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THE MIDLIFE CRISIS

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ABSTRACT

This paper documents a longitudinal crisis of midlife among the inhabitants of rich nations. Yet middle-aged citizens in our data sets are close to their peak earnings, have typically experienced little or no illness, reside in some of the safest countries in the world, and live in the most prosperous era in human history. This is paradoxical and troubling. The finding is consistent, however, with the prediction – one little-known to economists – of Elliott Jaques (1965). Our analysis does not rest on elementary cross-sectional analysis. Instead the paper uses panel and through-time data on, in total, approximately 500,000 individuals. It checks that the key results are not due to cohort effects. Nor do we rely on simple life-satisfaction measures. The paper shows that there are approximately quadratic hill-shaped patterns in data on midlife suicide, sleeping problems, alcohol dependence, concentration difficulties, memory problems, intense job strain, disabling headaches, suicidal feelings, and extreme depression. We believe the seriousness of this societal problem has not been grasped by the affluent world's policy-makers.

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INTRODUCTION

Residents of today's affluent nations are citizens of the richest societies in human history. By the midlife point, these men and women have normally encountered no significant illness or disability. They are also close to their peak life-time earnings (which occurs in the late-40s for those with low levels of education, and in the early-50s for those with high levels of education; see Bhuller *et al*. 2017). It would be expected, therefore, that middle-aged adults in the industrialized nations would have extraordinarily cushioned and enjoyable lives.

We demonstrate in this paper that measures of extreme distress paint a different picture. Something elemental appears to be going wrong in the middle of many of our citizens' lives. The paper's main finding is consistent -- in ways that remain to be fully understood -- with the ideas of Jaques (1965), and with the notion of a paradox of economic progress, and perhaps with the problem that humans are not influenced merely by absolute prosperity, as discussed in different ways by researchers such as Richard Easterlin, Richard Layard, Fredrik Carlsson and colleagues, and Carol Graham and colleagues (Layard 1980; Easterlin 2003; Carlsson *et al*. 2007; Graham 2007; Graham *et al*. 2017).

The paper offers new evidence that midlife is a time when people disproportionately take their own lives, have trouble sleeping, are clinically depressed, spend time thinking about suicide, feel life is not worth living, find it hard to concentrate, forget things, feel overwhelmed in their workplace, suffer from disabling headaches, and become dependent on alcohol. As shown below, markers of distress routinely follow the approximate shape of a quadratic

equation that is concave from below (although, unsurprisingly, a second-order equation should not to be thought of as holding in an exact way close to the end of the human lifespan). It should be emphasized that in the later analysis a quadratic is not forced on to the data. Instead, a set of age dummy variables is used in order to allow more general non-parametric estimation.

The paper's central result does not rest upon cross-sectional correlations. Nor is it dependent on data from a single nation; nor is it the result of young children in the household; nor is it driven merely by high effort among workers; nor is the observed pattern a temporary one or the result of cohort effects. The latter possibility is especially important to consider. In the analysis below, we attempt to ensure that the later evidence directly adjusts for cohort effects, and/or examines the key conclusion for widely different time-periods, and/or uses within-person fixed-effects analysis where the same individuals are followed longitudinally over many years. Nor does the paper's analysis rely merely on data on subjective well-being scores, although, as will be seen, one special strand of the previous cross-sectional happiness literature is potentially relevant. Nor do there appear to be especially large differences between male and female patterns, so it is not straightforward to believe that female menopause, for example, plays any major explanatory role.

Later analysis focuses primarily on ceteris paribus patterns. The age trajectory of human distress will be studied here, where feasible, by using conventional regression equations. Adjustment will thus generally be made for a set of other influences (they are measured contemporaneously in the equations), like marriage, employment, and having children. The study is therefore an analytical inquiry into the other-factors-constant consequences of ageing. It is not designed as a description, or empirical summary, of the

simple mean values for different age-groups in society.[1] The aim is instead to try to evaluate the tendency to -- or not to -- a crisis of middle age. Moreover, the paper's purpose is not to imply that all midlife individuals exhibit high levels of distress. The later analysis will attempt, as normal in applied research, to understand broad statistical influences among representative individuals.

BACKGROUND

The analysis builds on three literatures. They appear to have started independently of one another. In each case, it was initially rare to mention or cross-reference writings from the other two literatures, although today these literatures are beginning, if tentatively, to connect.

All three literatures are currently disputatious in tone. They are:

(i) an economics and behavioral-science literature on the idea that subjective well-being may be 'U-shaped' through life;

(ii) a social-science and medical literature on the idea that white low-education American men in midlife are currently experiencing new levels of psychological despair;

(iii) a psychotherapy and psychology literature on the idea that human beings have a 'midlife crisis'.

More generally, we examine data on extreme-distress measures rather than simpler life-satisfaction kinds of scores or experienced-utility measures (such as Winkelmann and Winkelmann 1998; Dolan and Kahneman 2007; Dolan *et al*. 2008).

[1] This study's approach is likely to seem natural to most economists and epidemiologists, but some psychologists prefer the tradition of non-adjusted studies of age and ageing. Because of different intellectual traditions, occasionally the debate in related literatures has been at cross-purposes and perhaps needlessly confrontational.

Within the first literature, (i), there has been much debate. This style of work, which is predominantly cross-sectional, appears particularly in economics and certain kinds of social-science journals (e.g., Blanchflower and Oswald 2008; Graham and Pozuelo 2017). It explores the claim that the mean level of life satisfaction and contentment may follow a convex quadratic equation over the bulk of the lifespan. Consistent with some aspects of this putative U-shape in subjective wellbeing, there is also growing evidence that old age seems to help human beings to engage in fewer regretful emotions (Charles *et al*. 2003). One cross-sectional study (Blanchflower and Oswald 2016) found that middle-aged Europeans consume the largest numbers of antidepressants. One of the few pieces of genuine longitudinal evidence examined the mean levels of life-satisfaction rather than extreme distress (Cheng *et al*. 2017). Another had identified one aspect of the U-shape (Van Landeghem 2012).

The notion of a midlife nadir is not generally accepted. An early review paper (Diener *et al*. 1999) concluded that wellbeing is approximately flat through the lifespan. Such scholars argue that midlife is a time of high satisfaction (Mroczek and Spiro 2005); that, at best, only low-income individuals experience a U-shape (Lang *et al*. 2011); others conclude that the cross-sectional U-shape is simply illusory (Galambos *et al*. 2020; Frijters and Beatton 2012). Some researchers are also reluctant to place any weight on subjective well-being scores because of their subjectivity (although Oswald and Wu (2010) offers a robustness check on such data).

Second, another and still-expanding literature, stimulated particularly by Case and Deaton (2015), has sprung up. Researchers have documented evidence of rising levels of mental distress among particular groups of US citizens, especially white midlife Americans with few educational qualifications (Graham 2017; Gaydosh *et al.* 2019; Blanchflower and Oswald 2020; Daly 2022). There has been debate about this important hypothesis (Goldman *et al*. 2018). To our knowledge, the literature generally views the American trend as recent, distinct, and unusual.

In a third and earlier literature, there is discussion about, and a general rejection of, the psychological concept of a 'midlife crisis' in humans. That term was adopted by Jaques (1965), in an article published in a psychotherapy journal. The argument made by Jaques was that in midlife a human being is forced to come to terms, painfully, with the certainty of his or her own eventual mortality.

Most psychologists since then have treated the notion with extreme skepticism (Wethington 2000; Freund and Ritter 2009; Galambos *et al*. 2020) -- and even, occasionally, derision.

DATA AND METHODS

In this section we describe the different data sets and methods used to analyse eight intuitively natural 'distress' indicators. We test both objective and subjective markers of extreme distress over the human lifespan. Depending on the nature of the data analysed, our empirical approach either adjusts for cohort effects, and/or examines widely different time-periods, and/or uses within-person fixed-effects analysis where the same individuals are followed longitudinally through time. The paper offers various forms of evidence. Regression equations and estimated coefficients are discussed in the subsequent Results section.

The data types are listed briefly below.

Cross-National Data on Suicide

Suicide data are collected from the mortality deaths database provided by the World Health Organisation. The data are available from: www.who.int/healthinfo/mortality_data. The data were classified into population 5-year bands to generate suicide rates per 100,000 individuals per nation. We focus our analysis on affluent countries and especially on English-speaking countries. The suicide rates are averaged over 5-year periods to be able to adjust for cohort effects and period effects. The unit of observation in the formal analysis is by country by 5-year-period-band by 5-year-age-band by gender.

Cohorts are constructed as the difference between periods and age bands. The standard difficulty faced in this type of analysis is the famous 'age-period-cohort' (APC) problem. This occurs because, as *period* = *age* + *cohort*, the three influences are, together, perfectly collinear. Therefore, in order to estimate separate coefficients on each of the age-bands, further assumptions need to be made. In this article, this is dealt with using the so-called intrinsic estimator approach, due to Fu, Yang and others (Fu 2000; Yang *et al*. 2004, 2008). It is known that the numbers of age groups and time periods (the so-called design matrix) in the APC accounting model may affect the estimates obtained from certain kinds of estimators. One way to think about the rationale for the Yang intrinsic estimator (IE), therefore, is that it removes the influence of the design matrix on the coefficient estimates. The intrinsic-estimator approach produces an estimator that has attractive statistical properties. Although its application to suicide rates appears to be rare, our later analysis is similar in spirit to a perhaps little-known paper on Canadian cohort data by Thibodeau (2015). Our results, in international data, are consistent with her findings for certain provinces of Canada. The IE approach also can be seen as a particular kind of principal-components regression estimator. For this analysis, we have also checked -- results not presented but available on request -- the method of equality-constraints as a robustness test.

Here, and throughout the paper itself, we concentrate on annual data because we lack data of higher frequency. We omit independent variables on childhood experience because the data sets do not offer such information.

UK Data on Clinical Depression and Generalized Anxiety Disorder

UK data on serious psychological illness are available to us in three separate years of the Adult Psychiatric Morbidity Survey (APMS). See, example, McManus *et al*. (2020). Here we use the long so-called Clinical Interview Schedule – Revised (CIS-R) to assess a range of different depressive and anxiety disorders. The schedule was administered face to face by an interviewer

using computer-assisted interviewing. The CIS-R is a structured interview schedule on the presence of symptoms in the week prior to interview. It comprises over 130 questions, spanning 14 types of symptoms (e.g., fatigue, sleep problems, worry). These items were used to assess for different types of clinical disorders (e.g., depression, generalized anxiety disorder). The 14 sections of the CIS-R cover: somatic symptoms, fatigue, concentration and forgetfulness problems, sleep problems, irritability, worry about physical health, depressive symptoms, depressive ideas, worry, anxiety, phobias, panic, and compulsions and obsessions. Each section starts with two filter questions to establish the presence of the specific symptom in the past month. A positive response leads to further questions about the symptom in the past week, including frequency, duration, severity, and time since onset.

Our approach is standard in this branch of psychological medicine. The participants' answers were used to generate what are known as 10th International Classification of Disease (ICD-10) diagnoses of anxiety and depressive disorders by applying an algorithm to operationalize the ICD-10 diagnostic criteria (WHO 1992). These ICD-10 diagnoses were then amalgamated to produce categories of disorder. The two most prevalent disorders classified were: generalized anxiety disorder (GAD) and depression (combining mild, moderate, and severe). The ICD-10 criteria for so-called code F41.1 (symptoms lasting for at least six months, general anxiety that is not restricted to any one environment, symptoms that include persistent nervousness, trembling, muscle tension, sweating, light-headedness, palpitations, and dizziness, and an overall anxiety symptom score of at least 2) were used to identify GAD, generalized anxiety disorder.

Clinical depression is measured in an equivalent way. The ICD-10 depressive episode criteria include: symptoms lasting at least two weeks, some of depressed mood, loss of interest and fatigue; some of reduced concentration, reduced self-esteem, ideas of guilt, pessimism about future, suicidal ideas or acts, disturbed sleep, diminished appetite; perceived social

impairment; and some of: lack of normal pleasure /interest, loss of normal emotional reactivity, a.m. waking ≥2 hours early, loss of libido, diurnal variation in mood, diminished appetite, loss of ≥5% body weight, psychomotor agitation, and psychomotor retardation. These were scored, within the data set rather than by us, to generate so-called ICD-10 codes F32.00, F32.01, F32.10, F32.11, and F32.2, which were combined to produce the final standardized technical category of 'depression'.

Cross-National Data on Sleeping Problems

Time-use data for Austria, Canada, Finland, France, Netherlands, Spain, United Kingdom, and the United States were collected using the multinational time-use study extract builder (MTUS-X) (Fisher *et al*. 2015). The data are available from: www.mtusdata.org. The studied data cover the 1965-2012 period. However, as these data were collected from multiple sources, the samples are not balanced and, in each country, individuals were interviewed in different years. For this reason, we have checked the pattern separately by country of residence of the respondents. The US sample is the largest (160,445 citizens) and covers the entire period (1965-2012), although it should be noted that the early 1965 sample is extremely small. The Dutch sample covers the period 1975-2005 including 84,028 observations. We have data from the UK time-use survey for the period 1974-2005 covering 66,959 individuals. Data for France are available for the period 1985-1999 covering 31,488 individuals. For the other countries, only one wave of data, in each case, was available: the 1992 wave for Austria (25,233 individuals), the 2009 wave for Spain (19,295 individuals), the 2010 wave for Canada (15,390 individuals), and the 1979 wave for Finland (12,038). Data for Germany were drawn from the 2012-2013 German Time-use Survey (TUS).

