Is Well-being U-Shaped over the Life Cycle?

David G. Blanchflower and Andrew J. Oswald

No 826

WARWICK ECONOMIC RESEARCH PAPERS

DEPARTMENT OF ECONOMICS

Is Well-being U-Shaped over the Life Cycle?

David G. Blanchflower
Bruce V. Rauner Professor of Economics
Dartmouth College, USA,
University of Stirling, NBER, IZA, CESifo and
Member, Monetary Policy Committee
Bank of England
Email: david.g.blanchflower@dartmouth.edu

Andrew J. Oswald
Department of Economics
University of Warwick UK
Email: andrew.oswald@warwick.ac.uk

29 October 2007

Abstract

We present evidence that psychological well-being is U-shaped through life. A difficulty with research on this issue is that there are likely to be omitted cohort effects (earlier generations may have been born in, say, particularly good or bad times). First, using data on 500,000 randomly sampled Americans and West Europeans, the paper designs a test that can control for cohort effects. Holding other factors constant, we show that a typical individual's happiness reaches its minimum -- on both sides of the Atlantic and for both males and females -- in middle age. Second, evidence is provided for the existence of a similar U-shape through the life-course in East European, Latin American and Asian nations. Third, a U-shape in age is found in separate well-being regression equations in 72 developed and developing nations. Fourth, using measures that are closer to psychiatric scores, we document a comparable well-being curve across the life cycle in two other data sets: (i) in GHQ-N6 mental health levels among a sample of 16,000 Europeans, and (ii) in reported depression and anxiety levels among 1 million U.K. citizens. Fifth, we discuss some apparent exceptions, particularly in developing nations, to the U-shape. Sixth, we note that American male birth-cohorts seem to have become progressively less content with their lives. Our paper's results are based on regression equations in which other influences, such as demographic variables and income, are held constant.

Word count: 7400 approx + tables
Keywords: Happiness; aging; well-being; GHQ; cohorts; mental-health; depression; life-course
JEL codes: D1, I3

Corresponding author: andrew.oswald@warwick.ac.uk.
Address: Department of Economics, University of Warwick, Coventry CV4 7AL, United Kingdom.
Telephone: (+44) 02476 523510

Acknowledgements: For helpful suggestions, we thank Andrew Clark, Andrew Gelman, Amanda Goodall, Richard Easterlin, the editor Stephen Birch, and three referees. The second author's work was supported by an ESRC professorial fellowship.

Is Well-being U-Shaped over the Life Cycle?

1. Introduction

A large empirical literature is emerging on the determinants of happiness and mental well-being. As would be expected, this topic has attracted attention from medical statisticians, psychologists, economists, and other investigators (including recently Easterlin 2003, Blanchflower and Oswald 2004, Helliwell and Putnam 2004, Lucas et al 2004, Layard 2005, Smith et al 2005, Ubel et al 2005, Gilbert 2006, and Kahneman et al 2006). However, a fundamental research question remains poorly understood. What is the relationship between well-being and age?

Traditional surveys of the field, such as Myers (1992), Diener et al (1999) and Argyle (2001), argue that happiness is either flat or slightly increasing in age. New work, however, has shown that there is some evidence of a U-shape through the life cycle. In cross-sections, even after correcting for potentially confounding influences, there is now thought to be a well-determined convex link between reported well-being and age. This finding appears in Clark and Oswald (1994), Gerlach and Stephan (1996), Theodossiou (1998), Winkelmann and Winkelmann (1998), Blanchflower (2001), Di Tella et al (2001, 2003), Clark and Oswald (2002), Frey and Stutzer (2002), Blanchflower and Oswald (2004), Graham (2005), Oswald (1997), Frijters et al (2004, 2005), Senik (2004), Van Praag and Ferrer-i-Carbonell (2004), Shields and Wheatley Price (2005), Oswald and Powdthavee (2005, 2007), Propper et al (2005), Powdthavee (2005), Bell and Blanchflower (2007), and Uppal (2006). Clark et al (1996) makes a similar argument for job satisfaction equations. Pinquart and Sorensen (2001) develops an equivalent case for a measure of loneliness, and Hayo and Seifert (2003) does so for a measure of economic subjective well-being. Jorm (2000), however, reviews psychiatric evidence and concludes that there are

conflicting results on how the probability of depression alters through the life course. Glaeser et al (2002) finds evidence that 'social capital' appears to be hill-shaped over the life cycle.

There is an important difficulty with the U-shape conclusion. A variable that measures how old someone is may be standing in for omitted cohort effects (earlier generations may have been born in, say, particularly good or bad times). Hence the U-shape in age could be an artifact of the data.

This is more than a theoretical possibility. Suicide levels seem to vary across cohorts (Stockard and O'Brien 2002). Moreover, Blanchflower and Oswald (2000) find some evidence of rising well-being among young people. There is also evidence -- for example, in Sacker and Wiggins (2002) -- that rates of depression and psychiatric distress, measured consistently across cohorts, have risen in a country such as Great Britain. Oswald and Powdthavee (2007) document worsening mental distress GHQ scores through time in Britain. These matters are still the subject of debate (Murphy et al 2000, Paykel 2000).

This paper offers some of the first evidence that the curvilinear relationship is robust to cohort effects. We draw initially upon randomly sampled data on more than 500,000 Americans and Europeans. These data come from the General Social Surveys of the United States and the Eurobarometer Surveys, and, necessarily given the design of our test, cover a period of some decades. After controlling for different cohorts, we show that well-being reaches its minimum around the middle of life. The regularity is intriguing. The U-shape is similar for males and females, and for each side of the Atlantic Ocean (though its minimum is reached a little later among American men). Moreover, because of the size of our data sets, the turning point in well-being -- the age at which happiness begins to lift back up -- is reasonably

precisely determined. In total we document a statistically significant U-shape in happiness or life satisfaction by age estimated separately for 72 countries -- Albania; Argentina; Australia; Azerbaijan; Belarus; Belgium; Bosnia; Brazil; Brunei; Bulgaria; Cambodia; Canada; Chile; China; Colombia; Costa Rica; Croatia; Czech Republic; Denmark; Dominican Republic; Ecuador; El Salvador; Estonia; Finland; France; Germany; Greece; Honduras; Hungary; Iceland; Iraq; Ireland; Israel; Italy; Japan; Kyrgyzstan; Laos; Latvia; Lithuania; Luxembourg; Macedonia; Malta; Mexico; Myanmar; Netherlands; Nicaragua; Nigeria; Norway; Paraguay; Peru; Philippines; Poland; Portugal; Puerto Rico; Romania; Russia; Serbia; Singapore; Slovakia; South Africa; South Korea; Spain; Sweden; Switzerland; Tanzania; Turkey; United Kingdom; Ukraine; Uruguay; USA; Uzbekistan; and Zimbabwe.

One point should perhaps be made clear from the outset. It is that the paper will concentrate mostly on so-called single-item measures of well-being, so cannot allow subtle differentiation -- as favoured in some psychology journals -- into what might be thought of as different types of, or sides to, human happiness or mental health. Nevertheless, the patterns that emerge seem of interest.

The paper's concern is with the ceteris paribus correlation between well-being and age. Hence we later partial out some other confounding factors, such as income and marital-status, that alter over a typical person's lifetime and have an effect upon well-being. This follows one tradition of empirical research. We read the effect of a variable's coefficient from a long regression equation in which other influences have been controlled for as effectively as possible.

Despite the commonness of this convention in modern social-science research, such a method is not inevitable. A valid and different approach is that of, for example, Mroczek and Kolanz (1998) and Easterlin (2006), who control for few or no

other influences upon well-being, and instead scrutinize the aggregate *uncorrected* relationship between happiness and age. These authors focus on a reduced-form issue. That asks a descriptive question: how does observed happiness vary over the life cycle? Related work is that of Mroczek and Spiro (2005), who establish in a data set on American veterans, where the youngest person in the data set is 40 years old -- making it hard to draw a full comparison with our later random samples -- that happiness rises into the person's early 60s, and then appears to decline.

