A snapshot of the age distribution of psychological well-being in the United States

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Psychological well-being (WB) includes a person's overall appraisal of his or her life (Global WB) and affective state (Hedonic WB), and it is considered a key aspect of the health of individuals and groups. Several cross-sectional studies have documented a relation between Global WB and age. Little is known, however, about the age distribution of Hedonic WB. It may yield a different view of aging because it is less influenced by the cognitive reconstruction inherent in Global WB measures and because it includes both positive and negative components of WB. In this study we report on both Global and Hedonic WB assessed in a 2008 telephone survey of 340,847 people in the United States. Consistent with prior studies, Global WB and positive Hedonic WB generally had U-shaped age profiles showing increased WB after the age of 50 years. However, negative Hedonic WB variables showed distinctly different and stronger patterns: Stress and Anger steeply declined from the early 20s, Worry was elevated through middle age and then declined, and Sadness was essentially flat. Unlike a prior study, men and women had very similar age profiles of WB. Several measures that could plausibly covary with the age-WB association (e.g., having children at home) did not alter the age-WB patterns. Global and Hedonic WB measures appear to index different aspects of WB over the lifespan, and the postmidlife increase in WB, especially in Hedonic WB, deserves continued exploration.

affect | hedonic

To complement economic indicators for policy evaluation, behavioral scientists and economists have developed self-report questions for measuring psychological well-being (WB). Among other applications, it has been proposed that these measures be used to monitor the WB of the nation (1–3). Two types of WB measures have been developed: Global WB, which assesses an overall judgment of one's life, including one's aspirations, achievements, and current circumstances, and Hedonic WB, which captures affective components of WB, such as the experience of happiness or stress (4). Global and Hedonic WB measures can be viewed as complementary, with each tapping different components of WB; however, both are rarely assessed in the same study.

How WB changes with age is an intriguing question, especially in light of prior findings that Global WB improves from middle age onward, even in the face of physical health decline, and little is known about the determinants of this pattern (5). Recent analyses suggest that this pattern is neither attributable to a cohort effect (with people of different ages having experienced different historical conditions) nor limited to Western cultures (5). One study has examined positive and negative affect by age in 2,727 adults (6) and found lower levels of negative affect in old age for men but not for women. The 30-day reporting period used for affect assessment is likely to yield data that are more similar to Global WB than to more immediate affective states (which are used in this study), because lengthy reporting periods are associated with people's implicit personal theories (7). However, an experience sampling study of 184 individuals who reported immediate affect five times a day for a week (8) did not have this concern. It showed a reduction in the frequency of negative affect as age increased, but no associations were found for intensity of negative affect or for frequency or intensity of positive affect.

In 2008, the Gallup Organization (9) conducted a telephone survey of over 340,000 individuals in the United States, allowing a determination of averages of both Global and Hedonic WB by age. Global WB was assessed with a single life evaluation question [a common technique in WB research (4)], and Hedonic WB was assessed with questions about affect experienced yesterday. We examine whether the age profiles of Global and Hedonic WB differ and in what manner. Selected demographic and economic factors associated with age that might account for the age-related pattern of WB measures are also examined.

Results

A total of 355,334 interviews were conducted in 2008. To ensure adequate numbers at each age, only participants between the ages of 18 and 85 years (inclusive) were included in the analyses for this paper. This exclusion yielded a sample comprising 340,847 individuals. The weighted sample was 48% male and had an average age of 47.3 years, 88% had at least a high-school education and 29% had a college degree, and the median monthly household income fell in the category of $3,000 to $3,999 ($n$ = 262,441 because many individuals were reluctant to provide information about their income).

