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David G. Blanchflower
Andrew J. Oswald

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Forschungsinstitut
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David G. Blanchflower
Dartmouth College
and IZA

Andrew J. Oswald
University of Warwick
and IZA

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IZA

P.O. Box 7240
53072 Bonn
Germany

Phone: +49-228-3894-0
Fax: +49-228-3894-180
E-mail: iza@iza.org

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ABSTRACT

Is Well-Being U-Shaped over the Life Cycle?*

We explore the idea that happiness and psychological well-being are U-shaped in age. The main difficulty with this argument 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 controls for cohort effects. A robust U-shape is found. Ceteris paribus, a typical individual's well-being reaches its minimum – on both sides of the Atlantic and for both males and females – in middle age. We demonstrate this with a quadratic structure and non-parametric forms. Second, some evidence is presented for a U-shape in developing countries and the East European nations. Third, using measures that are closer to psychiatric scores, we document a comparable well-being curve across the life course in two other data sets: (i) in GHQ-N6 mental health levels for a sample of 16,000 Europeans, and (ii) in reported depression and anxiety among approximately 1 million U.K. citizens. Fourth, we document occasional apparent exceptions, particularly in developing nations, to the U-shape. Fifth, we note that American male birth cohorts seem to have become progressively less happy 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.

JEL Classification: D1, I3

Keywords: happiness, aging, well-being, GHQ, cohorts

Corresponding author:

Andrew J. Oswald
Department of Economics
University of Warwick
Coventry CV4 7AL
United Kingdom
E-mail: andrew.oswald@warwick.ac.uk

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

1. Introduction

A large social-science 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 age and well-being?

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 is reported in Clark and Oswald (1994), Gerlach and Stephan (1996), Theodossiou (1998), Winkelmann and Winkelmann (1998), Blanchflower (2001), Di Tella et al (2001, 2003), 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 the 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) 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) find 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, uncovered now by various authors, 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 levels 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 in Britain. Nevertheless, 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 upon randomly sampled data on more than 500,000 Americans and Europeans. These data come mainly 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 birth cohorts, we show that well-being reaches its minimum around the middle of life, and in most data sets in a person's 40s. The regularity in the data is intriguing. The U-shape is fairly similar for males and females, and for each side of the Atlantic Ocean (though its minimum is apparently 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.

One point should 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, so we later partial out some other 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 particular 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. They largely ask the 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 do an exact 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. A 90 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 health and physical vitality. There is here no unambiguously correct answer. But 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 demographic and economic variables are held constant.

There is relatively little social-science theory upon which to draw (though mention should be made of Carstensen's theory, which, put informally, is 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 appear to 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, let the individual agent be concerned to maximize lifetime utility V by choosing a consumption path c(a) where a is the individual's age. Assume, for simplicity, that lifespan runs deterministically from time point t to time point 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

$$1 = \int_{t}^{T} c(a)da \quad (2)$$

in which the endowment of income to be allocated across all the periods has been set 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 kind of isoperimetric problem. The first-order condition for a maximum is the usual one: it requires the marginal utility of consumption to be the same at each level of age, a. Therefore, 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 necessarily constant across all 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 c and age a, then equation (3) has a simple implication. It is one that is implicit, though perhaps not always articulated, in much of standard economic theory. Consumption will be flat through time (because under separability u = u(c)) + v(a)) and, therefore, utility will also be flat through the lifespan if the non-consumption part of utility, v(.), is independent of age. In plainer language, happiness will not alter over a person's life course.

It seems reasonable to suggest that to go from the utility function u = u(c,a) to the presumption that u(..) is additively separable in its two arguments is a large, and potentially unwarranted, step. There is no clear reason why the marginal utility of consumption would be independent of a person's age. For example, one might

believe that young people wish to signal their status more, and therefore might have a greater return from units of consumption than the old (so the cross-partial derivative of u(c,a) would then be negative). Alternatively, one might argue that older people have more need of health and medical spending, and therefore that the marginal utility of consumption is greatest at high levels of age. Then, of course, 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 in this way get eventually to a model where well-being was curved through the lifespan, to do so seems too ad hoc (or perhaps one would say post-hoc) to be persuasive theoretically.

What this means is that textbook economic analysis, at least as based on normal assumptions of lifetime maximization and the concavity of utility, is -- without making assumptions about v(a) that could mechanically lead to any shape -- not capable of producing clear predictions about the nonlinear pattern of well-being through an individual's life.