As common observation shows, the quality of a person's health and physical abilities can depend sensitively on the point in the life cycle. Most diseases, and the probability of getting them, worsen with age. An 80 year old man cannot in general do the same number of push-ups as a 20 year old man. Hence an important issue is whether in happiness equations it is desirable to control in some way for physical vitality. The approach taken in the paper is not to include independent variables that measure physical health. This is partly pragmatic: our data sets have no objective measures and few subjective ones. But the decision is partly substantive: it seems interesting to ask whether people become happier as they age once only demographic and economic variables are held constant.

2. Theoretical issues

There is relatively little social-science theory upon which to draw. However, mention should be made of Carstensen's theory, which argues that age is associated with increasing motivation to derive emotional meaning from life and decreasing motivation to expand one's horizons: see Carstensen et al (1999) and Charles et al (2001). Conventional economics is in principle capable of making predictions about the life cycle structure of happiness -- if conceptualized as utility in the normal economist's framework. In practice, however, the theory does not generate a U-shape

in any natural way. Instead, perhaps the most natural conclusion is that well-being might be predicted to be independent of age. To see why, assume the individual agent tries to maximize lifetime utility V by choosing a consumption path c(a) where a is the individual's age. Assume that lifespan runs deterministically from time t to time T, and that there is no discounting. Let income, y, be fixed and given by the agent's talent endowment, and for simplicity normalize this to unity. Then the agent chooses consumption, c, at each age, a, to maximize lifetime happiness

$$V = \int_t^T u(c,a)da \quad (1)$$

subject to an inter-temporal borrowing constraint

$$1 = \int_t^T c(a)da \quad (2)$$

where the endowment of income to be allocated across all the periods has been normalized to one. Assume that u, utility, or well-being, is an increasing and concave function of consumption, c. Spending, by assumption, makes people happier, but at a diminishing rate.

This is the simplest form of isoperimetric problem. The first-order condition for a maximum is the usual one: the marginal utility of consumption must be the same at each age. Solving a Lagrangean L constructed from (1) and (2):

$$\frac{\partial L}{\partial c} = \frac{\partial u(c,a)}{\partial c} - \lambda = 0 \quad (3)$$

where, from the underlying mathematical structure, the multiplier lambda is constant across the different ages from t to T. Individuals thus allocate their discretionary spending to the points in time when they enjoy it most.

If the utility function u(c, a) is additively separable in consumption and age, equation (3) has a simple implication. It is one implicit in standard economic theory.

Consumption will rationally be flat through time (because under separability u = u(c)) + v(a)). Therefore utility will also be flat through the lifespan if the non-consumption part of utility, v(.), is independent of age. Happiness will be flat over the life course.

The presumption that u(..) is additively separable in its two arguments is a large, and probably unwarranted, step. There seems no reason why the marginal utility of consumption would be independent of a person's age. One might believe that young people wish to signal their status to obtain mates, and therefore might have a greater return from units of consumption than the old. Then the cross-partial derivative of u(c, a) would then be negative. Alternatively, older people may have more need of health and medical spending, so the marginal utility of consumption is greatest in old age. Then the cross-partial of u(c, a) is positive. While it would be possible to assume that early in life the first effect dominates and then in later life the second one dominates, and thus get to a model where well-being was curved through the lifespan, to do so seems too ad hoc (or post-hoc) to be persuasive theoretically.

Hence textbook economic analysis is not capable -- without extra assumptions about v(a) that could mechanically lead to any shape -- of producing unambiguous predictions about the pattern of well-being through life.

3. Empirical Results

We explore this issue empirically. We draw upon a number of data sets -- they combine data on hundreds of thousands of randomly selected individuals -- and first implement a test that controls for the possible existence of cohort effects. Our data do not follow the same person longitudinally. Instead we use statistically representative snapshots year after year. Other approaches to the cohort-effects problem have recently been proposed, using British longitudinal data, by Clark (2007) and Clark and Oswald (2007).

The early evidence starts with four tables. These give regression equation results in which the dependent variable is derived from two kinds of survey answers. The data sets are the U.S. General Social Surveys (GSS) from 1972-2006 and the Eurobarometers from 1976-2002. The exact wording of the GSS well-being question is: *"Taken all together, how would you say things are these days – would you say that you are very happy, pretty happy, or not too happy?"* In the Eurobarometer survey it is: *"On the whole, are you very satisfied, fairly satisfied, not very satisfied, or not at all satisfied with the life you lead?"*

To give a feel for the raw patterns in the data, happiness in the United States is expressed in a cardinal way by assigning 1 to 3 to the three answers, where 'very happy' is a 3. The mean of US happiness in the data is 2.2, with a standard deviation of 0.6. Similarly, European life satisfaction is cardinalized using the integers 1 to 4, where 'very satisfied' is a 4. Here the mean of life satisfaction is 3.0, with a standard deviation of 0.8. Well-being answers are skewed, in both data sets, towards the upper end of the possible distribution.

Table 1 takes all the males in the U.S. General Social Survey from 1972-2006. It estimates a happiness regression equation for this sub-sample, and reveals in its early columns that well-being is U-shaped in age. Then cohort variables are introduced. These take the form of a set of dummy variables – one dummy for each decade of birth. Although the introduction of the cohort dummies affects the turning point of the quadratic function in age, it does not do so in a way that changes the thrust of the idea that psychological well-being follows a U-shaped path.

The same statistical procedure is then adopted for the analysis of three further sub-samples, namely, the females in the GSS data set, the males in the Eurobarometer survey, and the females in the same European sample. We typically test for a U-

shape by examining whether the data take a quadratic form in age. The coefficients on age-squared variables are usually statistically significant at the 0.0001 level.

In the first column of Table 1, a GSS happiness ordered logit equation is estimated on the pooled sample of 20,316 American males with age entered as an independent variable. It has, as further independent regressors, a separate dummy variable for each year in the data set, and for each region of the United States. These are to mop up year-by-year variation in national well-being and unchanging spatial characteristics (such as, say, regions' climatic conditions).

The age regressor in the first column of Table 1 has a positive coefficient of 0.0096 and a t-statistic of approximately 12. Hence reported happiness is higher among people who are older. Subsequent columns of Table 1 add a number of additional regressors: they are years of education of the person; two dummy variables for racial type; 8 dummy variables to capture people's work-force status (that is whether they are employed, unemployed, self-employed, retired,…); a dummy to identify if the respondent has dependent children; a dummy to identify if at age 16 the person was not living with both parents because of their parents' divorce; and 4 dummy variables to capture the person's marital-status. Despite what might be conjectured, it seems to make little difference if controls are entered for having very young children in the household, or even children of various different ages. The well-being U-shape in age is apparently not produced by the influence of children. Subsequent columns of Table 1 check for a turning point in age. It does so, initially, in the simplest parametric way, by fitting a level and a squared term. In column 2 of Table 1, a quadratic form seems to approximate the data well: the equation traces out a happiness function that reaches a minimum at 35.7 years of age.

However, Table 1 then explores the possibility that the U-shape in age is a product merely of omitted cohort effects. Column 3 of Table 1 extends the specification by introducing separate dummy variables -- termed in the table Born<1910-1919, Born 1920-1929, and so on -- for each decade of birth (to avoid complete collinearity, we cannot enter a full set of individual birth-year dummies). The outcome of this exercise is a U-shape in age, but, interestingly, one where the turning point for Americans males is now later in the typical individual's life. According to the evidence in column 3 of Table 1, subjective well-being among American males bottoms out at an estimated 52.9 years. This is to be thought of, it should be emphasized, as the minimum-happiness age after controlling for other influences such as income, education and marital-status. Column 4 then adds the logarithm of household income, to allow for the influence of income upon reported happiness (although the causal interpretation here is perhaps open to debate, Gardner and Oswald 2007 find longitudinal evidence that windfalls raise mental well-being). Income enters positively with a t-statistic of approximately 12; the age minimum is 52.6, and thus barely alters.

A quadratic is restrictive. Column 5 thus tests for a U-shape without imposing any functional form. To do so, the age and age squared variables are replaced with a series of dummy variables representing five-year age bands. Despite the non-parametric form of the test, something fairly close to a quadratic emerges over most of the life course, although it turns over again slightly in late life. The happiness minimum in column 5 of Table 1 occurs in the age band 50-54 years.