All WB measures were associated with age, yet the patterns differed across the WB measures. Positive WB items (Global [$F(16, 338{,}578) = 150.8$, $P < 0.0001$], Enjoyment [$F(16, 339{,}724) = 74.7$, $P < 0.0001$], and Happiness [$F(16, 339{,}698) = 53.8$, $P < 0.0001$]) showed U-shaped patterns (Figs. 1 and 2), with their nadir located in the 50s. Two of the negative Hedonic WB items (Stress [$F(16, 340{,}342 = 884.9$, $P < 0.0001$] and Anger [$F(16, 340{,}542) = 254.2$, $P < 0.0001$]) showed declines over age (improving WB). About 35% of respondents reported a lot of Worry [$F(16, 340{,}397) = 304.4$, $P < 0.0001$] through the age of 50 years, followed by a steep decline. Sadness exhibited an inverted U-shaped pattern trend over age [$F(16, 340{,}424) = 32.9$, $P < 0.0001$] (Fig. 3). Because there are not accepted standards for judging WB effect sizes, the difference between the minimum and maximum WB over the 17 age categories and a corresponding effect size statistic were computed. For Global WB, the mean difference divided by the SD (d) was computed, and for Hedonic WB, differences in proportions and the effect size (h; which is the effect size statistic used for comparing proportions that is most comparable to d) were computed (10). For Global WB, the difference was 0.7 on the 0- to 10-point scale (d = 0.34). For Hedonic WB, differences in percentages were: Enjoyment, 6.6% (h = 0.19);

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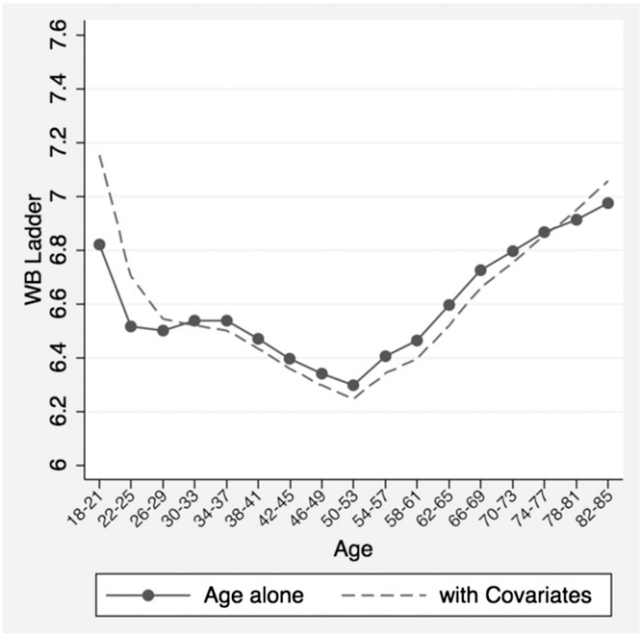

Fig. 1. Global WB: ladder. Mean (unadjusted and adjusted) plotted by 4-year age groups, where the connected line represents unadjusted data and dashed lines represent data adjusted for four covariates.

Happiness, 5.0% ($h = 0.16$); Worry, 18.2% ($h = 0.41$); Sadness, 4.7% ($h = 0.12$); Stress, 32.2% ($h = 0.70$); and Anger, 13.4% ($h = 0.42$).

To evaluate the pattern of increased WB after the age of 50 years formally, the age categories were treated as a continuous variable and both a linear model and a continuous piecewise linear model with an inflection point at the age of 54 years were estimated. The percentage of total between-category variance in WB that was captured by each model is reported in Table 1. For all WB variables, the piecewise linear model captured a significantly higher percentage of the variance between age categories than the linear model ($P < 0.001$), although the linear model was adequate for Stress and Anger.

Previous research detected age-WB associations for men and women in positive WB (6); for negative affect, an age-WB association was found for men but not for women. Although there were several statistically significant interaction effects between age and gender in our analyses, these were all very weak associations (based on the small F values) [Ladder: $F(16, 338{,}545) = 4.46$, $P < 0.001$; Enjoyment: $F(16, 339{,}708) = 2.89$, $P < 0.001$; Happiness: $F(33, 339{,}665) = 1.34$, P = not significant; Stress: $F(33, 340{,}309) = 4.24$, $P < 0.001$; Worry: $F(33, 340{,}364) = 4.69$, $P < 0.001$; Anger: $F(33, 340{,}509) = 3.97$, $P < 0.001$; and Sadness: $F(33, 340{,}391) = 3.72$, $P < 0.001$]. Figs. 4–6 show the means for Global and Hedonic WB variables by gender, and it is clear that the age patterns for men and women are almost identical. It is also notable that many main effects for gender are evident in the figures, for example, that Stress, Worry, and Sadness are all considerably higher for women (at all age categories) than for men. Also of interest is that women had higher levels of Global WB than men over part of the age distribution ($F[1, 338{,}545] = 160.8$, $P < 0.001$) yet had comparable levels of Happiness ($F[1, 339{,}665] = 0.5$, P = not significant) and lower levels of Enjoyment ($F[1, 339{,}708] = 209.4$, $P < 0.001$).