2. Empirical Results

To explore this issue empirically, we draw upon a number of data sets -- they combine data on hundreds of thousands of randomly selected individuals -- and implement a test that controls for the possible existence of cohort effects. Our data do not follow the same individuals through time. They provide repeated 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 key evidence in the paper is summarized in five tables. These give regression equation results in which the dependent variable is derived from two kinds of survey answers. The principal data sets employed in the paper are the U.S.

General Social Surveys (GSS) from 1972-2006 and the Eurobarometers from1976-2002. 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 can be expressed in a cardinal way by assigning 1 to 3 to the three answers above, where 'very happy' is a 3. In that case, the mean of US happiness in the data is 2.2 with a standard deviation of 0.6. Similarly, European life satisfaction can be cardinalized using the integers 1 to 4, where 'very satisfied' is a 4. In this case, the mean of life satisfaction is 3.0 with a standard deviation of 0.8. Well-being answers are somewhat 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 adopted for the analysis of three further sub-samples, namely, the females in the GSS data set, the males in the Eurobarometer survey, and finally 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. In column 2 of Table 1, further regressors are included in the equation, and the coefficient on age falls somewhat, to 0.0069, with a t-statistic that indicates it continues to be statistically significantly different from zero at usual confidence levels. These extra regressors are: years of education of the person; two dummy variables for racial type; 8 dummy variables to capture the working status (employed, unemployed, …) of the person; a dummy to identify if the respondent has dependent children[1]; a dummy to identify if at age 16 the person was not living with both parents because of divorce; and 4 dummy variables to capture the person's marital-status. Table 1 goes on to 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 3 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. This is effectively the U-shape result in the recent literature.

[1] Despite what might be conjectured, it seems to make little difference if controls are entered for having young children, or children of various different ages. The well-being U-shape in age is apparently not produced by the influence of children.

However, Table 1 then explores the possibility that the U-shape in age is a product merely of omitted cohort effects. Column 4 of Table 1 extends the specification by introducing a separate dummy variable -- 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 noticeably later in the typical individual's life. According to the evidence in column 4 of Table 1, subjective well-being among randomly selected American males bottoms out at an estimated 52.9 years. This is to be thought of, it should be said, as the minimum-happiness age after controlling for other influences such as income, education and marital-status. Column 5 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 document 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 might be thought restrictive. Column 6 now 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 6 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, for example, reports the same exercise for the 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. Once again, each individual gives a well-being score on a three-point scale from very happy down to not at all happy, and Table 2 estimates an ordered logit equation with the same structure as for the males in Table 1. Perhaps surprisingly, the analytical structure for American women is almost the same as for the men. In Table 2, 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 5 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 perhaps 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 on topics such as the level of detail in the measure of income, 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 is equal to 44.5 years (see column 3 of Table 3). It is not easy to say why this number might be

lower than in the USA (see column 3 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 strong signs from the tables that the United States and Europe differ in the time structure of the cohort effects upon happiness. 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 -- interacting the quadratic in age 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 data suggest that the answer is 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, and this is around one fifth of a standard deviation in well-being scores. At first sight that does not appear

particularly large. But, 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 (on Born<1900, Born 1900-1910, etc) are not always individually well-defined, there are signs from the 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 definitive way. Nevertheless, one piece of evidence against such a view comes out of the clear difference between the two continents' results. The estimated pattern of the cohort effects is very different between the US and Europe. As -- no doubt 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 these 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.

Table 5 tentatively explores whether the U-shape in age holds 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. Controls here include workforce-status, marital-status, schooling, 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 six 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 1 reports the results). The group with a U-shape includes a large number of developing countries including 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).[2] It would be unwise, nevertheless, 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 the 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, schooling, year, country, year, marital-status and labour force status as in column5 in Tables 3 and 4. Neither age term was significant for Austria (n=6594) or Norway (n=5465).

	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

[2] Numbers in parentheses are age minima taken from Appendix Table 1.

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 (GSS)	44.5	41,193

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 labour force status dummies (as in column 5 of Tables 1 and 2).