In our other data sets, the change in the minimum of the happiness U shape after the inclusion of cohort dummies is less pronounced. Table 2 reports the same exercise for females in the US General Social Survey. The pooled sample size is a

little larger (because women live longer than men) at 25,837 individuals. In Table 2, for women, well-being is at first increasing in age. But once a squared term in age is introduced, in the third column, it is clear that the data favour the quadratic form, and once again happiness is strongly U-shaped in age. When the same set of cohort dummies are incorporated into the equation, in column 4 of Table 2, the turning point of the happiness function is at age of 38.6 years, which is well below the value for men obtained in column 4 of Table 1 of 52.9 years.

With a few differences, Tables 3 and 4 tell the same broad story, although they use Eurobarometer data pooled from 1976 to 2002. Here the continent is different and the sample sizes far larger. A slightly different form of well-being question (on life satisfaction) has to be employed. But as these estimation methods effectively use only the ordering of well-being answers, the exact wording is unlikely to matter (and so empirically it seems to prove). In Table 3, an ordered logit is estimated for 293,612 males from France, Belgium, Netherlands, West Germany, Italy, Luxembourg, Denmark, Ireland, Great Britain, Greece, Spain, Portugal, Finland, Norway, Sweden and Austria. To allow comparisons, the aim is to achieve an econometric specification as close as possible, despite some differences in the data sets, to that for the United States in Tables 1 and 2. Before the cohort dummies are introduced, the turning point in the male well-being equation is at a minimum where age equals 44.5 years (see column 2 of Table 3). It is not easy to say why this number might be lower than in the USA (see column 2 of Table 1), but one conjecture is that the Second World War may have exacted a different toll on this generation of European males. Here the age at which well-being reaches a minimum in the full specification is 46.5 years, which is below the American number. Table 4

produces similar figures, and equations, for the female sub-sample of 314,431 randomly sampled European women.

Although, probably unsurprisingly, the birth-cohort coefficients (on Born<1910-1919, etc) are not always individually well-defined, there are signs from the tables that the United States and Europe differ in the time structure of the cohort effects. In Tables 1 and 2, there is evidence that successive American birth cohorts have become progressively less happy between 1900 and today. This finding is reminiscent of one of Easterlin's (2006), although he uses a different statistical method. In Europe, by contrast, Tables 3 and 4 suggest that well-being is broadly similar across birth-generations. This seems particularly clear for males. A full set of interaction terms – where both the age and age squared terms were interacted with the other independent variables -- was also tried, as a robustness check, but these were found to have coefficients that were almost always insignificantly different from zero at the 95% confidence level.

Even if statistically significant, is such a U-shape in age large enough to be important empirically? The answer seems to be yes.

One way to explore this is to compare the levels of well-being between, say, age 20 and age 45. This difference -- in the equations that control for other factors -- is approximately 0.1 to 0.2 cardinal well-being points, which is around one fifth of a standard deviation in well-being scores. At first sight that does not appear large. However, because the standard deviation is dominated by cross-section variation in reported well-being, there is a more useful and evocative way to think about the size of the age and age-squared effect. Going from age 20 to age 45 is approximately equal to one third of the size of the effect of the unemployment coefficient in a well-being equation. That is suggestive of a large effect on well-being.

Although the birth-cohort coefficients are not always individually well-defined, there are signs from the early Tables that the United States and Europe differ quite strongly in the time structure of the cohort effects upon happiness. In Tables 1 and 2, there is evidence that successive American generations became progressively less happy from 1900 to today. This conclusion is reminiscent of one of Easterlin's (2006), although he uses a different statistical method.

In Europe, by contrast, Tables 3 and 4 suggest that cohort well-being falls initially from the beginning of the century but, after bottoming out in the 1950s (which is the omitted base category), has actually been rising slightly throughout the most recent generations.

As with the effect of moving along the quadratic function in age, cohort dummy variables are here large in magnitude; they are not merely different from zero on a formal significance test. Put loosely, cohort effects are two or three times as large as the effect from the U-shape in age. The single greatest effect is visible in the equations for US males in Table 1. Here, comparing the happiest cohort of Americans to the least happy, the cardinalized well-being difference through the generations exceeds half of one standard-deviation of the happiness measure. In all the tables, whilst the details differ, estimated cohort effects are quantitatively significant and not merely statistically significant.

On a cautious note, it might be argued that the use of language itself could have altered over the century (perhaps modern generations of highly educated TV-watchers have become linguistically more or less expressive), and hence that in the US and Europe the paper's estimated happiness-cohort effects are partly or wholly an illusion caused by this changing nature of words. It is not easy to guard against such possibilities in a truly definitive way. Nevertheless, one piece of evidence against

such a view comes out of the difference between the continents' results. The estimated pattern of the cohort effects is different between the US and Europe. As -- because of common trends in technology -- both continents' ways of living have changed in broadly similar ways since 1900, it is not easy to see how the coefficients on the cohort dummies could be explained solely by some form of changed use of language in the modern world. Thus the cohort effects seem unlikely to be simply a mirage caused by alterations in the way that different generations use, and perceive the meaning of, words.

Does the U-shape in age hold in developing countries? Clearly mean life-spans are different, so it would be a surprise if exactly the same pattern emerged. No long time series is available to allow a test for cohort effects, but data are available, from four sweeps of the World Values Survey, on eighty countries covering the years 1981-1984; 1989-1993; 1994-1999; and 1999-2004. These data are drawn from twenty five Western countries such as the USA, Canada and the UK; fourteen East European countries (e.g. the Czech Republic, Hungary and Poland); and thirty seven developing countries (e.g. China, Uganda, Uruguay and Vietnam). Table 5 reports estimates of a series of life satisfaction equations with well-being scored from 1 at the dissatisfied end to 10 at the completely satisfied end; we report them separately for each of the three groups of countries. The controls here include work-force-status, marital-status, education, country and year dummies, and the person's income (grouped into appropriate deciles for his or her country).

A U-shape in age is found in all five columns of Table 5. It occurs in approximately the mid to late forties. When separate equations are estimated by country, but not by gender, the U-shape seems to occur in the majority of nations (Appendix Table 1 reports the results). The group with a U-shape has a large number

of developing countries in it, including, with the numbers in parentheses being the age minima from Appendix Table 1, the following nations: Azerbaijan (45.8); Brazil (36.5); China (46.5); Iraq (51.7); Mexico (41.4); Nigeria (42.4); Peru (39.5); Tanzania (46.2) and Zimbabwe (46.2).

We feel it would be unwise to overstate this finding. A group that did not have a U-shape in age, where either or both of the age terms were insignificant, often included countries where sample sizes were small, but were mostly developing countries (Armenia; Bangladesh; Chile; Colombia; Dominican Republic; Egypt; India; Indonesia; Iran; Jordan; Moldova; Morocco; Pakistan; Saudi Arabia; Singapore; Slovenia; Taiwan; Uganda; Venezuela and Vietnam).

When separate results are run by country, using Eurobarometer data 1976-2002, with both sexes pooled, the results are as follows -- where controls are log of income, year-of-birth dummies, gender, income, education, year, country, year, marital-status and work-force status as in column 4 in Tables 3 and 4.

	Age at minimum	Sample size
Belgium	46.4	33,035
Denmark	50.1	39,010
Finland	49.9	8,978
France	49.5	38,843
Germany	42.9	54,946
Greece	53.4	30,469
Ireland	38.4	25,191
Italy	64.2	35,327
Luxembourg	41.3	9,761
Netherlands	46.9	39,239
Portugal	66.1	25,529
Spain	50.1	20,854
Sweden	49.6	8,566
UK	35.8	40,668
Total	47.0	422,475
USA (Gen. Soc. Survey)	44.5	41,193

The age variables were here not significant for Austria (n=6,594) or Norway (n=5,465).

For the USA, a similar equation was run with controls for log of income, year and year-of-birth dummies, gender, region, family, marital and work-force status dummies (as in column 5 of Tables 1 and 2).