Reasons for the age patterns of WB were not explicitly hypothesized, but several variables could plausibly contribute to the increase in WB over age. For example, it is plausible that WB improves when children leave home, given reduced levels of family conflict and financial burden. We examined four measures whose age-specific distributions are shown in Table 2.[†] As expected, based on the content of the measures, they all were associated with age: percent female increased with age, percent with a partner rapidly increased through the age of 45 years and then slowly decreased with age, percent with a child at home increased through the age of 41 years and then decreased, and percent unemployed decreased after the age of 26 years. The effects of these measures then were statistically controlled, and adjusted WB means (by age category) were plotted. As shown by the dashed lines in Figs. 1–3, adjustment for these four potential moderators/mediators only marginally altered the pattern of the association of WB with age, indicating that they do not individually or collectively account for much of the age relation.

Discussion

These findings confirm a striking age and WB association using a multidimensional measurement approach that included Global WB and both positive and negative Hedonic WB. Before the age of about 50 years, positive WB as measured by the global measure and two positive hedonic adjectives decreased somewhat with increasing age. In dramatic contrast, the pattern of negative Hedonic WB was quite different: It was fairly constant during this period (Worry and Sadness) or improved with age (Stress and Anger). After the age of 50 years, Americans have increasing levels of WB, as indicated by increased Global WB and positive emotion and by decreased levels of negative emotions (except Sadness). The figures show considerable variation in the age patterns of the different hedonic outcomes. In particular, we do not see a simple replication U-shape of the global measure; these questions tap into different aspects of the hedonic experience. The positive experiences of Happiness and Enjoyment and the negative experience of Sadness, whose age profile is essentially the inverse of that of Happiness and Enjoyment, show modest variation with age: The U-shape is apparent, but there is very limited change with age (with Sadness having the weakest association with age). The other negative experiences, Anger, Stress, and Worry, are different yet again, and all three show a pronounced improvement with age, from early in adult life for Stress and Anger and for after about middle age for Worry. As people age, they are less troubled by Stress and Anger, and although Worry persists, without increasing, until middle age, it too fades after the age of 50 years. We have also looked at two other questions about Worry, worry about money and worry about having money to pay for health care, and they too replicate the pattern for overall worry. These sharply differentiated, and richly varied, age patterns show the importance of working with multiple measures to construct a comprehensive pattern of hedonic experience with age.

Our results are in partial agreement with the momentary assessment study of Carstensen et al. (8), which found that the frequency of negative affect (moments with any negative affect) decreased with age. However, that study found no associations for frequency or intensity of positive affect with age, whereas this study found modest differences indicating an increase in positive affect. A possible explanation for this discrepancy is the high degree of statistical power inherent in the current study that made it possible to detect smaller associations than those detectable in the study by Carstensen et al. (8). Alternatively, our affect assessment procedure did require a degree of retrospection, and the results could be biased by retrospective distortion, whereas the momentary assessments in the study by Carstensen et al. (8) eliminated this possible bias. It is also the case that the current sampling was likely much more representative of the US population compared with

[†]These analyses were conceptualized as exploratory and not as a comprehensive search for the determinants of age-associated WB, which would have to include a much wider range of personal and situational variables.