So far, our focus has been on happiness and life satisfaction. It seems useful to ask whether a life course U-shape also emerges when the 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. More precisely the question is #12 here:

Which of these is your main health problem/disability?
1 problems or disabilities (including arthritis or rheumatism) connected with your arms or hands
2 ...legs or feet
3 ...back or neck
4 do you have difficulty in seeing (while wearing spectacles or contact lenses)
5 difficulty in hearing
6 a speech impediment
7 severe disfigurement, skin conditions, allergies
8 chest or breathing problems, asthma, bronchitis

9 heart, blood pressure or blood circulation problems
10 stomach, liver, kidney or digestive problems
11 diabetes
12 depression, bad nerves or anxiety
13 epilepsy
14 severe or specific learning difficulties (mental handicap)
15 mental illness or suffer from phobias, panics or other nervous disorders
16 progressive illness not included elsewhere (e.g. cancer not included elsewhere, multiple sclerosis, symptomatic HIV, Parkinson's disease, muscular dystrophy)
17 other health problems or disabilities

What is graphed in Figure 1 is the mean incidence by age. The figure has an average 17,068 observations per cell (ie. per dot). The outcome is a hill-shaped relationship between the incidence of depression-and-anxiety and age, which maximises around age 46 in these raw data. Hence this seems consistent with the paper's earlier, and qualitatively different, life-satisfaction evidence.

Using the dprobit procedure in STATA, Table 6 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=972464. The quadratic maximises at age 44.6. Adding additional controls has fairly 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 labour force status. March is the month in which the highest depression rates are reported.

Table 7 performs a similar exercise on a 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, possibly uniquely, 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 7, our dependent variable is a measure of 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 six, we assigned 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 were summed, and we term the result a 'GHQ-N6' measure, where N stands for 'negative'. The mental distress score, denoted GHQ-N6, must for a person therefore lie between 0 and 18. Across Europe, the mean of the variable is 3.6 (standard deviation 3.7).

These six are the 6 negative questions from the fuller General Health Questionnaire GHQ-12 measure of psychological distress. The data set does not provide data on the other six 'positive' questions. Thus our focus is upon negative affect. Clark and Oswald (1994, 2002) show in British data that GHQ is quadratic in age.

Although much remains to be understood, there is a precedent for exploring separately the negative and positive questions within the 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 for workforce-status, marital-status, and schooling, reduces the maximum marginally to 46.8. In both cases, Ordinary Least Squares (OLS) is the method of estimation.

Columns 3 and 4 of Table 7 use the same sample of individuals and 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 controls, life satisfaction minimises at age 49.5 (and 49.3 in column 4).

Overall, the two kinds of results in the paper seem approximately mirror-images of one another. Happiness and life satisfaction are U-shaped in age; distress and depression follow an inverted U-shape.

Lastly, at the suggestion of a referee, Appendix Tables 2 and 3 slowly build up independent variables in well-being equations. These illustrate the case for males only. It can be seen that, especially in the United States, the addition of the marital-status variables has a noticeable effect on the turning point of the U-shape.

3. Conclusions

This paper offers evidence that well-being depends in a curvilinear way upon age: happiness is approximately U-shaped through the life course. Psychological well-being appears to reach a minimum in middle age[3]. The paper's results, which draw upon regression equations, and use data sets long enough to distinguish age effects from cohort effects, seem of interest. They suggest that the convex structure of the

[3] This conclusion is meant as a broad characterization of the data, and should be kept in perspective. There is, for example, a little evidence from our non-parametric work for a further flattening, and turn down, towards the end of life.

curve is fairly similar across different parts of the world[4]. Because the paper's equations control for many other influences upon happiness and life satisfaction -- including income, education and marriage -- the findings should be read as describing an age U-shape *in ceteris-paribus well-being.*

Our correction for birth-cohort influences makes some difference to the results claimed by the earlier literature, especially in American well-being equations, but the spirit of a U-shape is unaffected by cohort effects. On these estimates, happiness among American males and females reaches a minimum in, respectively, approximately their early 50s and late 30s. Reported life satisfaction levels among European men and women minimize around the mid 40s.

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

By definition, this paper has one limitation. It is that these international data sets do not follow the same individuals over the years. 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). It is perhaps also worth pointing out that panel data have their own disadvantages, particularly that of sometimes high levels of measurement error.

[4] To the best of our knowledge, the U-shape finding in United States data comes originally from results reported in Blanchflower et al (1993), which became Blanchflower and Oswald (2004).