Sleep duration is defined as the total time assigned to sleep and naps. We also included "imputed sleep'', defined as short gaps in the early hours at the beginning or end of the diary, where the diarist is at home or in the same location where they report sleeping on the diary day,

and asleep before the gap at the end of the diary, or they were asleep following the gap at the beginning of the diary.

Data on Suicidal Feelings, Concentration Problems and Forgetfulness, Alcohol Dependence

For this part of the study, we drew again on the Adult Psychiatric Morbidity Survey (APMS) series. The data are available from: www.ukdataservice.ac.uk. The latest survey is the fourth in the series and was conducted by NatCen Social Research, in collaboration with the University of Leicester, for National Health Service (NHS) Digital. A previous survey was conducted in 2000 (for 16-74 year-olds) by the Office for National Statistics, which covered England, Scotland and Wales. Another, the 2007 APMS Survey, included people aged over 16, and covered England only. The survey uses a robust stratified, multi-stage probability sample of households and assesses psychiatric morbidity using diagnostic criteria for several disorders.

The '*Not Worth Living'* measure is based on responses to the following questions:

Have you ever felt that life was not worth living?
1 Yes
2 No
If yes, was this....
1 ...in the last week?
2 in the last year?
3 or at some other time?

The 'Concentration and Forgetfulness' symptom score is constructed by scoring one for each of the below criteria met:

- *Noticed problems with concentration/memory for four days or more in the past week.*
- *Could not always concentrate on a TV programme, read a newspaper article or talk to someone without mind wandering in past week.*
- *Problems with concentration actually stopped you from getting on with things you used to do or would like to do.*
- *Forget something important in past seven days.*

We also use APMS data to create a measure of *Alcohol Dependence*. Participants were asked the Alcohol Use Disorders Identification Test (AUDIT) (Saunders *et al*. 1993), which takes the year before the interview as a reference period. In broad outline, our statistical analysis draws upon a so-called AUDIT score, and takes the cut-point of an AUDIT score of greater than or equal to 16 to indicate dependence.

The measure of *Suicidal Thoughts,* which is clearly related to, but is perhaps even more sharply focused than, the earlier 'not worth living' score, is derived from the question:

"There may be times in everyone's life when they become very miserable and depressed and may feel like taking drastic action because of these feelings. Have you ever thought of taking your life, even if you would not really do it?"

Those responding '*Yes'* were asked when this last occurred. A derived variable then identified those reporting suicidal thoughts in the past year. See also Spiers *et al*. (2012).

Longitudinal Data on Job Stress

Longitudinal data on job stress come from the Household, Income and Labour Dynamics in Australia (HILDA) Survey. The data and other access details are available from the HILDA website: https://melbourneinstitute.unimelb.edu.au/hilda. This is a nationally-representative longitudinal survey that was first conducted in 2001 (Wooden and Watson 2007). It collects annual information from members of Australian households who are at least 15 years of age. It began providing information on a total of 13,969 individuals from 7,682 different households interviewed since the first survey wave. In interviews, information is collected on a variety of topics including labour market dynamics, income and education levels, family composition, lifestyle choices, as well as the physical and psychological well-being of individuals.

Longitudinal Data on Migraine

The analysed data on migraine problems come from the British Household Panel Survey (BHPS). The data are available from: https://www.understandingsociety.ac.uk. The data set is

a nationally representative survey of British households, with over 10,000 adult respondents, and was first conducted between September and Christmas in 1991.

RESULTS

This section summarizes a set of mutually complementary findings. It draws upon the different markers of extreme psychological problems and mental crisis described above.

Presence of Clinical Depression, Generalized Anxiety Disorder, and Life Not Worth Living

First, as shown in Figure 1, there is a repeated hump-shaped age pattern through time of clinical depression and Generalized Anxiety Disorder in England. The data are once more from the Adult Psychiatric and Morbidity Survey -- APMS. Both indicators of distress use the internationally agreed ICD-10 diagnostic definitions. The sub-figures in Figure 1 are for three separate years (2000, 2007, 2014); at the time of writing the forthcoming 2021 data have not been released. The underlying equations, which are reported later in the supplementary Appendix, control for gender, educational level, marital status, the number of children, the type of housing in which the respondent lives, and employment status. On balance, throughout the paper, we think it best to control for standard kinds of socioeconomic covariates, even though it is technically possible to remove all potentially endogenous variables and still find evidence of the paper's main pattern – as in for example the paper's later results on suicide. Table S1 in the paper's Appendix gives raw numbers. Tables S2-S9 provide the background regression equations behind Figure 1.

Because the APMS data set is not a panel, it is infeasible to estimate within-person estimates of the ageing effect. That means it is less easy to rule out cohort effects that could lead to fallacious inferences about the role of human ageing. Therefore, Figure 1 deliberately shows the age curve for each of the years rather than pooled together. The approximate stability

across the sub-figures suggests the hill-shaped pattern is not merely the result of simple cohort effects. The hump-shape is apparently a consistent feature.

How large is the age effect? Figure 1 reveals that being in midlife approximately doubles the probability of depression, ceteris paribus, compared to being aged 65-74 or under the age of 25. Further details are in model 2 of Table S4 in the Appendix

The final row of Figure 1 examines a *Not Worth Living* measure, using the patterns in people's answers to the question: "*Have you ever felt that life was not worth living? Yes/No*". We code these as 1 for those citizens who answered: "*Yes, in the last year*". Again, in sub-Figure 1C, an equivalent middle-age peak is evident.

The Appendix gives miscellaneous APMS results for related markers of distress, including concentration and memory problems.

Suicide in Cross-National Data

Human suicide is the starkest measure of mental crisis. Once again, the data seem to exhibit a hump-shape that exists across the age groups. Figure 2 reports cross-national findings on suicide rates. It corrects for cohort effects in a now-conventional way described in work by Yang and colleagues (Yang *et al*. 2008). The supplemental information in the Appendix provides details on the so-called intrinsic estimator. For the statistical analysis, we created a dataset that contains a non-balanced panel of 9 affluent non-English countries and 8 English speaking countries. The data run through the years 1950 to 2015. The dataset has annual data and gives rise to 2389 and 2320 observations, respectively, in each of the two subsamples. The suicide rate is in logarithms in order to focus on percentage deviations.

A midlife maximum is evident in Figure 2 after correction for cohort effects, time dummies, and country dummies. Age coefficients are plotted. When averaging males and females in the English-speaking countries, for example, the peak risk is estimated to be

approximately in people's early 50s. These hump shapes are again consistent with a psychological low in the middle of people's lives in affluent countries. The estimated female peak here may occur slightly earlier than the male peak. Table S10 give the formal regression estimates that lie behind these curves. Table S11 is for a set of rich countries where English is not the first language.

It could be argued that suicide data are special, in the sense that they capture an exceptional tail of the distress distribution in a society. We therefore turn to a range of further indicators to check for signs of extreme distress in midlife.

Sleeping Problems and Hospital Admissions in Cross-National Data Through Time

Sleep is important to health (Spiegel *et al*. 1999) and it has been known since at least the time of William Shakespeare that sleep and the level of mental stress are closely connected (Furman *et al*. 1997). Worry keeps people awake at night; sleeping problems are a marker of anxiety; they also depress the strength of the immune system, raise the risk of personal accident, and have negative effects on people's productivity. There is also evidence linking greater sleep hours to reduced risk of depression (Furman *et al*. 1997; Spiegel *et al*. 1999; Taylor *et al*. 2005; Roenneberg 2013; Giuntella *et al*. 2017; Hafner *et al*. 2017). Official US medical guidelines, such as those issued by the Centers for Disease Control (CDC), state that healthy human adults need 8 hours of sleep per night.

What happens in the middle of people's lives? The answer is that adults in rich countries tend to have sleeping difficulties. These are sometimes of such worrying severity that they are akin to physical problems.

One simple piece of evidence is available from data from the National Health Service of the United Kingdom. Figure 3, which draws upon official NHS records, reveals a marked hill-shaped pattern. We are not sure exactly how ill a person has to be in order to have to go

to a hospital because of a sleeping problem, but it can be presumed that he or she would have to have really extreme symptoms of distress. To the best of our knowledge, this kind of diagram (Figure 3) is not known to many social scientists. It is perhaps worth emphasizing that, unlike the wellbeing and happiness literature, such evidence is not based on reported feelings.

Figures 3A and 3B, for the USA, are related, but they measure a different variable. These plot the mean hours of sleep for individuals for different periods spanning half a century. Further countries' results are in the Appendix. In each case, in a robust way, the low point in hours of sleep is reached in midlife, including for those individuals without young children.

Sub-figure 3C is of a complementary kind to Figure 3. Here, again, the information is not on subjective sleeping levels; instead it is objective and comes from hospitals in the United Kingdom. Figures 3C-3E are for the UK and Greater London area, on sleeping problems so acute that they led to admission to hospital.

Finally, in genuine panel data, from the British Household Panel Study (explained more fully later in the paper), following the same individuals as they grow older through time, Fig. 3F shows that a sleep hours U-shape pattern in age is present even in 'within-person' longitudinal data from Great Britain.

See Tables S12-13 for further details.

The midlife sleep-problem phenomenon in humans appears to be little-known to most researchers. A search of the literature using the Web of Science, however, shows the results on sleep hours are consistent with one published cross-sectional US study (Krueger and Friedman 2009), although age was not the authors' focus.

Disabling Headaches in Longitudinal Data

Headaches of a disabling kind -- migraine headaches -- are known to affect a significant proportion of the citizens of affluent countries. Their cause is not fully understood, but it is believed that migraine is a correlate of anxiety and depression (Ratcliffe *et al*. 2008; Spiers *et al*. 2012; Lampl *et al*. 2016; WHO 2016). A longitudinal study of 17,600 Canadians found that migraine headaches were, prospectively, one of the strongest predictors of who would be (newly) diagnosed with major depression within the ensuing 24 months (Patten 2001).

We therefore use fixed-effects methods to examine this indicator -- extreme headache attacks -- as an additional potential marker to assess the possible incidence of mental strain in midlife. For the exercise, data are drawn from Waves 1-18 of the British Household Panel Survey (BHPS). The migraine variable itself is derived from the BHPS health questionnaire: "*Do you have any of the listed health problems: … migraine?*".

We focus on individuals aged 16-75 years old. This produces 217,645 observations. Of those observations, 18,058 people-interviews (or 8.3%) listed migraine as a health problem. Fixed-effects logit regressions are estimated here and control for marital status, employment status, highest qualification level, homeownership status, number of days spent in the hospital last year, self-rated health, number of children under the age of 16 living in the same household, year fixed effects, and regional fixed effects.

Figure 4A plots the outcome. A hill shape in disabling headaches, with the maximum reached in midlife, emerges once again. These are within-person patterns obtained by following the same randomly selected group of British people as they age through time. See Table S14 for more information.

Extreme Job-Stress in Longitudinal Data

Work is a major part of life, so it is of interest to consider also what happens during that section of people's lives. It is known, for example, that job strain is a predictor of elevated blood pressure (Ramirez *et al*. 1996). Research evidence suggests that stress at work is a longitudinal predictor of depression and poor mental-health (Stansfeld *et al*. 1999; Choi 2018).

The next form of evidence applies a little-used measure of employees' strain in the workplace. Our analysis draws upon 17 waves (years 2002-2018) of the Household, Income and Labour Dynamics in Australia (HILDA) Survey.[2] We focus on extreme-stress evaluations. These are made by respondents relating to their current job. The survey respondents were asked to assign an integer value between [1] "strongly disagree" and [7] "strongly agree" to each of the following statements, among others:

(i) *I fear the amount of stress in my job will make me physically ill*

(ii) *My job is complex and difficult*

(iii) *My job is more stressful than I had ever imagined*

We average responses to these three statements. This creates an overall job-stress measure, which is then used as the dependent variable in fixed-effects regression equations. The grouping was also checked, and supported, by a principal-components factor analysis (not reported).

A hill-shape is again traced out. Figure 4B, based on Table S15, illustrates our longitudinal evidence following the same 20,648 working individuals (aged 15-75) through time (127,199 person-year observations). The 'within-person' regression equations adjust for income, total hours of work, job or industry type, education, marital status, number of children, alcohol consumption, and a range of variables for exercise and healthy diet.

[2] The HILDA survey data was extracted using PanelWhiz (Haisken-DeNew and Hahn 2006).

The maximum level of work stress is reached at approximately the age of 45. On these estimates, the size of the implied age-effect is substantial. It is 0.1 - 0.2 in size, which can be compared to the mean value of stress in the sample of 3.22, but that would make the estimated effect look smaller than is truly correct. A more appropriate way to understand the size of the effect is to compare with other coefficients in a stress regression equation. For instance, in the background regression equation in the Appendix, approximately 0.15 would then be the implied rise in stress associated with a full extra 8 hours of work per week.

Other Results

Information on additional markers of distress is available from the earlier-discussed Adult Psychiatric Morbidity Survey for England. These, it should be emphasized, are not longitudinal results, but we present them here for completeness.

The data in Figs. 4C-4D, on two distress measures, namely dependence on alcohol and having had suicidal thoughts, come from the APMS series (7,500 individuals) for 2014. Age bands are once more depicted on the x-axis. These diagrams plot the age-dummy coefficients from linear probability regression equations controlling for gender, education, marriage, dependent children, housing type, and unemployment. The by-now-usual hill shape seems still to be in evidence.

Tables S16-S21 contain further results and details.

CONCLUSIONS

The human midlife crisis seems to be an important and under-recognized phenomenon. We document longitudinal evidence of extreme distress among middle-aged adults in affluent countries. These individuals are close to their peak lifetime earnings and in general have

experienced no serious illness. Our findings therefore appear to point to a disturbing paradox within modern society.