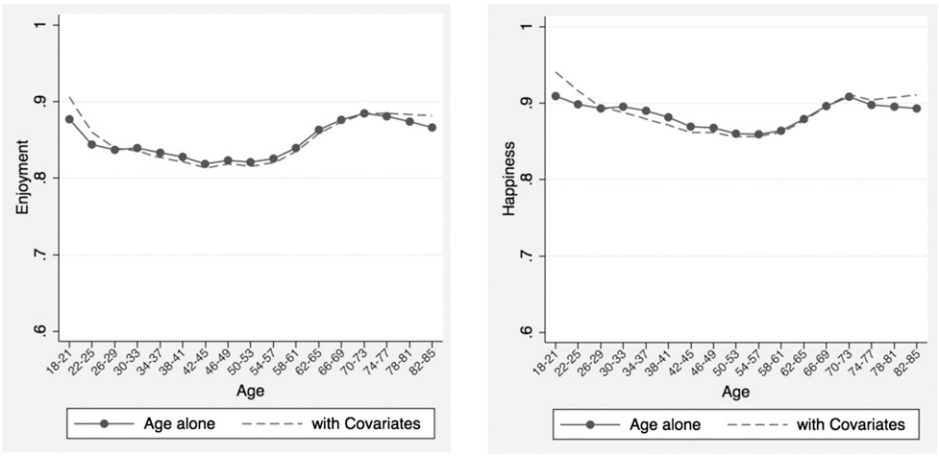

Fig. 2. Hedonic WB: Enjoyment and Happiness. WB measures (mean or proportion) plotted by 4-year age groups, where the connected line represents raw data and dashed lines represent data with covariates.

the more restricted sampling design of the study by Carstensen et al. (8). Thus, relative to prior studies, the present results broaden the case that WB, including positive affect, increases with age.

We also examined patterns of both Global WB and Hedonic WB (both positive and negative) for men and women and conclude that the age profiles are essentially identical, albeit with some gender differences in level, particularly for Sadness, Stress, and Worry, which are more prevalent among women. This finding conflicts with the conclusion by Mroczek and Kolarz (6) that only men showed an age pattern for negative WB; however, that study employed a retrospective assessment of affect over a long reporting period. This result emphasizes the potential importance