Columns 1-4 of Table 6 make use of data from eighteen Latin American countries. They are Argentina; Bolivia; Brazil; Colombia; Costa Rica; Chile; Ecuador; El Salvador; Guatemala; Honduras; Mexico; Nicaragua; Panama; Paraguay; Peru; Uruguay; Venezuela and the Dominican Republic. This sample is for the years 1997, 2000-2001 and 2003-2005, and, like Graham (2007), draws on the Latinobarometers. The life satisfaction question used in the Latinobarometers is identical to the one used in the Eurobarometers. Columns 1 and 3 include education dummies which were unavailable in 2000, hence the smaller sample size; the results are similar when the education variables are omitted and the additional year of data are added. There are estimated age minima for both men and women. As was found above using the World Values Survey, there are age minima for a majority, but not all, countries if separate equations are estimated. The countries where turning points are found, with the estimated minima in parentheses -- here excluding education dummies to help the sample sizes -- were Argentina (turning at age 52.3); Brazil (46.7); Colombia (49.7); Costa Rica (44.2); Chile (44.0); Ecuador (61.9); Honduras (58.3); Nicaragua (48.9); Paraguay (52.0); Uruguay (40.3); and Dominican Republic (48.7).

Columns 5 and 6 of Table 6 turn to Asia. These take data from the Asiabarometers for 2003 and 2004, and pooled across fifteen Asian countries -- Brunei; Cambodia; China; India; Indonesia; Laos; Malaysia; Myanmar; Philippines; Singapore; South Korea; Sri Lanka; Thailand; Uzbekistan; and Vietnam. The data measure happiness: *"All things considered, would you say that you are happy these*

days? 1=very unhappy; 2=not too happy 3=neither happy or unhappy; 4=pretty happy and 5=very happy". The regression controls are 5 education dummies; 3 marital-status dummies; one year dummy; and 18 work-force status dummies. In column 5, an age minimum for men is found at 46.9; and at age 39.1 for women in column 6. Separate minima in individual country equations are found in seven out of the fifteen countries -- for Cambodia (72.9); Myanmar (61.9); Singapore (43.9); South Korea (47.9); Laos (37.7); Brunei (37.3); and Uzbekistan (47.7)

It seems useful to ask whether a life course U-shape also emerges when a well-being variable is closer to a measure of mental health. Figure 1 plots the incidence of self-reported depression in the UK Labour Force Survey. Here the data are pooled for men and women across the period 2004Q2-2007Q1. The sample is for those aged 16-70. There are approximately one million observations (n=972,464), and the estimates are weighted using the person weights so are nationally representative. Respondents in the LFS are asked to report on any health problems they have had, and then to identify the most important of these and that is what is examined here. What is graphed in Figure 1 is the mean incidence of depression-and-anxiety by age. The figure has an average of 17,068 observations per cell (i.e. per dot). The outcome is a hill-shaped relationship between age and a measure of mental ill-health, which turns around age 46 in these raw data. This pattern is consistent with the paper's earlier, and qualitatively different, life-satisfaction evidence.

Using the dprobit procedure in STATA, Table 7 estimates the probability an individual in the LFS will report being depressed. In column 1, without any controls, *probability of depression = 0.0021416Age - 0.000024Age*^{2} where n=972,464. The quadratic maximises at age 44.6. Allowing for confounders has little impact. The

maximum is finally estimated at 44.0 in column 3 with a full set of controls for month, year, region, race, education, marital and work-force status. March is the month in which the highest depression rates are reported.

Table 8 performs a similar exercise for a different measure of mental health. The table draws upon data from Eurobarometer #56.1: *Social Exclusion and Modernization of Pension Systems* (ICPSR #3475). Between September and October 2001, this survey collected identical survey information from approximately 15,500 individuals living in Austria, Belgium Denmark, East Germany, Finland, France, Greece, Italy, Ireland, Luxembourg, the Netherlands, Portugal, Spain, the United Kingdom, Sweden and West Germany. This data file has data for the same individuals on mental strain and on life satisfaction. It was included within one of our Eurobarometers used in Tables 3 and 4.

In the first two columns of Table 8, the dependent variable is psychological distress constructed (in the spirit of the well-known General Health Questionnaire score) by amalgamating answers to the questions:

Have you recently:

1. *Lost much sleep over worry?*
2. *Felt constantly under strain?*
3. *Felt you could not overcome your difficulties?*
4. *Been feeling unhappy and depressed?*
5. *Been losing confidence in yourself?*
6. *Been thinking of yourself as a worthless person?*

To the answers to each of these, we assign the integers 0, 1, 2, 3 -- depending whether each was answered *not at all, no more than usual, rather more than usual, much more than usual*. Following Blanchflower and Oswald (2007), the numerical answers are

summed, and we term the result a 'GHQ-N6' measure, where N is for 'negative'. These questions are the 6 negatively worded ones from the fuller General Health Questionnaire GHQ-12 measure of psychological distress. Our data set does not provide data on the other six 'positive' questions. Thus our focus is upon negative affect.

The GHQ-N6 score lies between 0 and 18. Across Europe, the mean of this variable is 3.6 (standard deviation 3.7). Clark and Oswald (1994, 2002) show in British data that GHQ is quadratic in age. Blanchflower and Oswald (2007) has more on an international ranking of mental distress.

There is a precedent for exploring negative and positive elements within GHQ (see Huppert and Whittington, 2003). Column 1 of Table 7 just contains age and its square as controls, and the function reaches a maximum at age 47.8. Adding additional controls reduces this marginally. Columns 3 and 4 of Table 8 use the same sample of individuals and the same controls as in columns 1 and 2; but now ordered logit is the method of estimation, and life satisfaction is the dependent variable. In column 3, without controlling for confounders, satisfaction minimises at 49.5 (and age 49.3 in column 4).

4. Conclusions

This paper offers international evidence that well-being depends in a curvilinear way upon age. Happiness is approximately U-shaped through the life course; mental distress tends to reach a maximum in middle age. Our regression equations allow for confounding influences -- including income, education and marriage -- upon happiness and life satisfaction. The empirical findings should thus be read as tracing out an age U-shape in *ceteris-paribus well-being.* In some nations, that U-shape holds in raw data; in other countries it is necessary to use multiple

regression methods. Our main conclusion is meant as a broad characterization of the data, and should be kept in perspective. We have not presented detailed findings from the fitting of high-order polynomials. There is, for example, a little evidence from our non-parametric work for a further flattening, and a turn down, towards the end of a person's life.

The paper's results, which draw upon ordered-logit regression equations, and use data sets long enough to distinguish age effects from cohort effects, suggest that the convex structure of the curve is fairly similar across different parts of the world. The happiness U-shape finding in United States data stems originally from results in Blanchflower et al (1993), which became Blanchflower and Oswald (2004). Early British evidence for an equivalent U-shape, using instead GHQ scores, appears in Clark and Oswald (1994).

Do cohort effects matter? Our correction for birth-cohort influences makes some difference to the results claimed in the earlier literature, especially in American well-being equations, but the broad spirit of a U-shape seems to be unaffected by cohort influences. On these estimates, happiness among American males and females reaches a minimum in, respectively, approximately the individuals' early 50s and late 30s. Reported life satisfaction levels among European men and women minimize around the mid 40s. What explains such differences remains an open question.

It might be objected that our methods rely on decadal proxies for cohorts of Americans and Europeans. How to do better than this is not clear -- because one aim is to maintain the age and year dummies within the equations. Moreover, if subtler cohort effects were of major importance, we might expect more evidence of equation instability when they are imperfectly introduced in the form of the decade-long dummy variables. This paper has one noticeable limitation. It is that these

international data sets do not follow the same individuals each year. As far as we know, there is no internationally comparable panel data set on multiple nations in which general happiness or well-being questions are asked (a European Household Panel is currently being constructed but asks only questions such as income-satisfaction and housing-satisfaction). Further longitudinal inquiry will be valuable.

What causes the apparently U-shaped curve, and the rough regularity of its mathematical shape in different parts of the developed and developing world, is unknown. Tentatively:

- One possibility is that individuals learn to adapt to their strengths and weaknesses, and in mid-life quell their infeasible aspirations.
- Another -- though it could presumably only be a small part of the explanation -- is that cheerful people live systematically longer than the miserable, for reasons not currently understood, and that the well-being U-shape in age thus traces out in part a selection effect.
- A third is that a kind of comparison process is at work: I have seen school-friends die and come eventually to value my blessings during my remaining years.

It seems desirable that future work aim to understand the roots of the U-shaped pattern.

References

Argyle, M. (2001). The psychology of happiness. London: Routledge, Second edition.

Bell, D., & Blanchflower, D.G. (2007). The Scots may be brave but they are neither healthy nor happy. *Scottish Journal of Political Economy*, 54, 166-194.