Using eight different measures, an approximate hump-shape in severe distress over the life cycle emerges in data from industrialized nations such as the UK, Australia, and the USA. This paper's methods go beyond cross-sectional analyses based on simple measures of subjective wellbeing (for example, Graham and Pozuelo 2017). As far as we know, our recurring longitudinal patterns -- they are to be thought of as a collection of complementary types of evidence -- are not widely known by policymakers.

The late Elliott Jaques (1965) is believed to have coined the term 'midlife crisis' in the year 1965. He offered anecdotal evidence, and psychoanalytic arguments, for it. Using modern data sets and conventional statistical methods, this paper explores, and provides empirical support consistent with, the hypothesis advanced by Jaques. The paper's analysis finds hill-shaped patterns in data on:

- suicide,
- sleeping problems,
- extreme depression,
- intense job strain,
- disabling headaches,
- suicidal feelings,
- concentration and memory problems,
- alcohol dependence.

In some cases a particular mental-distress marker is available in many nations; in other cases it is available only for a few nations.

The explanation for the midlife shape currently remains open. Could the paper's empirical result be the product of the stresses of having dependent children, or a country-

specific or new phenomenon, or something to do with selection effects, or an illusion caused by cohort effects? These are natural and important possibilities. Nevertheless, the balance of our evidence appears to suggest not. It also does not seem that envy of others causes the midlife shape (Mujcic and Oswald 2018 test for that possibility, although not with extreme distress measures as the dependent variable). The notion of unmet aspirations as part of the explanation does, however, have intuitive appeal, in our judgment (see particularly Schwandt 2016). Perhaps so also, more speculatively, does some role for rising 'wisdom' seem possible (Jeste and Oswald 2014) in the observed reduction in distress levels later in life.

There is some published evidence for a midlife psychological low in data on chimpanzees and orangutans (Weiss *et al*. 2012). So sheer ageing biology in primates may play some kind of role. That would take the ultimate explanation out of the social sciences and into the natural sciences. Much is still to be understood.

Scientific caution remains appropriate. The evidence described here is based on a particular, if large, set of indicators. It is possible to think of objections to those indicators. A caveat on that, however, should arguably also be entered. It would be incumbent upon a critic of our chosen extreme-distress measures to suggest what would count instead as a set of better markers of human crisis. Most especially, it would not seem scientifically acceptable to suggest something like 'indicator X is less than perfect so I reject the repeated pattern of these multiple indicators'.

Finally, we believe it is not currently clear whether:

(i) there is a timeless and innate form of human middle-aged crisis, or

(ii) the midlife pattern documented here is some kind of perplexing, and perhaps temporary, byproduct of today's affluent world.

Whichever of these turns out to be true, the hill-shaped pattern of extreme distress over the human life-course in rich countries appears to constitute a foundational puzzle for economists, behavioral scientists, and perhaps other kinds of scientific researchers.

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Figure 1: The Age Profile of Distress, Using Three Different Measures, in England in 2000, 2007, and 2014

(Adult Psychiatric Morbidity Survey data)

[Note: 2021 data not yet available]

Year 2000 *Year 2007* *Year 2014*

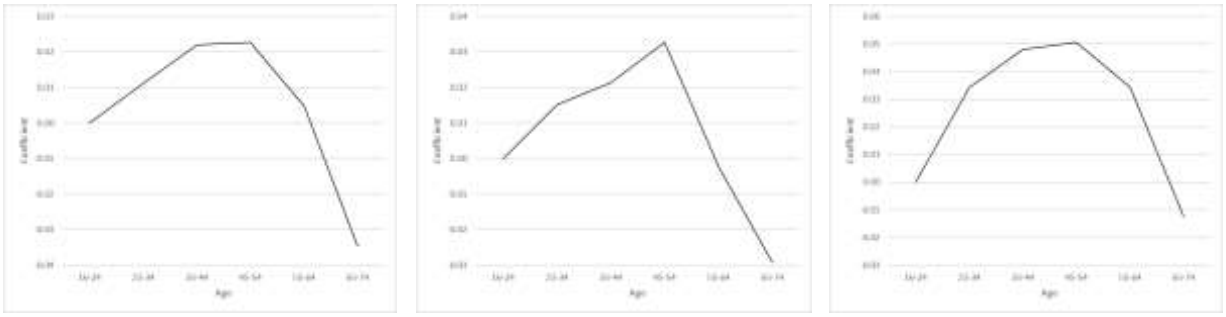


Fig. 1A. Presence of Diagnosed Depression in APMS for years 2000, 2007, and 2014

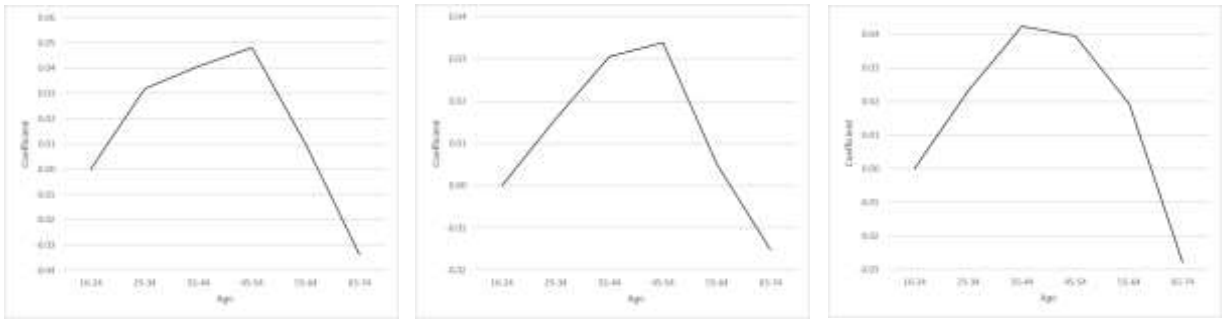


Fig. 1B. Presence of Generalized Anxiety Disorder in APMS for years 2000, 2007, and 2014

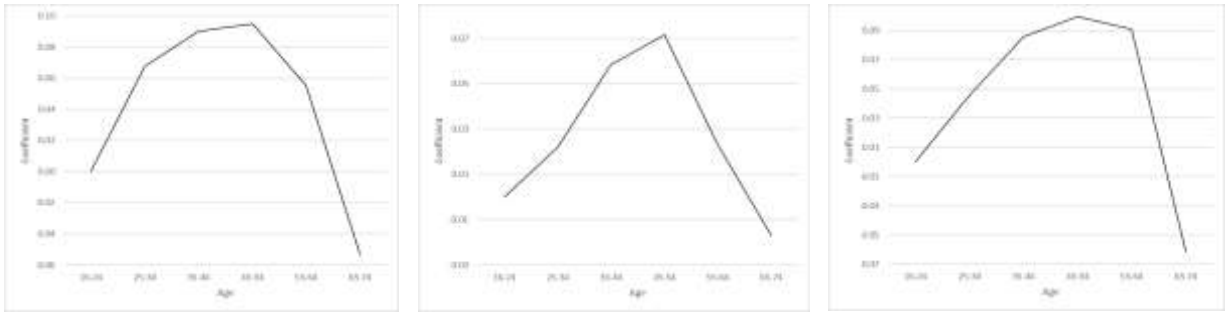
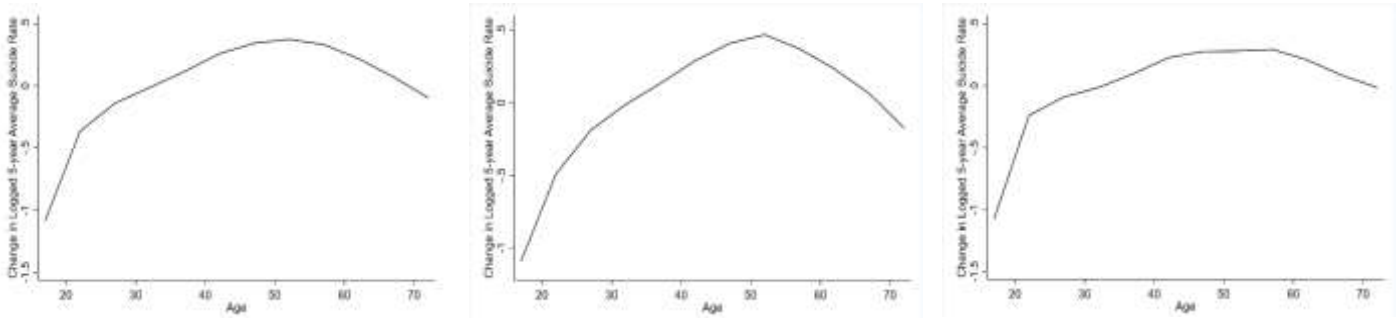


Fig. 1C. Felt That Life is Not Worth Living in APMS for years 2000, 2007, and 2014

Fig. 1. Depression, Generalized Anxiety Disorder, and Felt Life Not Worth Living. These diagrams plot the age-dummy coefficients from linear probability regression equations controlling for gender, education, marriage, dependent children, housing type, and unemployment. Depression (Fig. 1A) and Generalized Anxiety Disorder (Fig. 1B) and Life Not Worth Living (Fig. 1C) from direct survey question. The data in the figure come from the Adult Psychiatric Morbidity Survey (APMS) series (~7,500 individuals) of the general population in England (for the years 2000, 2007, 2014) using a detailed clinical schedule (the Clinical Interview Schedule Revised), which applies ICD-10 diagnostic criteria. Age bands are depicted on the x-axis. For clarity, standard-error bands are omitted but are available later in the Appendix. FURTHER INFORMATION ON THE CONSTRUCTION OF DEPRESSION AND G.A.D. SCORES:
https://www.ncbi.nlm.nih.gov/books/NBK262332/
http://doc.ukdataservice.ac.uk/doc/6379/mrdoc/pdf/6379_apms_2007_interviewer_instructions.pdf

Figure 2: The Age Profile of Suicide in the English-Speaking Nations Since the 1950s



Suicide Rates by Age Group After Adjusting for Cohort + Time

Effects for Seven Decades of Data, 1950-2015

[Note: 2020 standardized data not yet available]

(*left-to-right*: both genders; females; males)

Fig. 2. Suicide in the English-Speaking Nations. This figure uses World Health Organization (WHO) data from 1950 to 2015. Age is on the horizontal axis. The studied nations are Australia; Canada; Ireland; New Zealand; England and Wales; Northern Ireland; Scotland; United States of America. In some nations the suicide rate spikes up again at the end of life, but that is not the focus of this study. The plots in the above use the Intrinsic Estimator due to Yang and colleagues (Yang *et al*. 2004, 2008). This adjusts for country fixed-effects, cohort effects, and period effects. Moreover, similar results are obtained for cohort adjustment using the previously traditional method of equality-constraints. Those are available on request. For clarity, standard-error bands are omitted but are available later in the Appendix.

Note. For some recent data, which cannot be included in a consistent way in the 5-year bands of the cross-national cohort analysis, see the final figure in the Appendix.

Figure 3: Evidence of a Midlife Sleep 'Crisis', UK 2012-13.

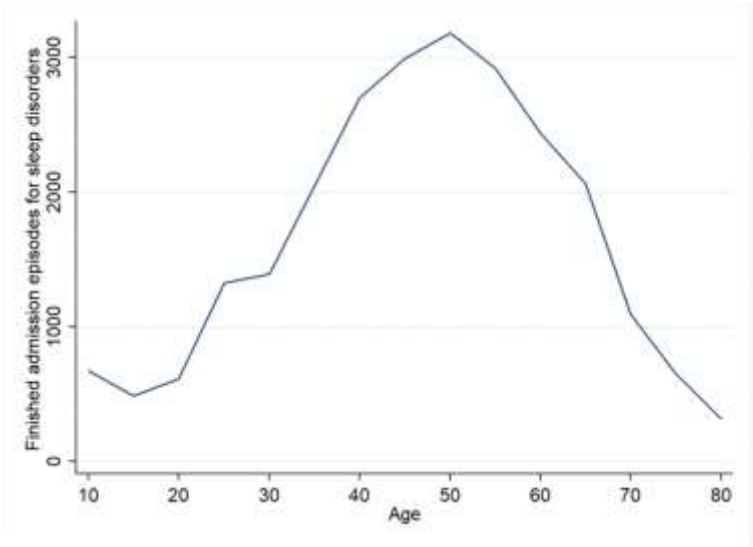


Fig. 3. Hospital Admission for Sleep Disorders. These are official data are from the National Health Service of the UK. Finished admissions episodes for sleep disorders by age, September 2012-August 2013. The data come from the Health and Social Care Information Centre: website address http://www.hscic.gov.uk/pubs/hesapcapraug13. There were approximately 35,000 hospital admissions for sleep disorders in year 2013. A finished admission episode (FAE) is the first period of inpatient care under one consultant within one healthcare provider. FAEs are counted against the year or month in which the admission episode finishes. Admissions do not represent the number of inpatients, as a person may have more than one admission within the period. Sleep disorders include insomnias, hypersomnias, disorders of sleep-wake schedule, sleep apnoea, narcolepsy and cataplexy, other sleep disorders, nonorganic insomnia, nonorganic hypersomnia, nonorganic disorder of the sleep-wake schedule, sleep terrors, nightmares, other nonorganic sleep disorders. This is the population; hence no standard-error bands are given.