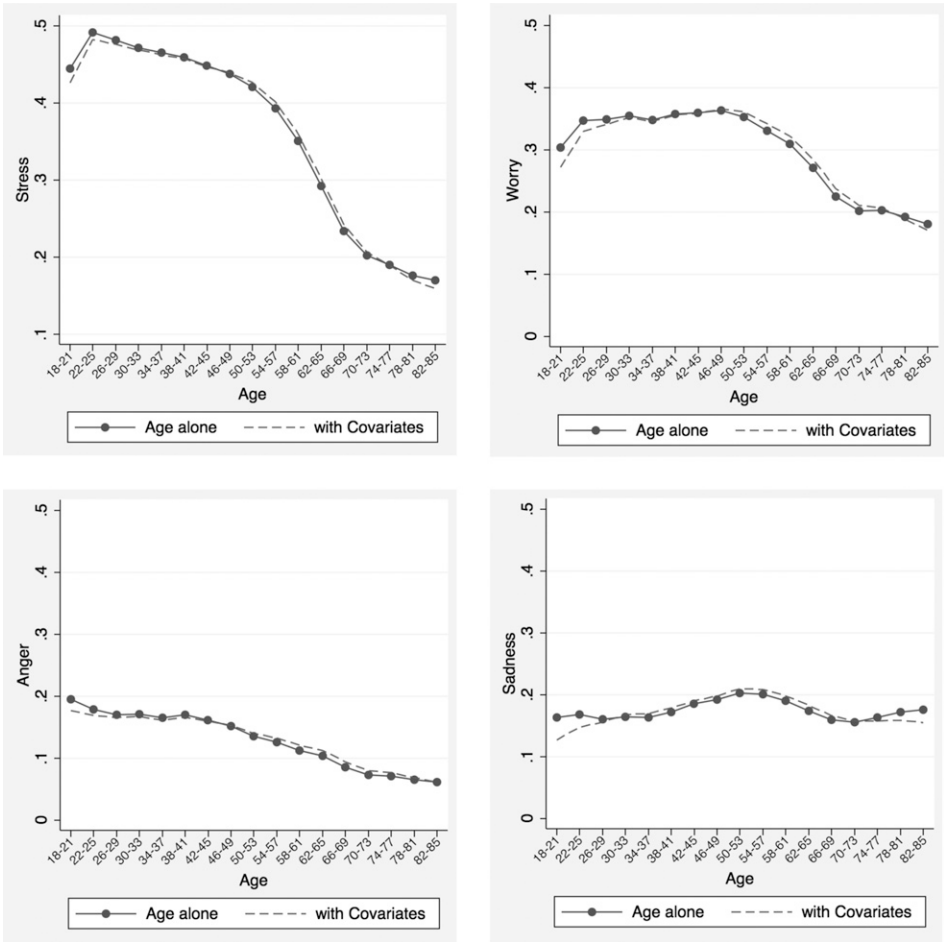

Fig. 3. Hedonic WB: Stress, Worry, Anger, and Sadness. WB measures (mean or proportion) plotted by 4-year age groups, where the connected line represents raw data and dashed lines represent data with covariates.

Table 1. Variance in WB as a percentage of the variance accounted for by the age categories

Dependent WB variable	Form of the association: Linear model, %	Form of the association: Piecewise linear model with inflection point at the age of 54 years, %
Global WB: ladder	7	41
PA: Enjoyment	11	49
PA: Happiness	0	28
NA: Stress	81	89
NA: Anger	94	97
NA: Worry	52	73
NA: Sadness	7	27

Variance in WB accounted for by a linear vs. two-part piecewise linear model as a percentage of the variance accounted for by 17 age categories. NA, negative affect; PA, positive affect.

of assessing affect with short recall periods to reduce potential bias (11); an alternative explanation is that the discrepancy may be attributable to sample differences in the two studies.

An unanticipated finding was that women scored higher than men on Global WB yet did not score differently from men on one positive hedonic measure (Happiness) and scored lower than men on the other hedonic measure (Enjoyment). To our knowledge, this is a unique and puzzling finding. Considering the exploratory nature of this analysis, this should be viewed with appropriate caution; nevertheless, it may indicate yet another important difference between Global and Hedonic WB.

These findings increase confidence in age-associated differences in both Global and Hedonic WB. However, we found it surprising that variables we thought would account for some of the age-WB pattern, namely, gender, having children under the age of 18 years at home, being unemployed, and not having a partner, had little impact on it.

The overall WB-age pattern calls out for explanation. Why are older people, on average, happier and less stressed than younger people? The results are generally consistent with Baltes' (12) theory of increased "wisdom" and emotional intelligence with age (at least through middle age), wherein decreased negative affective states could be a result of increasing wisdom, and with Carstensen et al.'s (13) socioemotional selectivity theory, wherein older people have an increased ability to self-regulate their emotions and view their situations positively. They are also in accord with a "positivity effect," wherein older people recall fewer negative memories than younger adults (14), and with the possibility that older people are more effective at regulating their emotions than younger adults (15). Although these theories provide a general framework for understanding increasing WB with age, they do not predict the specific patterns of WB shown here or the difference in Global and Hedonic WB age profiles. A more complete understanding of the determinants of aging on WB, including potential psychological, social, and biological explanations, deserves our attention considering the probable use of WB as a social indicator.