Blanchflower, D.G. (2001). Unemployment, well-being and wage curves in Eastern and Central Europe. *Journal of Japanese and International Economies*, 15, 364-402.

Blanchflower, D.G., & Oswald, A.J. (2000). The rising well-being of the young. In Youth employment and joblessness in advanced countries, eds. D.G. Blanchflower and R. Freeman, Chicago: NBER and University of Chicago Press.

Blanchflower, D.G., & Oswald, A.J. (2004). Well-being over time in Britain and the USA. *Journal of Public Economics*, 88, 1359-1386.

Blanchflower, D.G., & Oswald, A.J. (2007). Hypertension and happiness across nations. *Journal of Health Economics*, forthcoming.

Blanchflower, D.G., Oswald, A.J., & Warr, P. (1993). Well-being over time in Britain and the USA. Unpublished paper presented at a Happiness conference at the London School of Economics.

Carstensen, L.L., Isaacowitz, D.M., & Turk-Charles, S. (1999). Taking time seriously: A theory of socioeconomic selectivity. *American Psychologist*, 54, 165-181.

Charles, S.T., Reynolds, C.A., & Gatz, M. (2001). Age-related differences and change in positive and negative affect over 23 years. *Journal of Personality and Social Psychology*, 80, 136-151.

Clark, A.E. (2007). Born to be mild. Working paper, PSE, Paris.

Clark, A.E., & Oswald, A.J. (1994). Unhappiness and unemployment. *Economic Journal*, 104, 648-659.

Clark, A.E., Oswald, A., & Warr, P. (1996). Is job satisfaction U-shaped in age? *Journal of Occupational and Organizational Psychology*, 69, 57-81.

Clark, A.E., & Oswald, A.J. (2002) A simple statistical method for measuring how life events affect happiness, *International Journal of Epidemiology*, 31, 1139-1144.

Clark, A.E., & Oswald, A.J. (2007). The curved relationship between age and subjective well-being. Working paper, PSE, Paris.

Diener, E., Suh, E.M., Lucas, R.E., & Smith, H.L. (1999). Subjective well-being: Three decades of progress. *Psychological Bulletin*, 125(2), 276-302.

Di Tella, R., MacCulloch, R.J., & Oswald, A.J. (2001). Preferences over inflation and unemployment: Evidence from surveys of happiness. *American Economic Review*, 91, 335-341.

Di Tella, R., MacCulloch, R.J., & Oswald, A.J. (2003). The macroeconomics of happiness. *Review of Economics and Statistics*, 85, 809-827.

Easterlin, R.A. (2003). Explaining happiness. *Proceedings of the National Academy of Sciences*, 100, 11176-11183.

Easterlin, R.A. (2006). Life cycle happiness and its sources: Intersections of psychology, economics and demography. *Journal of Economic Psychology*, 27, 463-482.

Frey, B.S., & Stutzer, A. (2002). Happiness and economics. Princeton: Princeton University Press.

Frijters, P., Haisken-DeNew, J.P., & Shields, M.A. (2004). Money does matter! Evidence from increasing real income and life satisfaction in East Germany following reunification. *American Economic Review*, 94, 730-740.

Frijters, P., Haisken-DeNew, J.P., & Shields, M.A. (2005). The causal effect of income on health: Evidence from German reunification. *Journal of Health Economics*, 24, 997-1017.

Gardner, J., & Oswald, A.J. (2007). Money and mental well-being: A longitudinal study of medium-sized lottery wins. *Journal of Health Economics*; 26; 49-60.

Gerlach, K., & Stephan, G. (1996). A paper on unhappiness and unemployment in Germany. *Economics Letters*, 52, 325-330.

Gilbert, D. (2006). Stumbling on happiness. New York: Alfred A Knopf.

Glaeser, E.L., Laibson, D., & Sacerdote, B. (2002). An economic approach to social capital. *Economic Journal*, 112, F437-458.

Graham, C. (2005). Insights on development from the economics of happiness. *World Bank Research Observer*, 20, 201-231.

Graham, C. (2007). Happiness and health: Lessons – and questions – for public policy. Health Affairs, forthcoming.

Hayo, B., & Seifert, W. (2003). Subjective economic well-being in Eastern Europe. *Journal of Economic Psychology*, 24, 329-348.

Helliwell, J., & Putnam, R.D. (2004). The social context of well-being. *Philosophical Transactions of the Royal Society*, 359, 1435-1446.

Huppert, F.A., & Whittington, J.E. (2003). Evidence for the independence of positive and negative well-being: Implications for quality of life assessment. *British Journal of Health Psychology*, 8, 107-122.

Jorm, A.F. (2000). Does old age reduce the risk of anxiety and depression? A review of epidemiological studies across the adult life span. *Psychological Medicine*, 30, 11-22.

Kahneman, D., Krueger, A.B., Schkade, D., Schwarz, N., & Stone, A.A. (2006). Would you be happier if you were richer? A focusing illusion. *Science*, 312, 1908-1910.

Layard, R. (2005). Happiness: Lessons from a new science. London: Allen Lane.

Lucas, R.E., Clark, A.E., Georgellis, Y., & Diener, E. (2004). Unemployment alters the set point for life satisfaction. *Psychological Science*, 15 (1), 8-13.

Mroczek, D.K., & Kolanz, C.M. (1998). The effect of age on positive and negative affect: A developmental perspective on happiness. *Journal of Personality and Social Psychology*, 75, 1333-1349.

Mroczek, D.K., & Spiro, A. (2005). Change in life satisfaction during adulthood: Findings from the Veterans Affairs Normative Aging study. *Journal of Personality and Social Psychology*, 88, 189-202.

Murphy, J.M., Laird, N.M., Monson, R.R., Sobol, A.M., & Leighton, A.H. (2000). A 40-year perspective on the prevalence of depression – The Stirling County study. *Archives of General Psychiatry*, 57, 209-215.

Myers, D.M. (1992). The pursuit of happiness. New York: Morrow.

Oswald, A.J. (1997). Happiness and economic performance. *Economic Journal*, 107, 1815-1831.

Oswald, A.J., & Powdthavee, N. (2005). Does happiness adapt? A longitudinal study of disability with implications for economists and judges. University of Warwick: working paper.

Oswald, A.J., & Powdthavee, N. (2007). Obesity, unhappiness and the challenge of affluence: Theory and evidence. *Economic Journal*, 117(521), 441-454.

Paykel, E.S. (2000). Not an age of depression after all? Incidence rates may be stable over time. *Psychological Medicine*, 30, 489-490.

Pinquart, M., & Sorensen, S. (2001). Influences on loneliness in older adults: A meta-analysis. *Basic and Applied Social Psychology*, 23, 245-266.

Powdthavee, N. (2005). Unhappiness and crime: Evidence from South Africa. *Economica*, 72, 531-547.

Propper, C., Jones, K., Bolster, A., Burgess, S., Johnston, R., & Sarker, R. (2005). Local neighbourhood and mental health: Evidence from the UK. *Social Science and Medicine*, 61, 2065-2083.

Sacker, A., & Wiggins, R.D. (2002). Age-period-cohort effects on inequalities in psychological distress, 1981-2000. *Psychological Medicine*, 32, 977-990.

Senik, C. (2004). When information dominates comparison – Learning from Russian subjective panel data. *Journal of Public Economics*, 88, 2099-2123.

Shields, M.A., & Wheatley Price, S. (2005). Exploring the economic and social determinants of psychological well-being and perceived social support in England. *Journal of the Royal Statistical Society (Series A)*, 168, 513-537.

Smith, D.M., Langa, M., Kabeto, M.U., & Ubel, P.A. (2005). Health, wealth and happiness. *Psychological Science*, 16, 663-666.

Stockard, J., & O'Brien, R.M. (2002). Cohort variations and changes in age-specific suicide rates over time: Explaining variations in youth suicide. *Social Forces*, 81, 605-642.

Theodossiou, I. (1998). The effects of low-pay and unemployment on psychological well-being: A logistic regression approach. *Journal of Health Economics*, 17, 85-104.

Ubel, P.A., Loewenstein, G., & Jepson, C. (2005). Disability and sunshine: Can hedonic predictions be improved by drawing attention to focusing illusions or emotional adaptation? *Journal of Experimental Psychology: Appl*, 11, 111-123.