Figure 3A-3F: The Age Profile of Sleep Issues in the United States and the UK since the 1960s

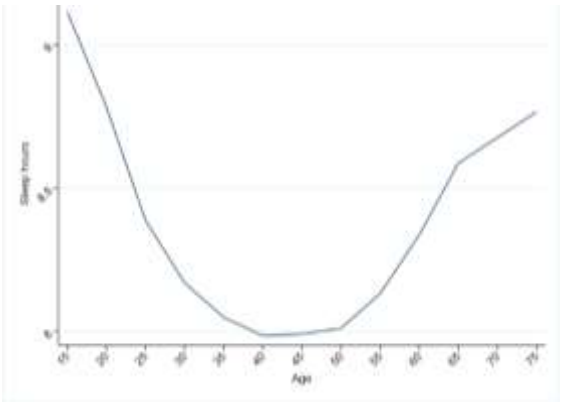


Fig. 3A. Sleep hours in the USA 1965-1992

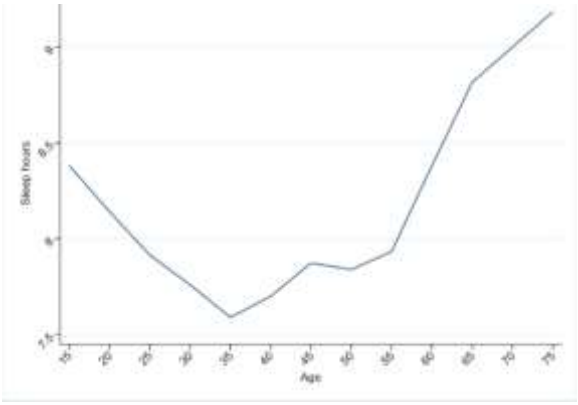


Fig. 3B. Sleep hours in the USA 1992-2019

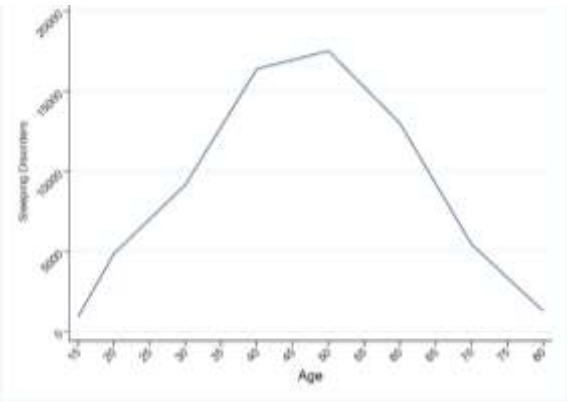


Fig. 3C. Hospital Admission for Sleep Disorders in UK 2012-2014

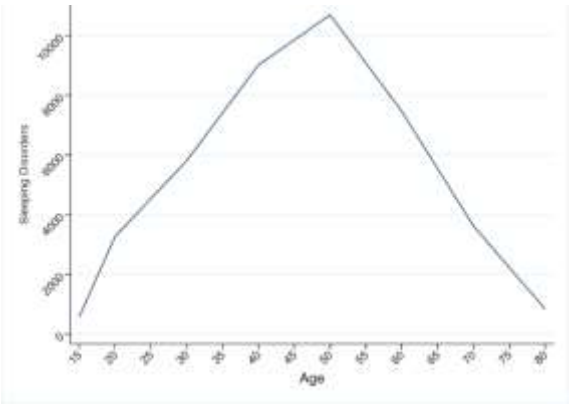


Fig. 3D. Hospital Admission for Sleep Disorders in UK 2015-2018

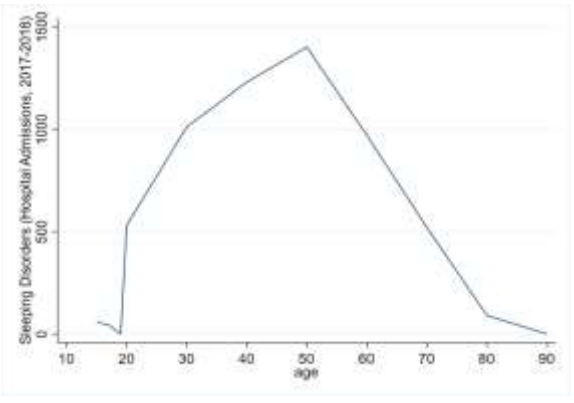


Fig. 3E. Hospital Admission for Sleep Disorders in London 2013-18

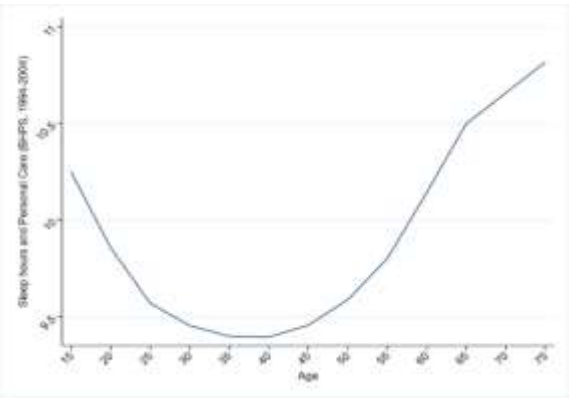


Fig. 3F. Sleep hours – within-person (Great Britain 1994-2004)

Figs. 3A to 3F. Sleep Hours (US, Great Britain) and Hospital Admissions for Sleep Disorders (UK). The upper part of this figure documents U-shaped sleep hours and age in a sample of half a million individuals over two periods of time in the USA. Age is plotted on the horizontal axis. The U-shape pattern continues to hold in regression equations that include standard demographic controls, including for children in the household. Figs. 3C to 3F. The lower part of this figure documents Hospital Admission for Sleep Disorders, UK, and London, and sleep hours in data from the British Household

Panel. The former are official data from the National Health Service of the UK. Finished admissions episodes for sleep disorders by age, September 2012-August 2018. The data come from the Health and Social Care Information Centre. The website address for that organization, containing other information, is http://www.hscic.gov.uk/pubs/hesapcapraug13. There are typically approximately 35,000 hospital admissions for sleep disorders per year in the UK. A finished admission episode (FAE) is the first period of inpatient care under one consultant within one healthcare provider. FAEs are counted against the year or month in which the admission episode finishes. Admissions do not represent the number of inpatients, as a person may have more than one admission within the period. Sleep disorders include insomnias, hypersomnias, disorders of sleep-wake schedule, sleep apnoea, narcolepsy and cataplexy, other sleep disorders, nonorganic insomnia, nonorganic hypersomnia, nonorganic disorder of the sleep-wake schedule, sleep terrors, nightmares, other nonorganic sleep disorders. This is the population; hence no standard-error bands are given. Fig. 3E**.** Hospital Admission for Sleep Disorders in the Greater London area. These are official data, as above, from the National Health Service, but for Greater London, which is the largest urban area in the UK. Finished admissions episodes for sleep disorders by age, covering years 2013-2018. *https://digital.nhs.uk/data-and-information/find-data-and-publications/supplementary-information/2018-supplementary-information-files/hospital-admissions-for-sleep-disorders-covering-the-london-commissioning-region*
Fig. 3F. The plot in Fig. 3F uses longitudinal data drawn from the British Household Panel Survey (BHPS) for the period 1994-2004. The estimates are from fixed-effects equations; hence the pattern is derived solely from within-person, not cross-sectional, variation. For clarity, standard-error bands are omitted but are available later in the Appendix.

Figure 4: The Age Profile of Disabling Headaches, Job Stress, Alcohol Dependence, and Suicidal Thoughts in the UK and Australia since 2002

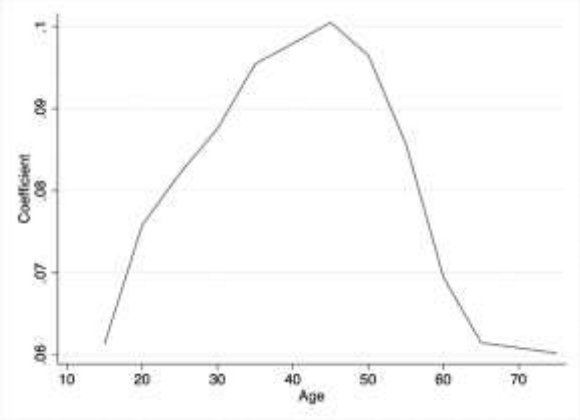


Fig. 4A. Disabling headaches - longitudinal data (Great Britain)

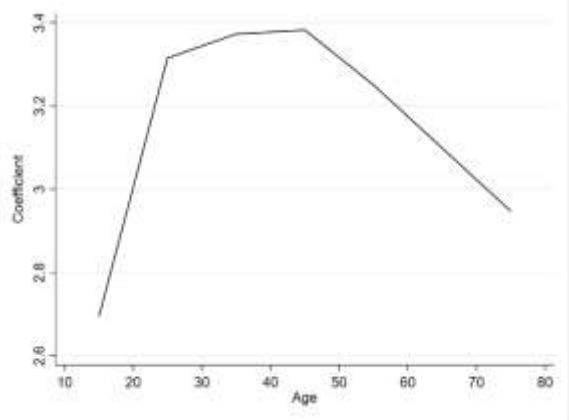


Fig. 4B. Severe job stress - longitudinal data (Australia)

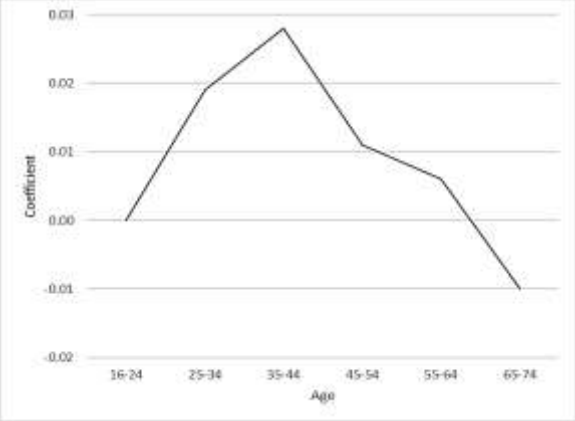


Fig. 4C. Alcohol dependence (England)

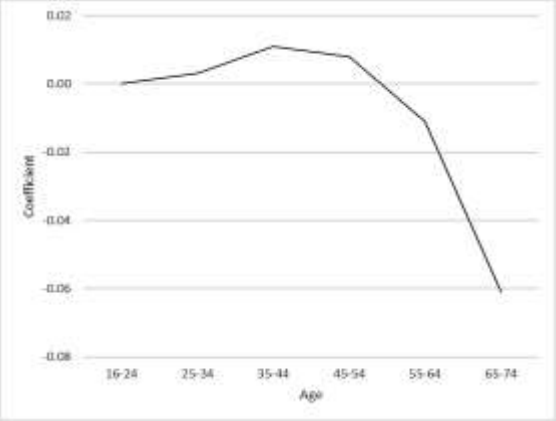


Fig. 4D. Suicidal thoughts in the past year (England)

Fig. 4. Further Measures of Distress. Figures 4A and 4B illustrate *within-person longitudinal changes in migraine* and *within-person longitudinal severe job stress* by age group, respectively. These are based on coefficients from fixed-effects regression equations with six banded dummy variables for age groups. The figures use within-person longitudinal data from the British Household Panel Survey (waves 1-18) and Australian HILDA Survey (year waves 2002-2018). The regression equations also control for other socioeconomic variables including income and number of young children. Total samples contain 213,011 and 127,199 person-year observations, respectively. The data in Figs. 4C-4D, on two other distress measures, come from the Adult Psychiatric Morbidity Survey (APMS) series (7,500 individuals) for 2014. Age bands are depicted on the x-axis. These diagrams plot the age-dummy coefficients from linear probability regression equations controlling for gender, education, marriage, dependent children, housing type, and unemployment. For clarity, standard-error bands are omitted but are available later in the Appendix.

Supplementary Appendix

Supplemental Information for

The Midlife Crisis

Osea Giuntella, Sally McManus, Redzo Mujcic, Andrew J. Oswald, Nattavudh Powdthavee, Ahmed Tohamy

Figures and Tables:

Table S1. APMS data for England: Descriptive statistics - Prevalence of depression, GAD, and Felt life not worth living, 2000, 2007, and 2014.