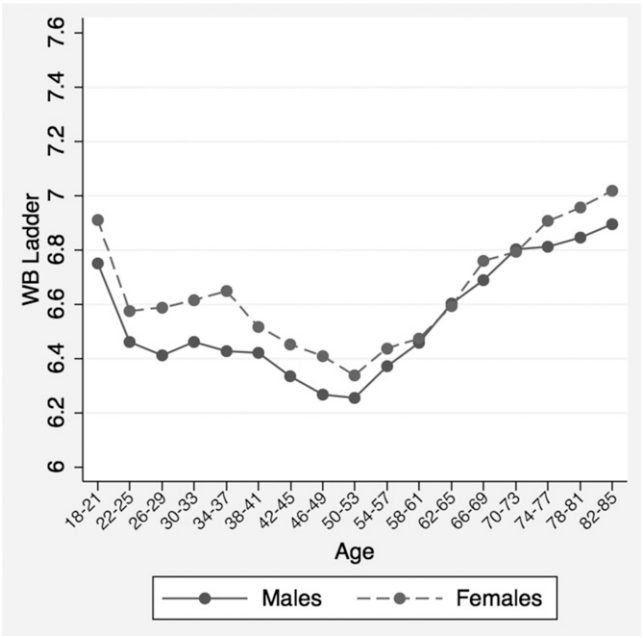

Fig. 4. Global WB: ladder. Mean plotted by 4-year age groups, where the connected line is for men and dashed lines are for women.

Materials and Methods

The survey method was a telephone interview using a dual-frame random-digit dial methodology that included cell phone numbers from the 50 states in

Table 2. Distribution of measures serving as covariates by age category

Age categories, years	Covariates: Female, %	With partner, %	With child at home, %	Unemployed, %
18–21	44	12	48	9
22–25	48	34	42	10
26–29	51	56	56	7
30–33	50	68	71	6
34–37	50	72	76	6
38–41	50	71	74	6
42–45	51	70	64	6
46–49	52	68	48	6
50–53	51	67	30	7
54–57	51	66	17	7
58–61	52	66	10	6
62–65	52	65	7	4
66–69	52	62	6	3
70–73	55	58	4	3
74–77	59	52	3	3
78–81	61	43	2	3
82–85	63	35	1	2

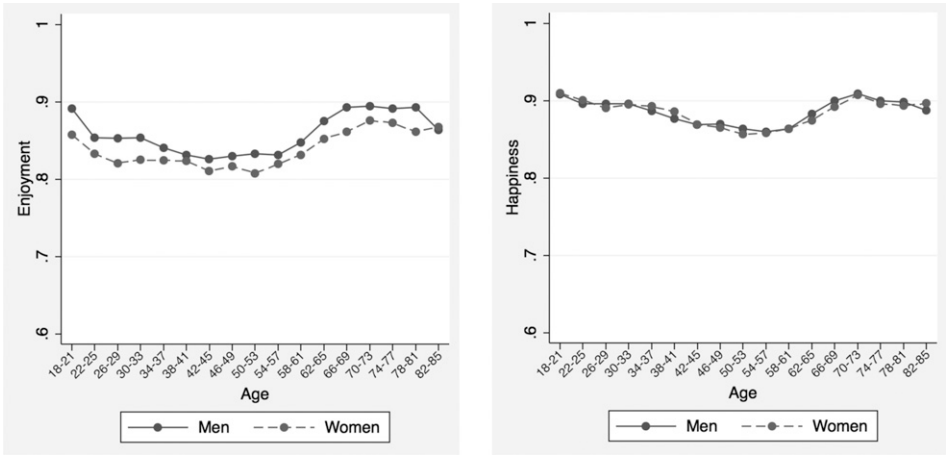

Fig. 5. Hedonic WB: Enjoyment and Happiness. Mean plotted by 4-year age groups, where the connected line is for men and dashed lines are for women.

the United States. Interviews were done between 9:00 AM and 10:00 PM (local time), with most done in the evening. Up to three to five callbacks were made in the case of no answer. Spanish language interviews were conducted when appropriate. Approximately 1,000 interviews were completed daily from January 2 through December 31, 2008.