What causes the apparently U-shaped curve in human well-being, and the rough regularity of its mathematical shape in different parts of the industrialized 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.

Whatever its ultimate causes, understanding the roots of the pattern seems an important task.

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

	(1)	(2)	(3)	(4)	(5)	(6)
Age	.0096 (11.78)	.0069 (5.32)	-.0236 (4.25)	-.0272 (3.34)	-.0313 (3.81)	
Age^2			.0003 (5.61)	.0003 (3.75)	.0003 (3.99)	
Born <1900				.1420 (0.91)	.0606 (0.37)	-.0783 (0.47)
Born 1900-1909				-.1261 (0.73)	-.2669 (1.46)	-.4325 (2.38)
Born 1910-1919				-.2405 (1.18)	-.3801 (1.76)	-.5086 (2.44)
Born 1920-1929				-.3872 (1.59)	-.5096 (1.99)	-.6115 (2.52)
Born 1930-1939				-.5686 (1.99)	-.6824 (2.28)	-.7519 (2.70)
Born 1940-1949				-.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 household 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	Yes
Cut1	-1.4891	-.7788	-1.3541	-1.9419	-.0440	.2732

Cut2	1.3247	2.2243	1.6520	1.0671	2.9875	3.3073
Sample size	20,316	19,996	19,996	19.996	18,494	18,494
Pseudo R^2	.0065	.0473	.0481.0488	.0524	.0530	
Log likelihood ratio	-18936	-17868	-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. They 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 workforce-status dummies, 4 marital-status dummies, 1 dummy to identify if the respondent has zero dependent children, and a further dummy to identify if at age 16 the children was not living with both parents as they were divorced.. The 'base' 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

Age	.0007 (1.04)	.0071 (7.17)	-.0187 (4.53)	-.0110 (1.88)	-.0256 (3.39)	
Age^2			.0003 (6.24)	.0002 (3.69)	.0003 (5.29)	
Born <1900				.0165 (0.13)	-.0857 (0.60)	-.2204 (1.53)
Born 1900-1909				-.0020 (0.01)	-.0502 (0.31)	-.2155 (1.37)
Born 1910-1919				-.1317 (0.76)	-.2126 (1.12)	-.3950 (2.16)
Born 1920-1929				-.0730 (0.35)	-.1484 (0.65)	-.3289 (1.54)
Born 1930-1939				-.1115 (0.45)	-.2185 (0.82)	-.4201 (1.71)
Born 1940-1949				-.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 household 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	Yes
Cut1	-1.9086	-.5200	-1.0203	-.9075	.5340	.6996
Cut2	.7971	2.3736	1.8765	1.9921	3.4937	3.6607

Sample size	25,837	25,478	25,478	25,478	22,699	22,699
Pseudo R^2	.0030	.0460	.0466.0473	.0528	.0532	
Log likelihood ratio	-24507	-23118	-23378	-23086	-20351	-20342
Age at the happiness minimum			***34.9***	***29.8***	***38.6***	

Notes The numbers in parentheses are t-statistics; they test the null hypothesis of a coefficient of zero. The equations 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 workforce-status dummies, 4 marital-status dummies, 1 dummy to identify if the respondent has zero children and a further dummy to identify if at age 16 the children was not living with both parents as they were divorced.. The 'base' 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 3. Life Satisfaction Equations for Men in Europe: Pooled Data 1976-2002

	(1)	(2)	(3)	(4)	(5)	(6)
Age	.0002 (1.16)	.0012 (3.24)	-.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	Yes
Cut1	-3.4653	-3.19057	-4.0423	-4.0536	-2.0447	1.5284

Cut2	-1.8445	-1.52990	-2.3787	-2.3890	-.3495	.1672
Cut3	.9849	1.3850	.5462	.5380	2.6201	3.1381
Sample size	293612	284577	284577	284577	206917	206917
Pseudo R^2	.0588	.0765	.0785	.0790	.0913	.0916
Log likelihood ratio	-29851.6	-283880.1	283240.2	-283111.9	-203950.7	-203891.6
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 workforce-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)	(6)
Age	-.0053 (27.23)	.00063 (1.96)	-.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	Yes
Cut1	-3.8589	-3.1603	-3.8022	-3.8240	-1.8868	-1.3905