	Age group						
	16 - 24	**25 - 34**	**35 - 44**	**45 - 54**	**55 - 64**	**65 - 74**	**Total**
Year 2000							
Depression	2.0%	2.3%	3.3%	3.4%	2.9%	0.8%	2.6%
SE	0.5%	0.4%	0.4%	0.5%	0.5%	0.2%	0.2%
Lower CI	1.2%	1.6%	2.5%	2.6%	2.1%	0.5%	2.2%
Upper CI	3.1%	3.1%	4.3%	4.5%	4.0%	1.4%	3.0%
Generalized Anxiety Disorder	1.4%	4.2%	5.7%	6.8%	4.6%	2.5%	4.4%
SE	0.4%	0.5%	0.6%	0.7%	0.6%	0.4%	0.2%
Lower CI	0.8%	3.4%	4.6%	5.6%	3.6%	1.7%	4.0%
Upper CI	2.4%	5.3%	6.9%	8.3%	5.8%	3.5%	4.9%
Felt life not worth living	18.3%	21.1%	21.6%	22.0%	20.5%	14.2%	20.1%
SE	1.5%	1.1%	1.0%	1.1%	1.1%	1.0%	0.5%
Lower CI	15.6%	19.1%	19.6%	19.9%	18.4%	12.3%	19.2%
Upper CI	21.4%	23.3%	23.6%	24.3%	22.7%	16.3%	21.0%
Base	794	1683	1848	1545	1442	1268	8580
Year 2007							
Depression	3.2%	2.5%	3.3%	4.8%	2.5%	1.6%	3.1%
SE	0.8%	0.4%	0.5%	0.6%	0.4%	0.4%	0.2%
Lower CI	2.0%	1.8%	2.5%	3.7%	1.8%	1.0%	2.7%
Upper CI	5.1%	3.6%	4.4%	6.2%	3.5%	2.5%	3.6%
Generalized Anxiety Disorder	3.6%	4.2%	5.3%	6.1%	4.1%	3.3%	4.6%
SE	0.7%	0.6%	0.6%	0.8%	0.6%	0.6%	0.3%
Lower CI	2.4%	3.1%	4.3%	4.7%	3.2%	2.3%	4.0%
Upper CI	5.3%	5.6%	6.6%	7.8%	5.4%	4.6%	5.1%
Felt life not worth living	20.0%	17.2%	20.0%	21.3%	17.1%	16.1%	18.8%
SE	1.8%	1.2%	1.2%	1.2%	1.1%	1.1%	0.6%
Lower CI	16.6%	14.9%	17.7%	19.1%	15.0%	13.9%	17.7%
Upper CI	23.9%	19.7%	22.4%	23.8%	19.3%	18.4%	19.9%
Base	568	1035	1413	1130	1279	1028	6453
Year 2014							
Depression	2.3%	3.5%	4.1%	4.5%	4.3%	2.1%	3.5%
SE	0.6%	0.6%	0.6%	0.6%	0.7%	0.5%	0.3%
Lower CI	1.4%	2.4%	3.1%	3.4%	3.2%	1.4%	3.1%
Upper CI	3.7%	5.0%	5.5%	5.9%	5.8%	3.2%	4.1%
Generalized Anxiety Disorder	6.3%	6.1%	6.9%	7.3%	6.4%	4.0%	6.3%
SE	1.0%	0.9%	0.8%	0.8%	0.8%	0.5%	0.3%
Lower CI	4.6%	4.7%	5.4%	5.8%	5.1%	3.0%	5.7%
Upper CI	8.7%	8.1%	8.8%	9.0%	8.1%	5.1%	7.0%
Felt life not worth living	21.4%	19.8%	20.7%	23.5%	25.4%	13.5%	21.0%
SE	1.7%	1.4%	1.3%	1.3%	1.3%	1.0%	0.6%
Lower CI	18.3%	17.2%	18.3%	20.9%	22.8%	11.7%	19.8%
Upper CI	24.9%	22.8%	23.4%	26.2%	28.1%	15.6%	22.1%
Base	559	1034	1178	1293	1226	1187	6477

Table S2. Linear Regression Models of Depressive Disorder. Adult Psychiatric Morbidity Survey (APMS) in the Year 2000. Assessment using the revised Clinical Interview Schedule (CIS-R) to identify presence of current Depressive Disorder according to diagnostic criteria.

	Model (1)				Model (2)			
Dependent variable: *Depressive Disorder*	**b**	**SE**	**95% CI**		**b**	**SE**	**95% CI**	
Age group								
25-34	0.004	0.006	-0.008	0.015	0.011	0.007	-0.002	0.025
35-44	0.012	0.006	0.000	0.025	0.022	0.008	0.007	0.037
45-54	0.014	0.007	0.001	0.027	0.023	0.008	0.007	0.039
55-64	0.011	0.006	-0.002	0.023	0.005	0.008	-0.011	0.021
65-74	-0.011	0.005	-0.021	0.000	-0.035	0.009	-0.052	-0.017
Sex								
Female					-0.002	0.004	-0.010	0.005
Marital status								
Separated					0.016	0.012	-0.008	0.040
Single					0.008	0.005	-0.003	0.018
Divorced					0.030	0.008	0.014	0.047
Widowed					0.019	0.011	-0.002	0.040
Children								
Children in household					-0.003	0.005	-0.012	0.006
Employment status								
Unemployed					0.013	0.014	-0.013	0.040
Economic inactivity					0.039	0.006	0.028	0.051
Educational qualification								
Teaching/HND/nursing					0.009	0.008	-0.007	0.024
A Level					0.005	0.006	-0.007	0.017
GCSE/equivalent					0.007	0.005	-0.002	0.016
None					0.012	0.006	0.000	0.025
Tenure								
Social renter					0.005	0.006	-0.007	0.017
Private or other renter					0.007	0.005	-0.002	0.016
Constant	0.019	0.005	0.010	0.028	-0.009	0.010	-0.028	0.010
Overall R^2		0.002				0.028		
Number of individuals		8,580				8,495		

Table S3. Linear Regression Models of Depressive Disorder. Adult Psychiatric Morbidity Survey (APMS) in the Year 2007. Assessment using the revised Clinical Interview Schedule (CIS-R) to identify presence of current Depressive Disorder according to diagnostic criteria.

	Model (1)				Model (2)			
Dependent variable: *Depressive Disorder*	**b**	**SE**	**95% CI**		**b**	**SE**	**95% CI**	
Age group								
25-34	-0.006	0.009	-0.024	0.012	0.015	0.010	-0.004	0.035
35-44	0.002	0.009	-0.016	0.019	0.021	0.011	0.001	0.042
45-54	0.016	0.010	-0.004	0.036	0.033	0.012	0.009	0.057
55-64	-0.007	0.009	-0.025	0.011	-0.002	0.011	-0.024	0.019
65-74	-0.016	0.009	-0.033	0.001	-0.029	0.011	-0.052	-0.007
Sex								
Female					0.004	0.004	-0.005	0.013
Marital status								
Cohabitating					-0.010	0.006	-0.021	0.002
Single					0.018	0.007	0.003	0.032
Widowed					0.020	0.008	0.005	0.035
Divorced					0.032	0.010	0.012	0.052
Separated					0.037	0.018	0.002	0.071
Children								
Children in household					-0.008	0.006	-0.021	0.004
Employment status								
Unemployed					0.041	0.026	-0.011	0.092
Economic inactivity					0.034	0.007	0.021	0.048
Educational qualification								
Teaching/HND/nursing					0.011	0.009	-0.006	0.028
A Level					0.004	0.006	-0.008	0.016
GCSE/equivalent					0.010	0.005	-0.001	0.020
Other					0.003	0.009	-0.014	0.020
None					0.015	0.006	0.003	0.026
Tenure								
Social renter					0.032	0.008	0.017	0.048
Private or other renter					-0.007	0.006	-0.020	0.005
Constant	0.032	0.008	-0.040	0.014	-0.013	0.014	-0.040	0.014
Overall R^2		0.003				0.030		
Number of individuals		7,403				7,212		

Table S4. Linear Regression Models of Depressive Disorder. Adult Psychiatric Morbidity Survey (APMS) in the Year 2014. Assessment using the revised Clinical Interview Schedule (CIS-R) to identify presence of current Depressive Disorder according to diagnostic criteria.

	Model (1)				Model (2)			
Dependent variable: *Depressive Disorder*	**b**	**SE**	**95% CI**		**b**	**SE**	**95% CI**	
Age group								
25-34	0.011	0.008	-0.005	0.028	0.034	0.010	0.014	0.054
35-44	0.018	0.009	0.001	0.035	0.048	0.011	0.026	0.070
45-54	0.022	0.009	0.005	0.039	0.051	0.011	0.029	0.072
55-64	0.020	0.008	0.003	0.036	0.034	0.011	0.014	0.055
65-74	-0.002	0.007	-0.016	0.012	-0.012	0.012	-0.035	0.010
75+	-0.011	0.007	-0.024	0.003	-0.034	0.012	-0.058	-0.009
Sex								
Female					0.004	0.005	-0.005	0.013
Marital status								
Single					0.020	0.008	0.003	0.036
Divorced/Separated/ Widowed					0.004	0.006	-0.008	0.016
Children								
Children in household					-0.006	0.007	-0.019	0.006
Employment status								
Unemployed					0.034	0.017	0.000	0.069
Economic inactivity					0.058	0.008	0.042	0.074
Educational qualification								
Teaching/HND/nursing					0.000	0.008	-0.015	0.015
A Level					0.003	0.007	-0.010	0.016
GCSE/equivalent					0.008	0.007	-0.005	0.021
Other/foreign					0.010	0.011	-0.011	0.031
None					0.015	0.008	-0.001	0.031
Tenure								
Social renter					0.050	0.009	0.032	0.068
Private or other renter					0.009	0.006	-0.003	0.021
Constant	0.023	0.006	0.012	0.034	-0.037	0.012	-0.060	-0.014
Overall R^2		0.004				0.043		
Number of individuals		7,546				7,438		

Table S5. Linear Regression Models of Generalized Anxiety Disorder. Adult Psychiatric Morbidity Survey (APMS) in the Year 2000. Assessment using the revised Clinical Interview Schedule (CIS-R) to identify presence of current Generalized Anxiety Disorder (GAD) according to diagnostic criteria. GAD is the most common type of mental disorder in the population and is characterized by feelings of fear and worry severe enough to impact on day-to-day living.

	Model (1)				**Model (2)**			
Dependent variable: *Generalized Anxiety Disorder*	**b**	**SE**	**95% CI**		**b**	**SE**	**95% CI**	
Age group								
25-34	0.029	0.006	0.016	0.041	0.032	0.008	0.017	0.047
35-44	0.042	0.007	0.028	0.055	0.041	0.009	0.023	0.058
45-54	0.054	0.008	0.038	0.070	0.048	0.010	0.028	0.068
55-64	0.034	0.007	0.020	0.047	0.010	0.010	-0.010	0.030
65-74	0.012	0.006	0.000	0.024	-0.034	0.012	-0.057	-0.010
Sex								
Female					-0.003	0.005	-0.013	0.007
Marital status								
Separated					0.036	0.015	0.006	0.066
Single					0.000	0.007	-0.014	0.014
Divorced					0.048	0.011	0.027	0.069
Widowed					0.002	0.011	-0.019	0.024
Children								
Children in household					-0.007	0.006	-0.019	0.005
Employment status								
Unemployed					0.011	0.013	-0.014	0.036
Economic inactivity					0.051	0.008	0.035	0.067
Educational qualification								
Teaching/HND/nursing					0.000	0.010	-0.020	0.021
A Level					0.003	0.008	-0.014	0.019
GCSE/equivalent					0.002	0.007	-0.012	0.017
None					0.017	0.009	0.000	0.034
Tenure								
Social renter					0.015	0.008	1.900	0.059
Private or other renter					0.000	0.008	0.020	0.983
Constant	0.014	0.004	0.006	0.022	0.000	0.012	-0.023	0.024
Overall R^2		0.007				0.026		
Number of individuals		8,580				8,495		

Table S6. Linear Regression Models of Generalized Anxiety Disorder. Adult Psychiatric Morbidity Survey (APMS) in the Year 2007. Assessment using the revised Clinical Interview Schedule (CIS-R) to identify presence of current Generalized Anxiety Disorder (GAD) according to diagnostic criteria. GAD is the most common type of mental disorder in the population and is characterized by feelings of fear and worry severe enough to impact on day-to-day living.

	Model (1)				Model (2)			
Dependent variable: *Generalized Anxiety Disorder*	**b**	**SE**	**95% CI**		**b**	**SE**	**95% CI**	
Age group								
25-34	0.006	0.009	-0.012	0.025	0.016	0.010	-0.005	0.037
35-44	0.018	0.009	0.000	0.036	0.030	0.012	0.007	0.054
45-54	0.025	0.011	0.003	0.047	0.034	0.014	0.007	0.061
55-64	0.006	0.009	-0.012	0.024	0.005	0.013	-0.020	0.030
65-74	-0.003	0.009	-0.021	0.015	-0.015	0.014	-0.043	0.012
Sex								
Female					0.015	0.006	0.004	0.026
Marital status								
Cohabitating					0.013	0.010	-0.007	0.034
Single					-0.001	0.009	-0.018	0.017
Widowed					0.011	0.010	-0.009	0.031
Divorced					0.028	0.013	0.002	0.053
Separated					0.026	0.019	-0.010	0.063
Children								
Children in household					-0.011	0.007	-0.026	0.003
Employment status								
Unemployed					0.071	0.028	0.015	0.127
Economic inactivity					0.027	0.007	0.014	0.041
Educational qualification								
Teaching/HND/nursing					0.020	0.011	-0.001	0.040
A Level					0.016	0.009	-0.001	0.034
GCSE/equivalent					0.004	0.007	-0.010	0.019
Other					0.005	0.012	-0.018	0.029
None					0.012	0.008	-0.004	0.027
Tenure								
Social renter					0.042	0.009	0.024	0.060
Private or other renter					0.011	0.009	-0.007	0.029
Constant	0.035	0.007	0.021	0.050	-0.020	0.017	-0.053	0.013
Overall R^2		0.003				0.023		
Number of individuals		7,403				7,212		

Table S7. Linear Regression Models of Generalized Anxiety Disorder. Adult Psychiatric Morbidity Survey (APMS) in the Year 2014. Assessment using the revised Clinical Interview Schedule (CIS-R) to identify presence of current Generalized Anxiety Disorder (GAD) according to diagnostic criteria. GAD is the most common type of mental disorder in the population and is characterized by feelings of fear and worry severe enough to impact on day-to-day living.

