible confounds on a study-by-study basis. Our recommendation is therefore necessarily broad—researchers should continue to heed classic advice about the virtues of combining cross-sectional and longitudinal designs to best understand developmental change.

The current studies also have implications for other studies that use data from the GSOEP. Recently, a growing number of studies have used longitudinal analyses of data from the GSOEP to examine how life satisfaction changes following the experience of life events (see Lucas 2007b, for a review). However, the results of these longitudinal analyses could be distorted if there are instrumentation effects that lead to decreasing life satisfaction as respondents participate in additional waves. Although one could correct for this by including wave dummy variables in the life event analyses themselves, the estimates for the instrumentation effects from such an analysis might not be optimal because they would be based on smaller, select samples and because they do not specifically take into account unique information provided by the refreshment samples. Our final analyses suggest that the instrumentation effect accounts for about a .038 drop per year (.81 points total over 21 years). Correcting for this decline might provide more precise estimates when examining other questions that rely on longitudinal analyses of GSOEP data.

7.2 Limitations

The strengths of these studies are clear—as far as we know, these are the largest nationally representative studies that include multiple cohorts, many waves of data, and refreshment samples to be used in research on the link between age and subjective well-being. But like any study, these studies also have some limitations. Foremost, we only focused on one aspect of subjective well-being, namely life satisfaction, because neither the BHPS nor the GSOEP included clear and repeated measures of positive and negative affect. The BHPS does include a measure of psychological distress (the General Health Questionnaire; Goldberg and Williams 1988), but the links between this measure and the commonly studied components of subjective well-being are unclear. Thus, support for the various models of well-being might have differed if these other components had been measured and our results are limited to changes in life satisfaction that may occur with age.

A second potential limitation concerns the use of a single-item measure of life satisfaction. For instance, one main concern about single-item scales is the potential for low reliability. However, Lucas and Donnellan (2007) used structural equation modeling techniques to show that the reliability of the single-item scales used in the GSOEP and BHPS is at least .67 (and likely higher). In addition, the fact that we were able to identify robust age-related changes suggests that there is enough valid variance to capture reliable trends across the lifespan. An additional concern about single-item scales relates to their breadth of coverage. However, life satisfaction is a relatively narrow and straightforward concept that should easily be captured with a single statement. In fact, multiple-item scales often include just slightly different wordings of the same basic idea (e.g., Diener et al. 1985). Finally, single-item measures have been shown to be valid. For instance, these measures have been shown to be reactive to changing life circumstances, and the size of the effects obtained with single-item measures are often very similar in size to those obtained using multi-item

measures (e.g., Lucas 2007a). Thus, evidence suggests that concerns about the quality of the single-item measures used in the GSOEP and BHPS should not limit the conclusions that can be drawn from these data.

7.3 Summary

Answers to seemingly simple questions regarding age-related changes in subjective well-being turn out to be deceptively complex. In our research with two nationally representative studies, the most robust finding was that life satisfaction declines at the end of the lifespan, a time during which many objective circumstances are likely to be worsening for individuals who are fortunate enough to reach the average life expectancy. This result seems to support the bottom-up perspective of subjective well-being in that the appraisal of life satisfaction is based, at least partially, on objective conditions. Although we were not able to determine a "universal" age-related trajectory of life satisfaction, we found clear evidence for changes across the lifespan which should prompt additional research on the processes that underlie these judgments.

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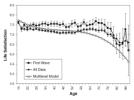

Fig. 1.
Results from the cross-sectional, aggregated, and multilevel modeling analyses (GSOEP)