Uppal, S. (2006). Impact of the timing and severity of disability on the subjective well-being of individuals with disabilities. *Social Science and Medicine*, 63, 525-539.

Van Praag, B., & Ferrer-i-Carbonell, A. (2004). Happiness quantified: A satisfaction calculus approach. Oxford: Oxford University Press.

Winkelmann, L., & Winkelmann, R. (1998). Why are the unemployed so unhappy? Evidence from panel data. *Economica*, 65, 1-15.

Table 1. Happiness Equations for Men in the USA: Pooled Data 1972-2006

	(1)	(2)	(3)	(4)	(5)
Age	.0096 (11.78)	-.0236 (4.25)	-.0272 (3.34)	-.0313 (3.81)	
Age^2		.0003 (5.61)	.0003 (3.75)	.0003 (3.99)	
Born 1900-1909			.1420 (0.91)	.0606 (0.37)	-.0783 (0.47)
Born 1910-1919			-.1261 (0.73)	-.2669 (1.46)	-.4325 (2.38)
Born 1920-1929			-.2405 (1.18)	-.3801 (1.76)	-.5086 (2.44)
Born 1930-1939			-.3872 (1.59)	-.5096 (1.99)	-.6115 (2.52)
Born 1940-1949			-.5686 (1.99)	-.6824 (2.28)	-.7519 (2.70)
Born 1950-1959			-.6219 (1.91)	-.7173 (2.11)	-.7843 (2.50)
Born 1960-1969			-.6045 (1.64)	-.6857 (1.78)	-.7575 (2.15)
Born 1970-1979			-.6858 (1.66)	-.7838 (1.82)	-.8581 92.17)
Born 1980 +			-.8168 (1.75)	-.8813 (1.81)	-.9630 (2.16)
Log of income				.2545 (12.42)	.2549 (2.33)
Age 20-24					-.1220 (0.99)
Age 25-29					-.2508 (1.92)
Age 30-34					-.2837 (2.03)
Age 35-39					-.3598 (2.37)
Age 40-44					-.4415 (2.67)
Age 45-49					-.4562 (2.49)
Age 50-54					-.4741 (2.39)
Age 55-59					-.3964 (1.81)
Age 60-64					-.2209 (0.93)
Age 65-69					-.0827 (0.32)
Age 70-74					-.1807 (0.64)
Age 75-79					-.1769 (0.57)
Age 80-84					-.1961 (0.58)
Age >=85					-.2530 (0.68)
Personal controls	No	Yes	Yes	Yes	Yes
Cut1	-1.4891	-1.3541	-1.9419	-.0440	.2732
Cut2	1.3247	1.6520	1.0671	2.9875	3.3073
Sample size	20,316	19,996	19.996	18,494	18,494
Pseudo R^2	.0065	.0481	.0488	.0524	.0530
Log likelihood ratio	-18936	-17853	-17841	-15890	-16416
Age at the happiness minimum		***35.7***	***52.9***	***52.6***	

Notes: The dependent variable, here and in later tables, is a measure of subjective well-being. The numbers in parentheses are t-statistics; they test the null hypothesis of a coefficient of zero. The six regression equations are to be read vertically. These are ordered logits and include 25 year-dummies and 9 region-dummies. 'Personal controls' are the number of years of education, two race-dummies, 8 work-force-status dummies, 4 marital-status dummies, 1 dummy to identify if the respondent has dependent children, and a further dummy to identify if at age 16 the respondent was not living with both parents because of a parental divorce. The cohort dummies are 'Born <1900', 'Born 1900-1909', and so on. The 'base' omitted cohort is that for people born pre-1900. The data set excludes 1972 when income is excluded; surveys were not conducted in 1979, 1981, 1992, 1995, 1997, 1999, 2001, 2003 and 2005. The exact wording of the well-being question is: "Taken all together, how would you say things are these days – would you say that you are very happy, pretty happy, or not too happy?".
Source: General Social Survey, 1972-2006

Table 2. Happiness Equations for Women in the USA: Pooled Data 1972-2006

	(1)	(2)	(3)	(4)	(5)
Age	.0007 (1.04)	-.0187 (4.53)	-.0110 (1.88)	-.0256 (3.39)	
Age^2		.0003 (6.24)	.0002 (3.69)	.0003 (5.29)	
Born 1900-1909			.0165 (0.13)	-.0857 (0.60)	-.2204 (1.53)
Born 1910-1919			-.0020 (0.01)	-.0502 (0.31)	-.2155 (1.37)
Born 1920-1929			-.1317 (0.76)	-.2126 (1.12)	-.3950 (2.16)
Born 1930-1939			-.0730 (0.35)	-.1484 (0.65)	-.3289 (1.54)
Born 1940-1949			-.1115 (0.45)	-.2185 (0.82)	-.4201 (1.71)
Born 1950-1959			-.1923 (0.68)	-.2842 (0.94)	-.5123 (1.84)
Born 1960-1969			.0079 (0.02)	-.0587 (0.17)	-.3188 (1.01)
Born 1970-1979			.0460 (0.13)	-.0389 (0.10)	-.3348 (0.95)
Born 1980 +			.0320 (0.08)	-.0082 (0.02)	-.3103 (0.78)
Log of income				.2392 (13.75)	.2429 (13.88)
Age 20-24					-.0398 (0.32)
Age 25-29					-.0611 (0.47)
Age 30-34					-.1213 (0.88)
Age 35-39					-.1872 (1.26)
Age 40-44					-.2322 (1.46)
Age 45-49					-.1815 (1.04)
Age 50-54					-.1322 (0.70)
Age 55-59					-.1800 (0.88)
Age 60-64					.0301 (0.14)
Age 65-69					.0880 (0.37)
Age 70-74					.3180 (1.24)
Age 75-79					.2312 (0.83)
Age 80-84					.2929 (0.97)
Age >=85					.2646 (0.80)
Personal controls	No	Yes	Yes	Yes	Yes
Cut1	-1.9086	-1.0203	-.9075	.5340	.6996
Cut2	.7971	1.8765	1.9921	3.4937	3.6607
Sample size	25,837	25,478	25,478	22,699	22,699
Pseudo R^2	.0030	.0466	.0473	.0528	.0532
Log likelihood ratio	-24507	-23378	-23086	-20351	-20342
Age at the happiness minimum		***34.9***	***29.8***	***38.6***	

Notes: As for Table 1.

Table 3. Life Satisfaction Equations for Men in Europe: Pooled Data 1976-2002

	(1)	(2)	(3)	(4)	(5)
Age	.0002 (1.16)	-.0509 (33.77)	-.0446 (19.71)	-.0407 (15.18)	
Age^2		.0006 (35.66)	.0005 (23.02)	.0004 (18.21)	
Born 1900-1909			.0906 (1.32)	.0977 (1.24)	-.0446 (0.56)
Born 1910-1919			.0427 (0.61)	.0150 (0.18)	-.1855 (2.24)
Born 1920-1929			-.0212 (0.28)	-.0939 (1.06)	-.2879 (3.25)
Born 1930-1939			-.0945 (1.12)	-.1944 (1.98)	-.3259 (3.41)
Born 1940-1949			-.1649 (1.77)	-.2588 (2.38)	-.3245 (3.14)
Born 1950-1959			-.2610 (2.56)	-.3288 (2.76)	-.3675 (3.28)
Born 1960-1969			-.1734 (1.56)	-.2177 (1.68)	-.2366 (1.95)
Born 1970-1979			-.0805 (0.67)	-.1060 (0.75)	-.1051 (0.80)
Born 1980 +			-.0787 (0.60)	-.1391 (0.89)	-.1200 (0.83)
Log of income				.3539 (49.65)	.3539 (49.39)
Age 20-24					-.1058 (4.14)
Age 25-29					-.2226 (7.58)
Age 30-34					-.2860 (8.27)
Age 35-39					-.3207 (8.30)
Age 40-44					-.3211 (7.19)
Age 45-49					-.3555 (7.20)
Age 50-54					-.2936 (5.27)
Age 55-59					-.2456 (4.03)
Age 60-64					.0125 (0.18)
Age 65-69					.0914 (1.24)
Age 70-74					.1418 (1.74)
Age 75-79					.1853 (2.09)
Age 80-84					.2271 (2.25)
Age >=85					.2230 (1.85)
Personal controls	No	Yes	Yes	Yes	Yes
Cut1	-3.4653	-4.0423	-4.0536	-2.0447	1.5284
Cut2	-1.8445	-2.3787	-2.3890	-.3495	.1672
Cut3	.9849	.5462	.5380	2.6201	3.1381
Sample size	293,612	284,577	284,577	206,917	206,917
Pseudo R^2	.0588	.0785	.0790	.0913	.0916
Log likelihood ratio	-29852	-283240	-283112	-203951	-203892
Age at the life satisfaction minimum	***44.5***		***48.5***	***46.5***	