	Model (1)				**Model (2)**			
Dependent variable: *Generalized Anxiety Disorder*	**b**	**SE**	**95% CI**		**b**	**SE**	**95% CI**	
Age group								
25-34	-0.002	0.014	-0.029	0.025	0.023	0.016	-0.008	0.055
35-44	0.006	0.013	-0.020	0.032	0.042	0.015	0.012	0.073
45-54	0.009	0.013	-0.017	0.035	0.040	0.016	0.008	0.071
55-64	0.001	0.013	-0.025	0.027	0.019	0.016	-0.012	0.051
65-74	-0.024	0.012	-0.046	-0.001	-0.028	0.016	-0.060	0.004
75+	-0.038	0.012	-0.061	-0.016	-0.059	0.017	-0.093	-0.024
Sex								
Female					0.016	0.007	0.002	0.029
Marital status								
Single					0.034	0.010	0.014	0.054
Divorced/Separated/ Widowed					0.018	0.008	0.002	0.034
Children								
Children in household					-0.014	0.009	-0.032	0.004
Employment status								
Unemployed					-0.008	0.016	-0.040	0.024
Economic inactivity					0.043	0.009	0.024	0.061
Educational qualification								
Teaching/HND/nursing					0.010	0.012	-0.013	0.033
A Level					-0.002	0.009	-0.020	0.016
GCSE/equivalent					0.008	0.009	-0.009	0.025
Other/foreign					-0.002	0.013	-0.028	0.024
None					0.026	0.011	0.006	0.047
Tenure								
Social renter					0.043	0.011	0.022	0.065
Private or other renter					0.011	0.009	-0.008	0.029
Constant	0.063	0.010	0.043	0.084	-0.016	0.018	-0.050	0.019
Overall R^2		0.004				0.025		
Number of individuals		7,546				7,438		

Table S8. Linear Regression Models of Reporting 'Life Not Worth Living'. Adult Psychiatric Morbidity Survey (APMS) in the Year 2000. Depended variable equals 1 if responding 'Yes' to a question on whether the person has felt that life is not worth living, 0 otherwise.

	Model (1)				Model (2)			
Dependent variable: *Felt life not worth living*	**b**	**SE**	**95% CI**		**b**	**SE**	**95% CI**	
Age group								
25-34	0.034	(0.018)	-0.001	0.069	0.068	(0.020)	0.029	0.106
35-44	0.040	(0.018)	0.005	0.075	0.090	(0.021)	0.050	0.130
45-54	0.040	(0.018)	0.004	0.076	0.095	(0.022)	0.051	0.139
55-64	0.027	(0.019)	-0.010	0.064	0.055	(0.023)	0.009	0.101
65-74	-0.040	(0.018)	-0.075	-0.004	-0.053	(0.024)	-0.101	-0.005
Sex								
Female					0.066	0.010)	0.047	0.085
Marital status								
Separated					0.144	(0.030)	0.085	0.203
Single					0.072	(0.015)	0.043	0.102
Divorced					0.152	(0.018)	0.116	0.188
Widowed					0.119	(0.021)	0.078	0.161
Children								
Children in household					-0.014	(0.013)	-0.039	0.011
Employment status								
Unemployed					0.049	(0.030)	-0.011	0.109
Economic inactivity					0.082	(0.013)	0.056	0.108
Educational qualification								
Teaching/HND/nursing					-0.007	(0.020)	-0.046	0.031
A Level					-0.005	(0.018)	-0.041	0.031
GCSE/equivalent					-0.010	(0.015)	-0.039	0.019
None					-0.015	(0.016)	-0.047	0.017
Tenure								
Social renter					0.077	(0.014)	5.530	0.000
Private or other renter					0.035	(0.018)	1.940	0.053
Constant	0.181	(0.015)	0.152	0.209	-0.022	(0.027)	-0.075	0.031
Overall R^2		0.004				0.050		
Number of individuals		8,574				8,491		

Table S9. Linear Regression Models of Reporting 'Life Not Worth Living'. Adult Psychiatric Morbidity Survey (APMS) in the Year 2014. Depended variable equals 1 if responding 'Yes' to a question on whether the person has felt that life is not worth living, 0 otherwise.

	Model (1)				Model (2)			
Dependent variable: *Felt life not worth living*	**b**	**SE**	**95% CI**		**b**	**SE**	**95% CI**	
Age group								
25-34	-0.016	(0.023)	-0.062	0.030	0.046	(0.027)	-0.008	0.099
35-44	-0.007	(0.022)	-0.049	0.036	0.086	(0.026)	0.034	0.137
45-54	0.021	(0.022)	-0.022	0.063	0.100	(0.026)	0.049	0.151
55-64	0.040	(0.022)	-0.004	0.083	0.091	(0.028)	0.037	0.145
65-74	-0.079	(0.020)	-0.118	-0.040	-0.061	(0.029)	-0.118	-0.005
75+	-0.067	(0.020)	-0.106	-0.027	-0.092	(0.030)	-0.152	-0.033
Sex								
Female					0.046	(0.011)	0.025	0.066
Marital status								
Single					0.074	(0.018)	0.039	0.108
Divorced/Separated/ Widowed					0.085	(0.013)	0.060	0.110
Children								
Children in household					-0.049	(0.015)	-0.078	-0.020
Employment status								
Unemployed					0.058	(0.036)	-0.013	0.129
Economic inactivity					0.072	(0.015)	0.043	0.100
Educational qualification								
Teaching/HND/nursing					0.007	(0.020)	-0.033	0.047
A Level					0.001	(0.017)	-0.033	0.035
GCSE/equivalent					0.010	(0.015)	-0.019	0.039
Other/foreign					-0.007	(0.027)	-0.060	0.046
None					0.033	(0.017)	0.000	0.065
Tenure								
Social renter					0.132	(0.015)	0.102	0.162
Private or other renter					0.062	(0.015)	0.033	0.091
Constant	0.214	(0.017)	0.181	0.247	0.011	(0.029)	-0.047	0.068
Overall R^2		0.009				0.056		
Number of individuals		7,537				7,429		

Supporting Text on Suicide Analytics

Suicide in Cross-National Data

In the analysis we have omitted the very highest ages, because the study's focus is on whether there is midlife distress. In some countries, it should be emphasized, including in the USA in some years where there is widespread access to guns, there is evidence of a turn-up in suicidality towards the end of life (though this is less true of females). That is consistent with the intuitive idea that very old people, with major illnesses, are statistically more prone to take their own lives. The current study does not focus on that segment of the lifespan, and some might wish to argue that self-inflicted deaths at the very end of life, by those in pain or with extreme illness, may not be a major public-policy concern.

Table S10 gives more details on the cohort-adjusted estimates. The dependent variable in that table is the natural logarithm of the suicide rate (expressed per 100,000 citizens). Each data point is a 5-year average. The countries covered in Table S10 are the English-speaking ones of Canada, Australia, Ireland, New Zealand, England and Wales (they are necessarily combined in our data set), Northern Ireland, Scotland, and the United States of America. The base category in Table S10 is Canada, so the coefficients on the country dummy variables are level-effects relative to Canada.

Of primary interest is the pattern of the age dummies. For English-speaking females in Table S10, the age dummy variables have negative coefficients through youth, and then turn positive at age 35-39. From there they rise steadily to age 50-54, with the coefficients altering, across the age blocks, from -0.014 at age 30-34, to 0.13 at age 35-39, 0.29 at age 40-44, 0.41 at age 45-49, and 0.47 at age 50-54. Then the coefficients decline through the numbers, respectively, 0.37 at age 55-59, 0.23 at age 60-64, 0.06 at age 65-69, and -0.17 at age 70-74. This evidence of a marked hill-shape in suicide risk by age is also found for English-speaking males. However, in the case of the second column on Table S10, which is for the male

subsample, it would certainly be fair to conclude that the hill-shape reaches its literal peak somewhat beyond what would usually be called 'midlife'. It does so at age 55-59. The coefficients suggest a slightly smoother hill-top, where the pattern is rising from 0.09 at age 35-39, to 0.22 at age 40-44, to 0.27 at age 45-49, to 0.28 at age 50-54, to 0.29 at age 55-59, and then down to 0.20 at age 60-64, 0.08 at age 65-69, and -0.016 at age 70-74. These coefficients depict in a visual way the age profile of suicide in the principal English-speaking nations of the world. The period dummies in Table S10 reveal a significant amount of variation, with the highest values occurring in the late 1970s, throughout the 1980s, and early in the 1990s. These were the periods of high unemployment rates in the industrialized world; but in this analysis it is not possible to give an explanation for the observed pattern. There are also strong patterns in the cohort dummies. Low suicide-risk values occur among birth cohorts who were born in the 1920s to the 1940s.

Table S11 gives equivalent results for non-English affluent countries in Europe. The countries covered in Table S2 are Germany, Belgium, Denmark, Finland, France, the Netherlands, Norway, Switzerland, and Sweden. The base category in Table S11 is Austria.

Sleeping Problems in Cross-National Data

The diagrams use information only on workweek days. However, we have found that a U-shaped midlife pattern is observed even during weekends; all calculations can be redone with 7-day data. Furthermore, we excluded from the analysis any children under 10 years of age and did not include naps -- defined as any sleep taking place between 11am and 9pm -- in our measure of sleep duration. However, including sleep naps and focusing on overall sleep duration throughout the day yields similar results.

The U-shaped pattern uses self-reported sleeping hours, and thus might be some form of statistical illusion or error of measurement. This is a natural, and scientifically appropriate, concern. Yet the UK hospital admissions data cast doubt on that concern. Lauderdale *et al*.

(2008) also offers more general support for the similarity of subjective and objective sleep information. We additionally explored the patterns in data from the Cleveland Family Study; that suggests again, in objectively measured sleeping-hours data, an approximate U-shape in age. Also, using panel data from Germany, and graphical and Granger-causality methods, we checked that the sleep-age profile mirrors an age U-shape in life satisfaction.

Supplementary Figures:

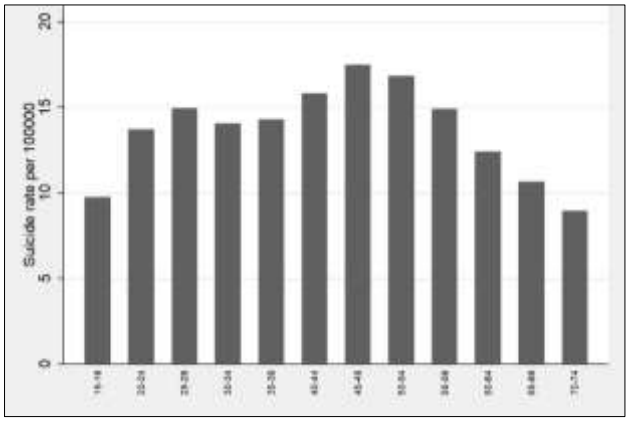


Fig. S5. (Unadjusted) Suicide Data for the English-Speaking Nations in 2015/16

These are the raw data (that is, not regression-adjusted).

Table S10. Suicide Regression Equations for the English-Speaking Nations since 1950. Intrinsic Estimator approach to solve the APC problem of identification with person overlaps, using 5 period (years) averages for the English-speaking subsample. Cohort dummies overlap in this model just as in Thibodeau's work on Canada. z-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Dependent Variable: Logged 5-year average Suicide rate per 100,000 citizens

	Female	**Male**	**Both**
Female			-1.06
			(-64.9)***
Country Dummies:			
Australia	0.19	0.052	0.12
	(4.05)***	(1.31)	(3.66)***
Ireland	-0.78	-0.72	-0.75
	(-16.3)***	(-18.3)***	(-22.4)***
New Zealand	0.11	-0.059	0.023
	(2.27)**	(-1.53)	(0.71)
England and Wales	-0.19	-0.52	-0.36
	(-4.00)***	(-13.5)***	(-10.8)***
Northern Ireland	-0.38	-0.67	-0.53
	(-8.14)***	(-17.4)***	(-16.0)***
Scotland	0.012	-0.35	-0.17
	(0.26)	(-9.13)***	(-5.19)***
United States of America	-0.018	0.034	0.0078
	(-0.38)	(0.86)	(0.23)
Age Dummies:			
15-19	-1.09	-1.08	-1.08
	(-26.9)***	(-32.3)***	(-38.2)***
20-24	-0.49	-0.24	-0.37
	(-12.7)***	(-7.52)***	(-13.5)***
25-29	-0.19	-0.094	-0.14
	(-4.84)***	(-2.89)***	(-5.15)***
30-34	-0.014	-0.017	-0.015
	(-0.35)	(-0.52)	(-0.56)
35-39	0.13	0.094	0.11
	(3.35)***	(2.90)***	(4.10)***
40-44	0.29	0.22	0.26
	(7.35)***	(6.87)***	(9.29)***
45-49	0.41	0.27	0.34
	(10.4)***	(8.42)***	(12.4)***
50-54	0.47	0.28	0.37

	(11.9)***	(8.53)***	(13.5)***
55-59	0.37	0.29	0.33
	(9.41)***	(8.94)***	(12.0)***
60-64	0.23	0.20	0.22
	(5.90)***	(6.28)***	(7.90)***
65-69	0.062	0.081	0.072
	(1.58)	(2.50)**	(2.60)***
70-74	-0.17	-0.016	-0.095
	(-4.38)***	(-0.50)	(-3.41)***
Period Dummies:			
1950-1954	-0.55	-0.49	-0.52
	(-13.7)***	(-14.9)***	(-18.5)***
1955-1959	-0.30	-0.29	-0.29
	(-7.32)***	(-8.65)***	(-10.3)***
1960-1964	0.012	-0.15	-0.069
	(0.30)	(-4.49)***	(-2.41)**
1965-1969	0.18	-0.085	0.047
	(4.42)***	(-2.54)**	(1.66)*
1970-1974	0.21	-0.063	0.072
	(5.12)***	(-1.89)*	(2.54)**
1975-1979	0.36	0.081	0.22
	(8.84)***	(2.42)**	(7.73)***
1980-1984	0.32	0.24	0.28
	(8.00)***	(7.13)***	(9.90)***
1985-1989	0.23	0.30	0.26
	(5.55)***	(9.02)***	(9.27)***
1990-1994	0.086	0.28	0.18
	(2.13)**	(8.46)***	(6.50)***
1995-1999	0.013	0.20	0.11
	(0.32)	(6.13)***	(3.84)***
2000-2004	-0.090	0.073	-0.008
	(-2.23)**	(2.19)**	(-0.30)
2005-2009	-0.095	0.030	-0.033
	(-2.23)**	(0.84)	(-1.10)
2010-2014	-0.38	-0.13	-0.25
	(-7.07)***	(-2.98)***	(-6.79)***
Cohort Dummies:			
1878	0.69	0.75	0.72
	(5.17)***	(6.81)***	(7.70)***
1883	0.48	0.53	0.50
	(5.01)***	(6.64)***	(7.48)***
1888	0.44	0.35	0.40
	(5.54)***	(5.33)***	(7.09)***
1893	0.21	0.20	0.21
	(2.97)***	(3.46)***	(4.15)***
1898	0.089	0.069	0.079
	(1.38)	(1.30)	(1.74)*
1903	-0.044	-0.033	-0.039
	(-0.74)	(-0.66)	(-0.92)