Cut2	-2.1632	-1.4370	-2.0759	-2.0973	-.1382	.3582
Cut3	.6640	1.4582	.8260	.8057	2.7974	3.2942
Sample size	314,431	304,869	304,869	304,869	215,558	215,558
Pseudo R^2	.0724	.0867	.0880	.0882	.0991	.0992
Log likelihood ratio	-317506.9	-303083.9	-302627.9	-302561.1	-213239.3	-213218.6
Age at the life satisfaction minimum			***45.5***	***48.2***	***46.8***	

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

	(1)	(2)	(3)	(4)	(5)	(6)
	Men	Women	Men	Women	Men	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 schooling dummies, 3 year-dummies and 7 workforce-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'.*

Table 6. Depression-and-Anxiety Equations, UK 2004Q2-2007Q1 (dprobits)

	(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
Labour force status dummies	0	0	5
Schooling 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 are ‘white’ and March.

Table 7. 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
Labour force status dummies	0	17	0	17
Schooling 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. Labour force status dummies also include a control for whether the respondent had been unemployed at any time in the last five years.

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 schooling dummies; 6 labour force status dummies; 3 year dummies and income decile dummies. Minima obtained from the coefficients on the age and age squared variables by differentiating with respect to age and setting to zero and solving. Some countries only have single years of data.

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

	(1)	(2)	(3)	(4)	(5)	(6)
Age	-.0009 (0.20)	.01135 (1.55)	-.02178 (2.83)	-.02541 (3.29)	-.02718 (3.34)	-.03133 (3.66))
Age^2		-.00013 (2.25)	.00018 (2.95)	.00022 (3.55)	.00026 (3.75)	.00030 (4.07)
Years of schooling				.0514 (11.29)	.0394 (8.46)	.0215 (4.22)
Log household income						.2546 (12.42)
Race dummies	2	2	2	2	2	2
Year dummies	25	25	25	25	25	25
Region dummies	8	8	8	8	8	8
Cohort dummies	9	9	9	9	9	9
Marital-status dummies	0	0	4	4	4	4
Family dummies	0	0	0	0	2	2
Labour market dummies	0	0	0	0	7	7
Cut1	-2.1733	-2.0280	-2.2790	-1.8536	-1.9419	-.0440
Cut2	.6619	.8079	.6802	1.1189	1.0671	2.9875
Sample size	20,316	20,316	20,315	20,036	19,996	18,494
Pseudo R^2	.0113	.0114	.0388.0395	.0488	.0524	
Log likelihood ratio	-18846	-18844	-18321	-18050	-17841	-16423
Age at the happiness minimum	***43.6***	***60.1***	***58.1***	***52.9***	***52.6***	

Notes The numbers in parentheses are t-statistics. The equations are ordered logits. The 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

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

	(1)	(2)	(3)	(4)	(5)	(6)
Age	.0002 (1.16)	-.0040 (3.10)	-.0318 (16.06)	-.0409 (18.61)	-.0446 (19.71)	-.0407 (15.18)
Age^2			.0003 (18.45)	.0004 (22.84)	.0004 (23.02))	.0004 (18.21)
Log of income						.3539 (49.65)
Year dummies	22	22	22	22	22	22
Country dummies	16	16	16	16	16	16
Cohort dummies	0	9	9	9	9	9
Schooling dummies	0	0	0	9	9	9
Marital-status dummies	0	0	0	4	4	4
Labour market dummies	0	0	0	0	6	6
Cut1	-3.4653	-4.0581	-4.2260	-4.0957	-4.3578	-2.2726
Cut2	-1.8446	-2.4347	-2.6020	-2.4606	-2.6932	-.5774
Cut3	.9850	.4038	.2390	.4211	.2339	2.3923
Sample size	293,612	293,612	293,612	285,436	284,577	206,917
Pseudo R^2	.0588	.0607	.0612	.0696	.0790	.0913
Log likelihood ratio	-298512	-297933	-297762	-286817	-283112	-203950
Age at the life satisfaction minimum			***50.9***	***47.7***	***47.7***	

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 workforce-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 France, Belgium, Netherlands, West Germany, Italy, Luxembourg, Denmark, Ireland, Great Britain, Greece, Spain, Portugal, Finland, Norway, Sweden and Austria..
Source: Eurotrends file (Eurobarometer ICPSR #3384)

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