Notes: The numbers in parentheses are t-statistics. All equations are ordered logits and include 16 country-dummies and 23 year-dummies. 'Personal controls' are 9 educational-qualification dummies, 6 work-force-status dummies, and 5 marital-status dummies. The 'base' cohort is that for people born pre-1900. The data set excludes 1981, and columns 2-4 also exclude 1979 and 1981, 1995 and 1996 because there are no income variables for those years. The exact wording of the well-being question is: "On the whole, are you very satisfied, fairly satisfied, not very satisfied, or not at all satisfied with the life you lead?" The countries are Austria., Belgium, Denmark, Finland, Great Britain, Greece, East Germany, France, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden and West Germany,.
Source: Eurotrends file (Eurobarometer ICPSR #3384)

Table 4. Life Satisfaction Equations for Women in Europe: Pooled Data 1976-2002

	(1)	(2)	(3)	(4)	(5)
Age	-.0053 (27.23)	-.0398 (28.86)	-.0359 (16.81)	-.0389 (15.24)	
Age^2		.00044 (30.14)	.0003 (20.08)	.0004 (18.78)	
Born 1900-1909			.0184 (0.30)	.1175 (1.61)	.0256 (0.35)
Born 1910-1919			-.0016 (0.03)	.0982 (1.30)	-.0294 (0.38)
Born 1920-1929			-.0408 (0.58)	.0240 (0.29)	-.1026 (1.24)
Born 1930-1939			-.1063 (1.36)	-.0609 (0.66)	-.1527 (1.70)
Born 1940-1949			-.1163 (1.33)	-.0820 (0.79)	-.1514 (1.55)
Born 1950-1959			-.1876 (1.95)	-.1162 (1.02)	-.1876 (1.76)
Born 1960-1969			-.1517 (1.44)	-.0686 (0.55)	-.1358 (1.17)
Born 1970-1979			-.0552 (0.48)	.0408 (0.30)	-.0155 (0.12)
Born 1980 +			-.0219 (0.17)	.0539 (0.36)	.0071 (0.05)
Log of income				.3405 (49.35)	.3425 (49.42)
Age 20-24					-.0889 (3.46)
Age 25-29					-.2005 (6.82)
Age 30-34					-.2334 (6.85)
Age 35-39					-.3100 (8.17)
Age 40-44					-.3323 (7.57)
Age 45-49					-.3516 (7.24)
Age 50-54					-.3490 (6.35)
Age 55-59					-.2999 (5.01)
Age 60-64					-.1458 (2.18)
Age 65-69					-.0620 (0.86)
Age 70-74					.0176 (0.22)
Age 75-79					.0882 (1.02)
Age 80-84					.1200 (1.24)
Age >=85					.2498 (2.21)
Personal controls	No	Yes	Yes	Yes	Yes
Cut1	-3.8589	-3.8022	-3.8240	-1.8868	-1.3905
Cut2	-2.1632	-2.0759	-2.0973	-.1382	.3582
Cut3	.6640	.8260	.8057	2.7974	3.2942
Sample size	314,431	304,869	304,869	215,558	215,558
Pseudo R^2	.0724	.0880	.0882	.0991	.0992
Log likelihood ratio	-317507	-302628	-302561	-213239	-213219
Age at the life satisfaction minimum		***45.5***	***48.2***	***46.8***	

Notes: See Table 3.

Table 5. Life Satisfaction Equations: World Values Survey Data 1981-2004

	(1) Men	(2) Women	(3) Men	(4) Women	(5) Men	(6) Women
	Western Europe		*Eastern Europe*		*Developing Countries*	
Age	-.0570 (13.74)	-.0371 (9.70)	-.0772 (10.68)	-.0593 (9.20)	-.0414 (8.95)	-.0360 (8.12)
Age^2	.0006 (14.24)	.0004 (9.72)	.0008 (10.67)	.0006 (8.83)	.0005 (9.29)	.0004 (7.86)
Cut1	-4.9134	-4.4746	-4.0432	-3.7387	-2.5244	-2.1663
Cut2	-4.2999	-3.8588	-3.4915	-3.1577	-1.9276	-1.5718
Cut3	-3.4685	-3.0849	-2.7613	-2.4412	-1.3525	-1.0131
Cut4	-2.8399	-2.4890	-2.2223	-1.9426	-.9067	-.5640
Cut5	-1.9622	-1.5927	-1.3586	-1.0357	-.0194	.3228
Cut6	-1.3187	-.9949	-.8194	-.4997	.4750	.8155
Cut7	-.4274	-.2169	-.1014	.0982	1.0796	1.3702
Cut8	.8268	.9366	.9300	1.0265	1.8427	2.1340
Cut9	1.7985	1.9007	1.6424	1.7271	2.5311	2.7979
Sample size	33,470	35,448	12,806	14,419	33,631	33,072
Pseudo R^2	.0324	.0279	.0284	.0274	.0488	.0464
Log likelihood ratio	-62681	-67801	-27268	-30959	-70942	-69561
Life satisfaction minima	***45.2***	***47.0***	***46.5***	***48.2***	***42.6***	***44.3***

Notes: The source is: World Values Surveys, 1981-1984; 1989-1993; 1994-1999 and 1999-2004. Controls are 9 income deciles, 5 marital-status dummies, 9 education dummies, 3 year-dummies and 7 work-force-status dummies. *Western countries* are Australia; Austria; Belgium; Canada; Denmark; Finland; France; Germany; Greece; Iceland; Ireland; Italy; Japan; Luxembourg; Malta; Netherlands; Norway; Northern Ireland; Portugal; Spain; Sweden; Switzerland; Great Britain; United States; West Germany. *Eastern Europe* countries are Bosnia and Herzegovina; Bulgaria; Croatia; Czech Republic; Estonia; Hungary; Latvia; Lithuania; Poland; Romania; Slovakia; Slovenia; Macedonia; Serbia and Montenegro. *Developing countries* are Albania; Algeria; Argentina; Bangladesh; Belarus; Brazil; Chile; China; Colombia; Dominican Republic; Egypt; India; Indonesia; Iran; Iraq; Jordan; Kyrgyzstan; Mexico; Moldova; Morocco; Nigeria; Peru; Philippines; Puerto Rico; Russia; Saudi Arabia; Singapore; South Africa; Taiwan; Tanzania; Turkey; Uganda; Ukraine; Uruguay; Venezuela; Vietnam and Zimbabwe. Question is All things considered, how satisfied are you with your life as a whole these days? A. 1 'Dissatisfied' to 10 'Satisfied'. t-statistics are in parentheses.

Table 6. Life Satisfaction Equations: Latinobarometers and Asianbarometers, 1997-2005.