1908	-0.14	-0.19	-0.16
	(-2.51)**	(-4.01)***	(-4.15)***
1913	-0.16	-0.30	-0.23
	(-3.07)***	(-6.78)***	(-6.18)***
1918	-0.25	-0.41	-0.33
	(-4.85)***	(-9.74)***	(-9.19)***
1923	-0.31	-0.44	-0.38
	(-6.48)***	(-11.0)***	(-11.1)***
1928	-0.45	-0.49	-0.47
	(-9.74)***	(-13.1)***	(-14.6)***
1933	-0.48	-0.52	-0.50
	(-10.9)***	(-14.4)***	(-16.3)***
1938	-0.53	-0.57	-0.55
	(-11.9)***	(-15.4)***	(-17.6)***
1943	-0.49	-0.52	-0.50
	(-10.5)***	(-13.5)***	(-15.4)***
1948	-0.42	-0.41	-0.41
	(-8.70)***	(-10.1)***	(-12.2)***
1953	-0.35	-0.23	-0.29
	(-6.96)***	(-5.50)***	(-8.20)***
1958	-0.29	-0.12	-0.21
	(-5.44)***	(-2.72)***	(-5.48)***
1963	-0.20	0.018	-0.092
	(-3.56)***	(0.39)	(-2.30)**
1968	-0.11	0.18	0.036
	(-1.76)*	(3.58)***	(0.86)
1973	0.046	0.27	0.16
	(0.69)	(4.97)***	(3.42)***
1978	0.24	0.33	0.29
	(3.29)***	(5.42)***	(5.53)***
1983	0.40	0.36	0.38
	(4.64)***	(5.17)***	(6.35)***
1988	0.67	0.50	0.59
	(6.20)***	(5.59)***	(7.71)***
1993	0.96	0.65	0.81
	(5.19)***	(4.28)***	(6.22)***
Constant	2.09	3.32	3.23
	(58.1)***	(111)***	(122)***
Observations	1,198	1,199	2,397

Table S11. Suicide Regression Equations for Non-English-Speaking Nations since 1950. Intrinsic Estimator approach to solve the APC problem of identification with person overlaps, using 5 period (years) averages for affluent non-English-speaking countries. z-statistics in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Dependent Variable: Logged 5-year average Suicide rate per 100,000 citizens

	Females	**Males**	**Both**
Female			-0.98
			(-83.4)***
Country Dummies:			
Belgium	-0.078	-0.29	-0.19
	(-2.17)**	(-10.1)***	(-7.44)***
Denmark	0.065	-0.25	-0.094
	(1.79)*	(-8.69)***	(-3.75)***
Finland	-0.000091	0.20	0.10
	(-0.0025)	(7.02)***	(4.07)***
France	-0.19	-0.25	-0.22
	(-5.33)***	(-8.79)***	(-8.95)***
Netherlands	-0.52	-1.02	-0.77
	(-14.5)***	(-35.4)***	(-31.0)***
Norway	-0.62	-0.64	-0.63
	(-17.0)***	(-21.9)***	(-25.0)***
Sweden	-0.097	-0.31	-0.20
	(-2.68)***	(-10.6)***	(-8.07)***
Switzerland	0.015	-0.12	-0.052
	(0.40)	(-4.09)***	(-2.09)**
Age Dummies:			
15-19	-1.20	-1.20	-1.20
	(-38.1)***	(-47.2)***	(-54.9)***
20-24	-0.58	-0.40	-0.49
	(-19.6)***	(-16.9)***	(-24.0)***
25-29	-0.38	-0.25	-0.32
	(-13.1)***	(-10.5)***	(-15.6)***
30-34	-0.18	-0.15	-0.16
	(-6.35)***	(-6.29)***	(-8.24)***
35-39	0.005	-0.003	0.001
	(0.16)	(-0.13)	(0.040)
40-44	0.16	0.16	0.16
	(5.61)***	(6.78)***	(7.98)***
45-49	0.32	0.28	0.30
	(11.2)***	(12.0)***	(15.0)***
50-54	0.45	0.33	0.39
	(15.5)***	(14.4)***	(19.6)***
55-59	0.42	0.35	0.39
	(14.6)***	(14.8)***	(19.1)***
60-64	0.36	0.29	0.33

	(12.4)***	(12.2)***	(16.1)***
65-69	0.34	0.28	0.31
	(11.6)***	(11.8)***	(15.2)***
70-74	0.29	0.32	0.30
	(9.67)***	(13.3)***	(14.7)***
Period Dummies:			
1950-1954	-0.44	-0.33	-0.39
	(-7.47)***	(-6.90)***	(-9.40)***
1955-1959	-0.12	-0.072	-0.095
	(-3.79)***	(-2.86)***	(-4.40)***
1960-1964	-0.092	-0.061	-0.077
	(-2.98)***	(-2.46)**	(-3.58)***
1965-1969	-0.0092	0.0042	-0.0025
	(-0.30)	(0.17)	(-0.12)
1970-1974	0.15	0.11	0.13
	(5.09)***	(4.35)***	(6.20)***
1975-1979	0.28	0.20	0.24
	(9.36)***	(8.50)***	(11.7)***
1980-1984	0.35	0.31	0.33
	(11.8)***	(13.0)***	(16.0)***
1985-1989	0.34	0.28	0.31
	(11.4)***	(11.9)***	(15.2)***
1990-1994	0.16	0.17	0.17
	(5.57)***	(7.23)***	(8.22)***
1995-1999	0.016	0.049	0.032
	(0.55)	(2.05)**	(1.59)
2000-2004	-0.095	-0.088	-0.091
	(-3.20)***	(-3.68)***	(-4.45)***
2005-2009	-0.20	-0.23	-0.22
	(-6.79)***	(-9.58)***	(-10.5)***
2010-2014	-0.33	-0.34	-0.34
	(-10.2)***	(-13.0)***	(-14.9)***
Cohort Dummies:			
1878	0.55	0.69	0.62
	(2.80)***	(4.41)***	(4.58)***
1883	0.33	0.31	0.32
	(3.69)***	(4.29)***	(5.16)***
1888	0.18	0.22	0.20
	(2.51)**	(3.91)***	(4.08)***
1893	0.12	0.15	0.13
	(1.95)*	(3.03)***	(3.16)***
1898	0.040	0.11	0.076
	(0.72)	(2.56)**	(2.01)**
1903	-0.0040	0.043	0.019
	(-0.079)	(1.06)	(0.56)
1908	-0.013	-0.051	-0.032
	(-0.28)	(-1.35)	(-0.99)
1913	-0.076	-0.15	-0.11
	(-1.75)*	(-4.21)***	(-3.71)***

1918	-0.11	-0.22	-0.16
	(-2.69)***	(-6.67)***	(-5.81)***
1923	-0.16	-0.25	-0.20
	(-4.20)***	(-7.96)***	(-7.66)***
1928	-0.18	-0.24	-0.21
	(-4.97)***	(-8.39)***	(-8.46)***
1933	-0.19	-0.27	-0.23
	(-5.56)***	(-9.96)***	(-9.80)***
1938	-0.15	-0.29	-0.22
	(-4.67)***	(-11.2)***	(-9.85)***
1943	-0.17	-0.28	-0.23
	(-5.31)***	(-10.6)***	(-9.99)***
1948	-0.14	-0.18	-0.16
	(-4.00)***	(-6.67)***	(-6.76)***
1953	-0.091	-0.084	-0.088
	(-2.60)***	(-2.98)***	(-3.60)***
1958	-0.095	-0.051	-0.073
	(-2.57)**	(-1.73)*	(-2.86)***
1963	-0.14	-0.047	-0.094
	(-3.63)***	(-1.49)	(-3.48)***
1968	-0.18	-0.020	-0.10
	(-4.45)***	(-0.60)	(-3.55)***
1973	-0.15	-0.018	-0.081
	(-3.22)***	(-0.49)	(-2.61)***
1978	-0.063	0.063	0.00025
	(-1.26)	(1.58)	(0.0073)
1983	0.094	0.12	0.11
	(1.65)*	(2.54)**	(2.66)***
1988	0.20	0.14	0.17
	(2.83)***	(2.44)**	(3.46)***
1993	0.40	0.29	0.35
	(3.74)***	(3.39)***	(4.66)***
Constant	2.56	3.71	3.63
	(90.5)***	(163)***	(177)***
Observations	1,320	1,320	2,640

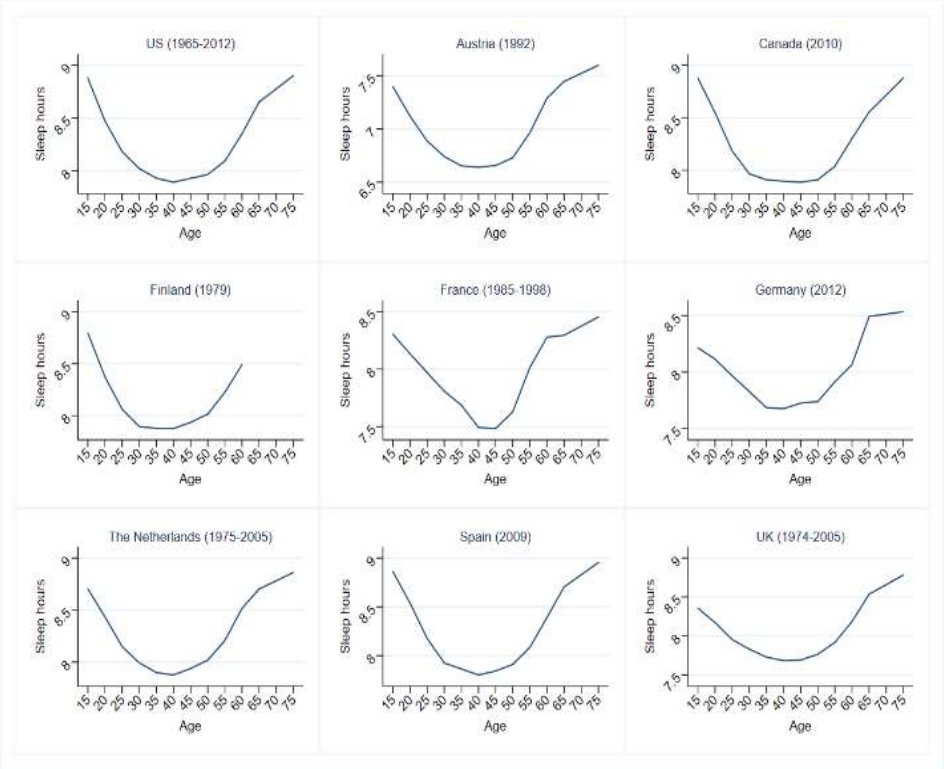


Fig. S6A. Midlife and sleep hours, by country

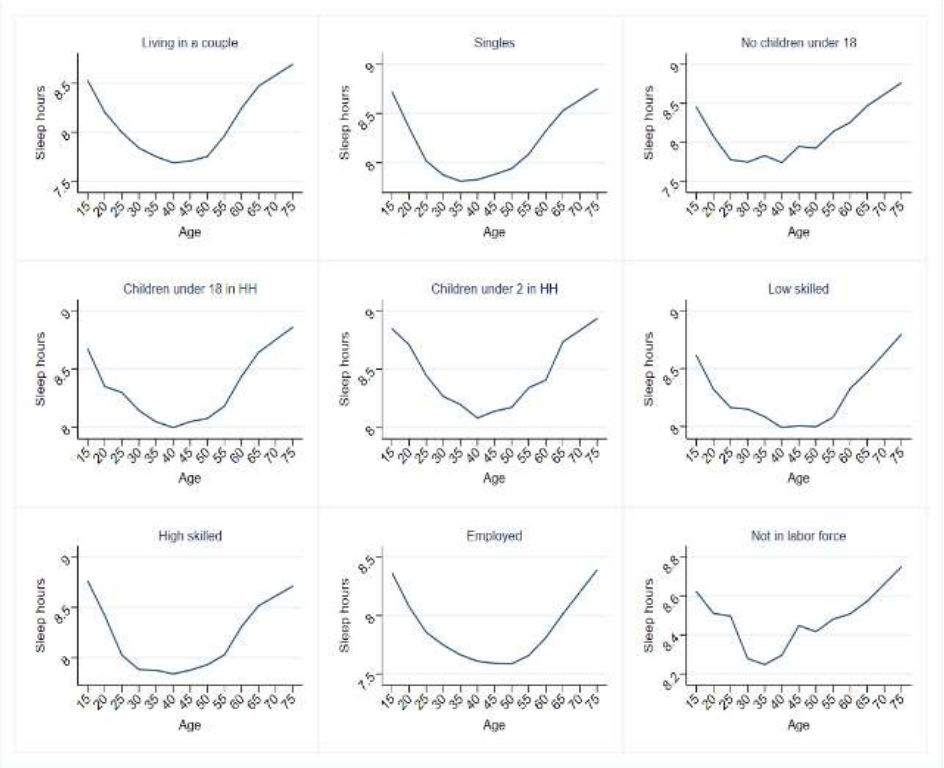


Fig. S6B. Midlife and sleep hours, by demographic group (pooling 9 countries)

Fig. S6. Sleep Hours, by Nation and Type of Person. This figure documents U-shaped sleep hours and age in a sample of half a million individuals. Time-use data for Austria, Canada, Finland, France, Germany,

Netherlands, Spain, United Kingdom, and the United States, 1965-2012. Age is plotted on the horizontal axis. The U-shape pattern continues to hold in regression equations that include standard demographic controls, including for children in the household. In Fig. S6B, low-skilled are defined as individuals with completed secondary education or below. High-skilled are defined as individuals with greater than secondary education. For clarity, standard-error bands are omitted but are available later in the SI Appendix.