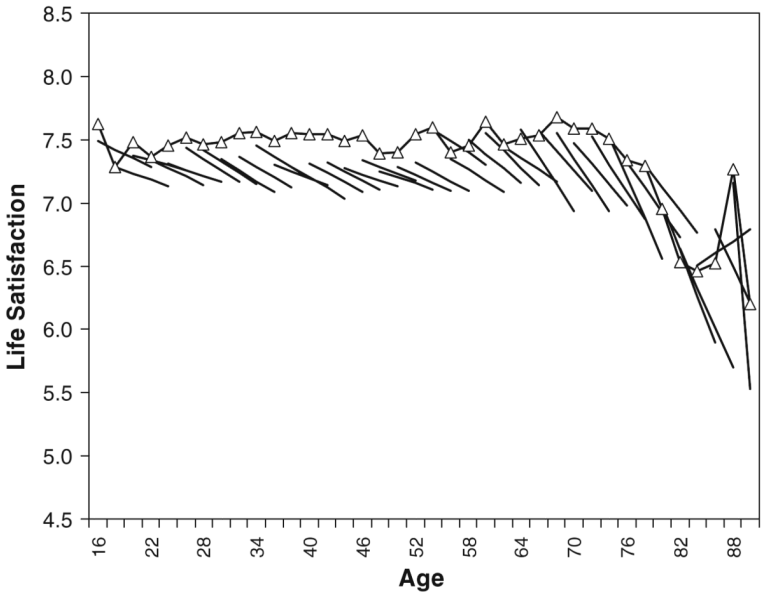

Fig. 2.
Plot of linear effect of length of time in study by age group (GSOEP)

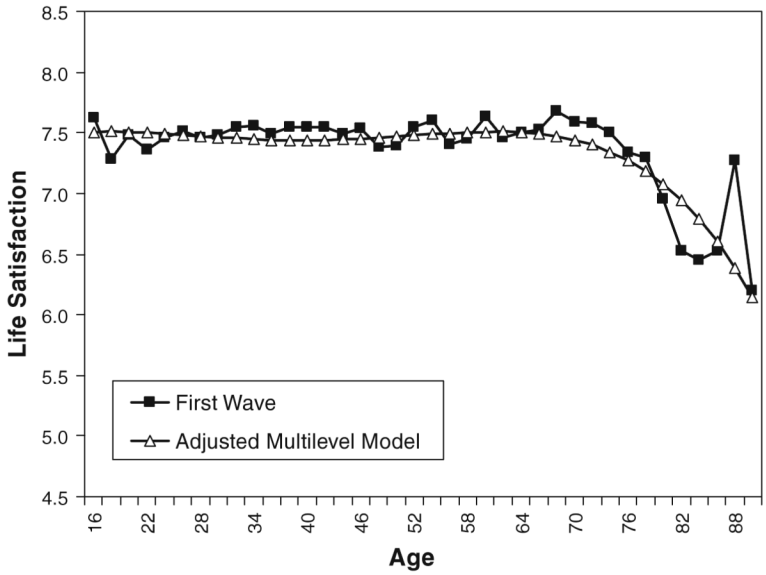

Fig. 3.
Comparison of the first-year cross-sectional effect to the adjusted age effect from the final multilevel model (GSOEP)

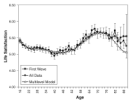

Fig. 4.
Results from the cross-sectional, aggregated, and multilevel modeling analyses (BHPS)

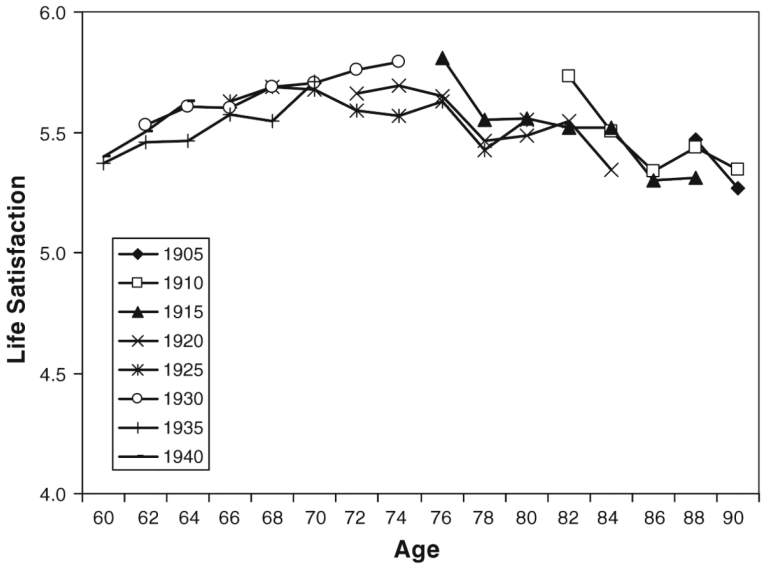

Fig. 5.
Cohort-sequential analysis from age 60 to age 90 (BHPS)