	(1)	(2)	(3)	(4)	(5)	(6)
		Latin America			*Asia*	
	Men	Men	Women	Women	Men	Women
Age	-.0260 (7.60)	-.0237 (7.60)	-.0292 (9.09)	-.0247 (8.42)	-.0553 (3.40)	-.06645 (3.20)
Age^2	.00026 (6.87)	.00022 (6.42)	.00034 (9.49)	.00026 (8.10)	.00059 (2.88)	.00085 (3.22)
Personal controls	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	4	5	4	5	1	1
Education dummies	16	No	16	No	5	5
Cut1	--3.2229	-2.0000	--3.0918	-1.7773	-4.7416	-5.3722
Cut2	-1.2003	-.0890	--1.0320	.1576	-2.6887	-3.0610
Cut3	.5909	1.6096	.7004	1.8005	-1.0108	-1.1904
Cut4					1.2675	1.1391
Sample size	45,177	54,128	46,951	56,450	8,592	5,025
Pseudo R^2	.0587	.0626	.0601	.0636	.0487	.0822
Log likelihood ratio	-54111	-66304	-56504	-69459	-10529	-5878
Life satisfaction minima	***50.0***	***53.9***	***42.9***	***47.5***	***46.9***	***39.1***

Source: *Columns 1-4* Latino Barometers 1997, 2000, 2001 and 2003-2005. Dependent variable derived from the following question "In general, would you say that you are satisfied with your life? Would you say that you are very satisfied, fairly satisfied, not very satisfied or not satisfied at all?" Notes: countries are Argentina; Bolivia; Brazil; Colombia; Costa Rica; Chile; Ecuador; El Salvador; Guatemala; Honduras; Mexico; Nicaragua; Panama; Paraguay; Peru; Uruguay; Venezuela and the Dominican Republic. Controls are 6 work-force status dummies, 2 marital status dummies, 16 education dummies and 17 country dummies. Education variables are unavailable for 2000. When separate country equations were estimated for males and females pooled using the specifications in columns and there were no age minima for Bolivia; El Salvador; Guatemala; Mexico: Panama; Peru and Venezuela. There were age minima for eleven countries - Argentina 52.3 (7,037); Brazil 46.7 (6,548); Colombia 49.7 (7,133); Costa Rica 44.2 (5,856); Chile 44.0 (7,104); Ecuador 61.9 (7,136); Honduras 58.3 (5,939); Nicaragua 48.9 (5,896); Paraguay 52.0 (4,152); Uruguay 40.3 (7,111); Dominican Republic 48.7 (1,989).
Columns 5 and 6 Asian Barometers. Countries are Brunei; Cambodia; China; India; Indonesia; Laos; Malaysia; Myanmar; Philippines; Singapore; South Korea; Sri Lanka; Thailand; Uzbekistan and Vietnam. Controls are 5 education dummies; 3 marital-status dummies; one year dummy and 18 work-force status dummies.
Separate minima in individual country equations were found for Cambodia 72.9 (n=812); Myanamar 61.9 (n=1597); Singapore 43.9 (n=798); South Korea 47.9 (n=1614); Laos 37.7 (n=799); Brunei 37.3 (n=802); Uzbekistan 47.7 (n=792)
t-statistics are in parentheses.

Table 7. Depression-and-Anxiety Equations, UK 2004Q2-2007Q1

	(1)	(2)	(3)
Age	.00214 (39.11)	.00210 (38.34)	.00273 (53.89)
Age^2	-.00002 (38.33)	-.00002 (37.91)	-.00003 (51.26)
Male		-.0059 (24.38)	-.0014 (7.66)
Mixed race		.0045 (2.71)	.0005 (0.50)
Asian		-.0017 (2.27)	-.0033 (6.50)
Black		-.0034 (3.55)	-.0046 (7.22)
Chinese		-.0077 (3.75)	-.0061 (4.50)
Other races		.0034 (2.66)	-.0008 (0.94)
Immigrant		-.0037 (7.58)	-.0030 (8.33)
January		-.0009 (1.72)	-.0008 (2.06)
February		-.0011 (2.07)	-.0010 (2.36)
April		-.0001 (0.16)	-.0002 (0.45)
May		-.0014 (2.23)	-.0011 (2.48)
June		-.0005 (0.85)	-.0003 (0.79)
July		-.0005 (0.96)	-.0004 (0.95)
August		-.0015 (2.65)	-.0012 (2.78)
September		-.0010 (1.66)	-.0006 (1.47)
October		-.0008 (1.43)	-.0006 (1.53)
November		-.0016 (2.65)	-.0012 (2.69)
December		-.0004 (0.82)	-.0002 (0.61)
Region of residence dummies	19	19	19
Year dummies	3	3	3
Marital-status dummies	0	0	5
Work-force status dummies	0	0	5
Education dummies	0	0	8
Age at depression maximum	***44.6***	***51.5***	***44.0***
N	972,464	939,039	938,337
Pseudo R^2	.0110	.0217	.1181
Log likelihood	-765455	-75172	-67720

Source: UK Labour Force Surveys. Base categories (for ethnic and month) are 'white' and March. Estimation is by dprobit. t-statistics are in parentheses.

Table 8. Equations for GHQ-N6 Mental Distress and Life Satisfaction in European Data, 2001-2002

	(1)	(2)	(3)	(4)
	GHQ-N6	GHQ-N6	Life satisfaction	
	OLS	OLS	Ordered logit	Ordered logit
Age	.0953 (11.42)	.0896 (8.03)	-.0347 (7.69)	-.0584 (9.23)
Age^2	-.0010 (11.58)	-.0010 (8.43)	.0004 (7.54)	.0006 (9.19)
Male	-.6562 (11.31)	-.5052 (8.12)	.0084 (0.27)	-.1214 (3.46)
Country dummies	14	14	14	14
Marital-status dummies	0	9	0	9
Work-force status dummies	0	17	0	17
Education dummies	0	8	0	8
Cut1/Constant	1.7063	1.4328	-4.9954	-6.0031
Cut2			-3.0086	-3.9030
Cut3			-.1599	-.8289
Age at depression *maximum*	***47.8***	***46.8***		
Age at satisfaction *minimum*			***49.5***	***49.3***
N	15,441	15,438	15,885	15,882
Adjusted/Pseudo R^2	.0438	.0984	.0489	.0941
F statistic/Log likelihood ratio	42.63	33.42	-15278	-14549

Source: Eurobarometer #56.1: *Social Exclusion and Modernization of Pension Systems* (ICPSR #3475), September and October 2001. Work-force status dummies also include a control for whether the respondent had been unemployed at any time in the last five years. t-statistics are in parentheses.

Appendix Table 1. Life Satisfaction U-Shape-in-Age Minima: World Values Surveys

A) Countries with age & age^2 significant (55)

Country	*Minimum*	*N*
All countries	46.1	151298
Albania	40.0	1834
Argentina	49.3	2143
Australia	40.2	1772
Azerbaijan	45.8	1710
Belarus	52.6	2895
Belgium	52.2	1462
Bosnia	55.6	2251
Brazil	36.6	2748
Bulgaria	53.4	1802
Canada	54.0	1676
China	46.5	2385
Croatia	48.1	892
Czech Republic	47.2	2612
Denmark	46.1	847
El Salvador	47.8	1024
Estonia	45.1	1851
Finland	44.9	1759
France	61.9	1250
Great Britain	48.1	3168
Germany	47.5	939
Hungary	52.3	879
Iceland	49.3	2226
Iraq	51.7	827
Ireland	50.3	943
Israel	58.3	1500
Italy	50.7	1071
Japan	49.8	1173
Korea	40.0	917
Kyrgyzstan	47.7	205
Latvia	51.0	1716
Lithuania	50.4	716
Macedonia	49.8	3182
Malta	49.9	927
Mexico	41.4	4433
Netherlands	54.6	1036
Nigeria	42.4	2484
Norway	43.9	1191
Peru	39.5	1057
Philippines	40.4	1710
Poland	50.2	2242
Puerto Rico	35.6	4221
Romania	51.2	2119
Russia	55.3	7356
South Africa	41.8	826
Serbia	49.0	2519
Slovakia	46.0	1906
Spain	50.2	2029
Sweden	49.0	6885
Switzerland	35.2	3303
Tanzania	46.2	1640
Turkey	45.0	1303
Ukraine	62.1	1001
Uruguay	53.1	2452
USA	40.1	927
Zimbabwe	42.9	3172

b) Countries with no age minimum (25)

Country	*N*
Algeria	1012
Armenia	1863
Austria	1207
Bangladesh	2630
Chile	2069
Colombia	2985
Dominican Republic	309
Egypt	2676
Greece	917
India	5786
Indonesia	878
Iran	1910
Jordan	1126
Luxembourg	592
Moldova	1850
Morocco	1382
New Zealand	1002
Pakistan	1594
Saudi Arabia	1356
Singapore	1427
Slovenia	639
Taiwan	719
Uganda	544
Venezuela	2131
Vietnam	963

Notes: Controls are age; age squared; male; 6 marital-status dummies; 7 education dummies; 6 work-force status dummies; 3 year-dummies and income decile dummies. Minima are obtained from the coefficients on the age and age squared variables, then differentiating with respect to age, and solving for the turning point. For some countries there is only a single year of data. The source is the World Values Survey.

Figure 1. Depression probability, LFS 2004Q2-2007Q1