The questionnaire covered many topics of interest to the Gallup Organization and Healthways Corporation, including basic demographic information, participants' opinions about the current economic climate and their personal financial situation, information about past diseases, and other topics. The Global WB question was as follows: "Please imagine a ladder with steps numbered from 0 at the bottom to 10 at the top. The top of the ladder represents the best possible life for you, and the bottom of the ladder represents the worst possible life for you. On which step of the ladder would you say you personally feel you stand at this time?" (16). Hedonic WB or affect

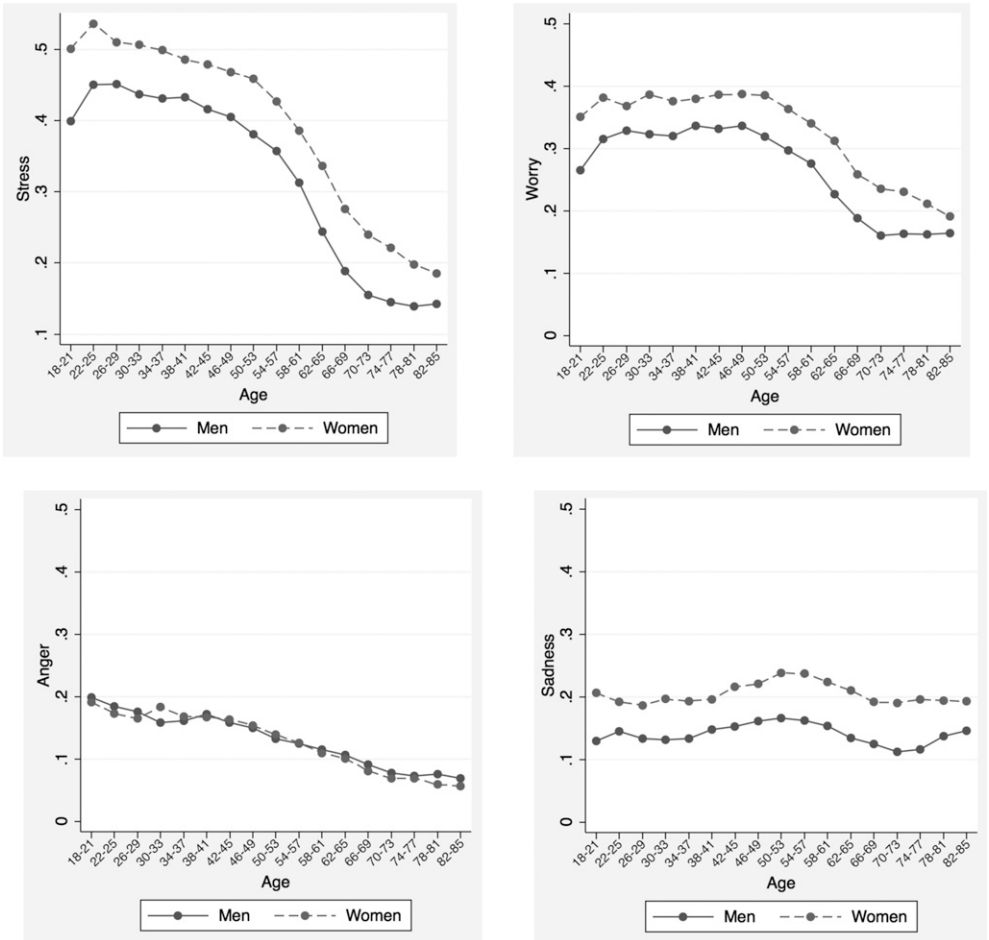

Fig. 6. Hedonic WB: Stress, Worry, Anger, and Sadness. Mean plotted by 4-year age groups where the connected line is for men and dashed lines are for women.

questions had "No/Yes" response options and were worded as follows: "Did you experience the following feelings during A LOT OF THE DAY yesterday? How about _____?" where each affect (positive affect adjectives: Enjoyment, Happiness; negative affect adjectives: Stress, Worry, Anger, Sadness) was answered separately. This question format is similar to those used in other daily studies of affect but differs in its dichotomous response format and in the requirement that the feeling be present during "a lot of the day."

The purpose of this survey was to assess and rapidly disseminate data on daily WB and other attitudes. Thus, its design was developed to maximize the response rate within the constraints of this objective. For example, the number of callbacks was restricted to three to five, and no other techniques were used to enhance response rate (e.g., prior mailings). To broaden coverage and representativeness, cell phones were part of the sampling design; relative to landlines, the response rate for cell phones is typically lower than that for landlines. Of all calls that resulted in contacts with eligible candidates, 31% agreed to be interviewed; of those, 90% completed the entire interview. Although a higher response rate would be preferred, we note that studies suggest that nonresponse bias is not proportional to response rate (17). Despite the sampling limitations, available evidence suggests that the estimates of population parameters were not compromised; for example, the survey predicted recent election results within an acceptable margin of error.