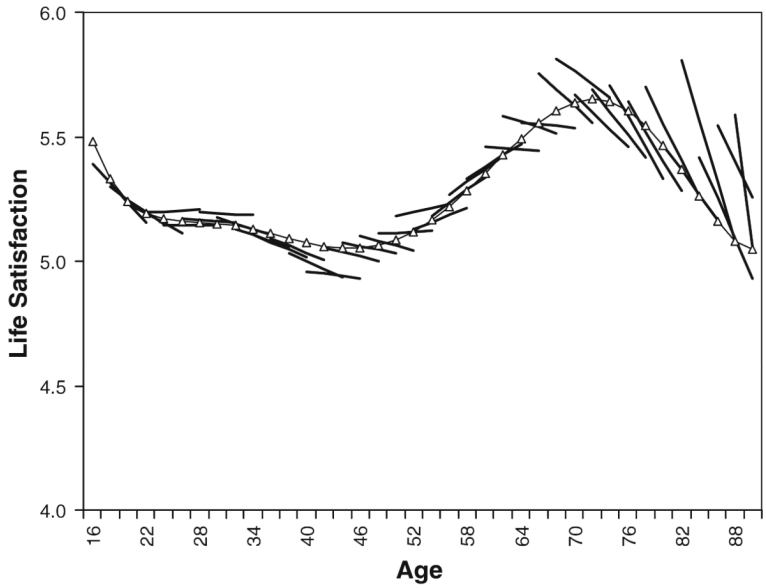

Fig. 6.
Plot of linear effect of wave by age group (BHPS)

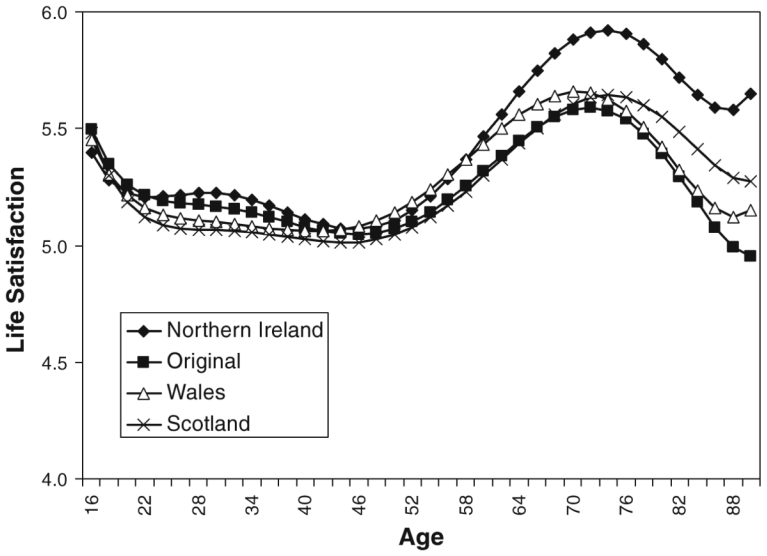

Fig. 7.
Estimated life satisfaction trajectory for the four subsamples of the BHPS

Table 1

Estimated parameters for age in Studies 1 and 2

Effect	Study 1			Study 2		
	B	**SE**	***t***	***B***	**SE**	***t***
Intercept	7.453	0.021	354.949*	5.052	0.013	386.282*
Centered age	0.006	0.013	0.461	0.013	0.015	0.861
Centered age^2	0.027	0.006	4.263*	0.124	0.009	13.221*
Centered age^3	−0.001	0.002	−0.027	0.036	0.005	6.706*
Centered age^4	−0.004	0.001	−6.161*	−0.016	0.002	−8.928*
Centered age^5				−0.004	0.000	−8.312*
Centered age^6				0.001	0.000	8.136*

*Note: $p < .05$.

Study 1 *df* = 166,047 (except for the intercept, where *df* = 20,144); Study 2 *df* = 96,654 (except for the intercept, where *df* = 21,447). Study 1 model also includes dummy variables for each wave and each calendar year of the study