Weighted least square models were computed in STATA (StataCorp, LP) using 4-year age blocks (e.g., 18–21 years, 22–25 years).[‡] Age was treated as a categorical variable to facilitate the estimation and plotting of adjusted means or proportions without imposing any a priori assumptions about the functional form of the age gradient.[§] A second set of analyses examined the functional form of the WB-age relation by assessing how well it was represented by (i) a linear model or (ii) a two-part piecewise linear (i.e., spline) model. Next, we examined the age-WB association by gender, given prior research suggesting differences. Finally, a set of models was estimated that controlled for several measures that might plausibly covary with WB and age (i.e., unemployment, marital status, children living at home), and hence might "explain" the WB-age association. Both unadjusted and adjusted means and proportions were obtained.

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[‡]There were virtually no differences in results using weighted least square regression vs. weighted logistic regression (for dichotomous dependent variables) because of the large sample size and marginal distributions.

[§]Weights supplied by the Gallup Organization were used to adjust the sample to the population distribution of age in the US population.

1. Kahneman D, Krueger AB, Schkade D, Schwarz N, Stone AA (2004) Toward national well-being accounts. *Am Econ Rev* 94:429–434.
2. Diener E, Kesebir P, Lucas R (2008) Benefits of accounts of well-being—For societies and for psychological science. *Appl Psychol Int Rev* 57:37–53.
3. Oswald AJ, Hu S (2010) Objective confirmation of subjective measures of human well-being: Evidence from the U.S.A. *Science* 327:576–579.
4. Kahneman D, Diener E, Schwarz N (1999) *Well-Being: The Foundations of Hedonic Psychology* (Russell Sage Foundation, New York).
5. Blanchflower DG, Oswald AJ (2008) Is well-being U-shaped over the life cycle? *Soc Sci Med* 66:1733–1749.
6. Mroczek DK, Kolarz CM (1998) The effect of age on positive and negative affect: A developmental perspective on happiness. *J Pers Soc Psychol* 75:1333–1349.
7. McFarland C, Ross M, DeCourville N (1989) Women's theories of menstruation and biases in recall of menstrual symptoms. *J Pers Soc Psychol* 57:522–531.
8. Carstensen LL, Pasupathi M, Mayr U, Nesselroade JR (2000) Emotional experience in everyday life across the adult life span. *J Pers Soc Psychol* 79:644–655.
9. Harter JK, Gurley VF (2008) Measuring health in the United States. *APS Obs* 21:23–26.
10. Livingston EH, Elliot A, Hynan L, Cao J (2009) Effect size estimation: A necessary component of statistical analysis. *Arch Surg (Chicago)* 144:706–712.
11. Stone AA, Shiffman S, Atienza A, Nebling L, eds (2007) *The Science of Real-Time Data Capture: Self-Reports in Health Research* (Oxford Univ Press, New York).
12. Baltes PB (2003) Extending longevity: Dignity gain—Or dignity drain? *MaxPlanck Res* 3:14–19.
13. Carstensen LL, Fung HH, Charles ST (2003) Socioemotional selectivity theory and the regulation of emotion in the second half of life. *Motiv Emot* 27:103–123.
14. Charles ST, Carstensen LL (2008) Unpleasant situations elicit different emotional responses in younger and older adults. *Psychol Aging* 23:495–504.
15. Scheibe S, Blanchard-Fields F (2009) Effects of regulating emotions on cognitive performance: What is costly for young adults is not so costly for older adults. *Psychol Aging* 24:217–223.
16. Cantril H (1965) *The Pattern of Human Concerns* (Rutgers Univ Press, New Brunswick, NJ).
17. Curtain R, Presser S, Singer E (2005) Changes in telephone survey nonresponse over the past quarter century. *Public Opin Q* 69:87–98.