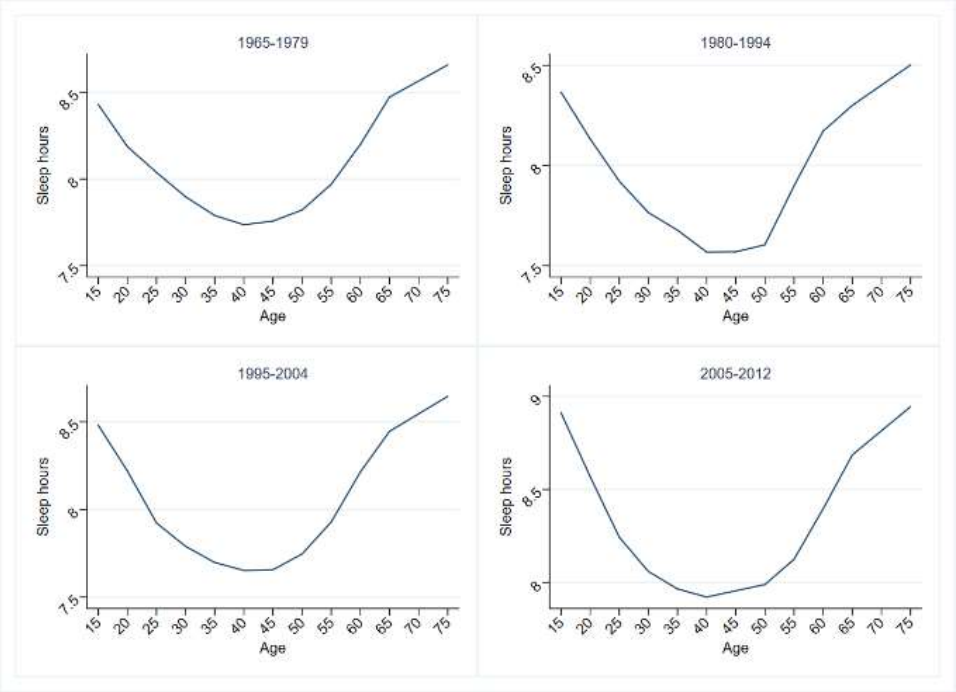


Fig. S7A. Midlife and sleep hours, by time period (pooling 9 countries)

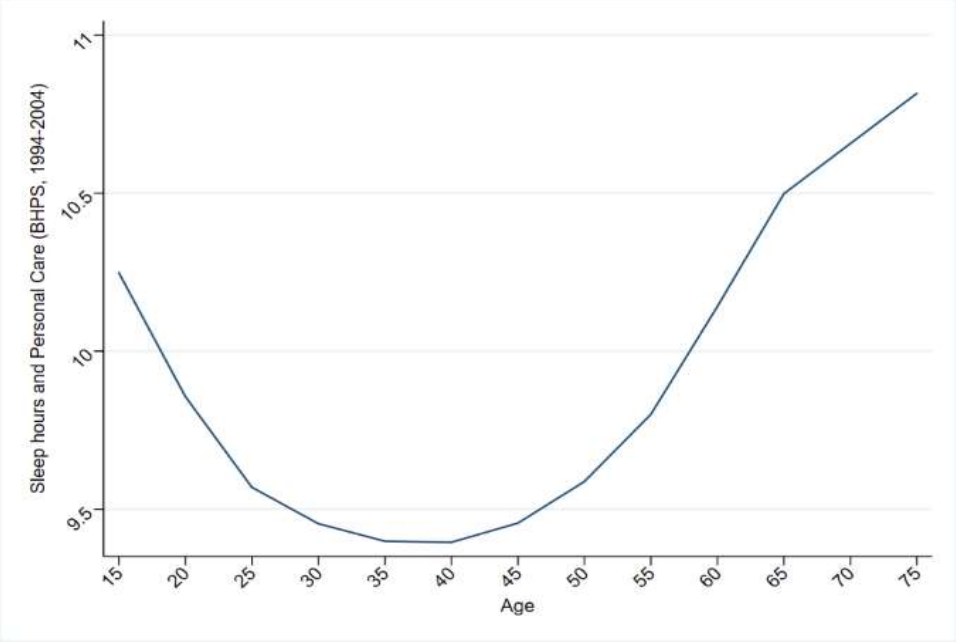


Fig. S7B. Within-person longitudinal data on sleep hours and age (Great Britain)

Fig. S7. Sleep Hours, by Time Period and in Intrapersonal Data. This figure documents U-shaped sleep hours and age in a sample of half a million individuals. Time-use data for Austria, Canada, Finland, France, Germany, Netherlands, Spain, United Kingdom, and the United States, 1965-2012. Age is plotted on the horizontal axis. The U-shape pattern continues to hold in regression equations that include standard demographic controls, including for children in the household. The plot in Fig. S7B uses data drawn from the British Household Panel Survey (BHPS) for the period 1994-2004. This is based on fixed-effects equations so the Fig. S7B pattern is derived solely from within-person, not cross-sectional, variation. For clarity, standard-error bands are omitted but are available later in the SI Appendix.

Table S12. Regression Equations for Sleep. Time-use data for Austria, Canada, Finland, France, The Netherlands, Spain, United Kingdom, and the United States (1965-2012). Dependent variables are the amount of 'Sleep hours', and a binary indicator for individuals who 'Sleep less than 6 hours'. Age is in banded 5-year intervals. Controls include income, education, employment status, number of children, marital status, gender, and self-reported health. All estimates include year, month and day-of-the-week dummies. Standard errors (in parentheses) are clustered at the country level. All estimates used the survey proposed weights. *** p<0.01, ** p<0.05, * p<0.1.

	Sleep hours			Sleep less than 6 hours		
	(1)	(2)	(3)	(4)	(5)	(6)
Age group:						
20-24	-0.491***	-0.496***	-0.236*	0.036***	0.035***	0.030***
	(0.089)	(0.090)	(0.118)	(0.007)	(0.007)	(0.004)
25-30	-0.795***	-0.800***	-0.441***	0.040***	0.039***	0.036***
	(0.057)	(0.057)	(0.101)	(0.009)	(0.009)	(0.005)
31-34	-0.959***	-0.965***	-0.556***	0.041***	0.040***	0.038***
	(0.064)	(0.065)	(0.110)	(0.009)	(0.010)	(0.006)
35-40	-1.053***	-1.058***	-0.620***	0.042***	0.042***	0.039***
	(0.070)	(0.071)	(0.117)	(0.010)	(0.010)	(0.006)
41-44	-1.082***	-1.089***	-0.662***	0.043***	0.043***	0.040***
	(0.074)	(0.074)	(0.114)	(0.011)	(0.011)	(0.007)
45-50	-1.047***	-1.053***	-0.681***	0.046***	0.045***	0.043***
	(0.098)	(0.098)	(0.108)	(0.011)	(0.011)	(0.006)
51-54	-0.999***	-1.003***	-0.702***	0.044***	0.044***	0.042***
	(0.123)	(0.123)	(0.108)	(0.011)	(0.011)	(0.006)
55-60	-0.836***	-0.840***	-0.655***	0.028***	0.027***	0.030***
	(0.145)	(0.144)	(0.110)	(0.006)	(0.006)	(0.004)
61-64	-0.555**	-0.559**	-0.556***	0.011*	0.010*	0.021***
	(0.184)	(0.183)	(0.144)	(0.005)	(0.005)	(0.006)
65-70	-0.287	-0.287	-0.442**	-0.002	-0.003	0.014*
	(0.153)	(0.153)	(0.141)	(0.004)	(0.004)	(0.006)
71-74	-0.083	-0.086	-0.316	-0.010*	-0.011*	0.007
	(0.184)	(0.182)	(0.185)	(0.005)	(0.005)	(0.005)
75-80	0.089	0.086	-0.187	-0.013***	-0.014***	0.004
	(0.223)	(0.219)	(0.241)	(0.003)	(0.002)	(0.007)
81-84	0.436*	0.433*	0.114	-0.018***	-0.020***	-0.002
	(0.217)	(0.214)	(0.250)	(0.002)	(0.002)	(0.006)
85-90	1.570***	1.560***	1.267***	-0.061**	-0.057**	-0.043*
	(0.142)	(0.128)	(0.146)	(0.020)	(0.021)	(0.020)
90+	2.654***	2.642***	2.352***	-0.059**	-0.054**	-0.041*
	(0.269)	(0.272)	(0.283)	(0.020)	(0.022)	(0.020)
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Country F.E.	No	Yes	Yes	No	Yes	Yes
Controls	No	No	Yes	No	No	Yes
Observations	256,776	256,776	256,776	256,776	256,776	256,776
R-squared	0.094	0.095	0.126	0.033	0.034	0.040

Table S13. Within-person Regression Equations for Sleep (Great Britain). Data are drawn the British Household Panel Survey calibrated time-use data (1994-2004). Time-use variables were measured for BHPS using evidence derived from a smaller-scale panel survey that collected time-use information by both the survey and diary methods (Home OnLine, 1998-2001). Dependent variables are the amount of 'Sleep hours and Personal Care', and a binary indicator for individuals who spent less than 9.18 hours on "Sleep and Personal Care", equivalent to the bottom quartile of the distribution. Age is in banded 5-year intervals. Controls include gender, marital status, household type, number of children, employment status, and retirement status. All estimates include year, month and day-of-the-week dummies. Standard errors (in parentheses) are clustered at the individual level. All estimates used the survey proposed weights. *** p<0.01, ** p<0.05, * p<0.1.

	Sleep Hours and Personal Care			**Short Sleep Hours and Personal Care**		
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Age group:						
20-24	-0.319***	-0.142***	-0.132***	0.099***	0.035***	0.034***
	(0.017)	(0.011)	(0.012)	(0.009)	(0.008)	(0.010)
25-30	-0.697***	-0.309***	-0.281***	0.273***	0.129***	0.129***
	(0.020)	(0.014)	(0.016)	(0.012)	(0.011)	(0.016)
31-34	-0.811***	-0.366***	-0.329***	0.349***	0.173***	0.165***
	(0.020)	(0.015)	(0.019)	(0.012)	(0.012)	(0.019)
35-40	-0.858***	-0.395***	-0.363***	0.387***	0.194***	0.188***
	(0.020)	(0.015)	(0.021)	(0.012)	(0.013)	(0.021)
41-44	-0.810***	-0.375***	-0.353***	0.370***	0.184***	0.179***
	(0.020)	(0.015)	(0.023)	(0.012)	(0.013)	(0.023)
45-50	-0.637***	-0.295***	-0.297***	0.266***	0.117***	0.145***
	(0.021)	(0.016)	(0.024)	(0.011)	(0.013)	(0.025)
51-54	-0.468***	-0.230***	-0.248***	0.182***	0.073***	0.111***
	(0.021)	(0.016)	(0.026)	(0.011)	(0.013)	(0.027)
55-60	-0.226***	-0.110***	-0.142***	0.082***	0.005	0.058**
	(0.022)	(0.017)	(0.027)	(0.010)	(0.013)	(0.028)
61-64	0.164***	0.060***	-0.001	-0.022**	-0.050***	0.013
	(0.022)	(0.018)	(0.029)	(0.009)	(0.013)	(0.029)
65-70	0.550***	0.291***	0.166***	-0.071***	-0.073***	-0.003
	(0.020)	(0.020)	(0.031)	(0.008)	(0.014)	(0.030)
71-74	0.811***	0.476***	0.311***	-0.079***	-0.067***	-0.002
	(0.021)	(0.021)	(0.033)	(0.008)	(0.014)	(0.030)
75-80	1.090***	0.698***	0.491***	-0.080***	-0.062***	-0.002
	(0.021)	(0.022)	(0.034)	(0.008)	(0.014)	(0.030)
81-84	1.397***	0.963***	0.735***	-0.082***	-0.059***	-0.004
	(0.023)	(0.023)	(0.037)	(0.008)	(0.015)	(0.030)
85-90	1.734***	1.269***	1.017***	-0.082***	-0.062***	-0.004
	(0.029)	(0.026)	(0.040)	(0.008)	(0.016)	(0.031)
90+	2.145***	1.659***	1.326***	-0.081***	-0.064***	-0.005
	(0.045)	(0.035)	(0.048)	(0.008)	(0.020)	(0.031)
Year F.E.	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	Yes	No	Yes	Yes
Person F.E.	No	No	Yes	No	No	Yes
Observations	91,686	91,686	91,686	91,686	91,686	91,686
R-squared	0.608	0.805	0.931	0.164	0.349	0.692

Table S14. Migraine and Age: Fixed-Effect Logit Regressions. Longitudinal data from the British Household Panel Survey (BHPS) waves 1-18. These are within-person, not cross-sectional, estimates.

Dependent variable is derived from the BHPS health questionnaire: "*Do you have any of the listed health problems: migraine or frequent headaches*?" Migraine variable equals 1 if respondent answered 'Yes', 0 otherwise.

The youngest age group [16-25] is the base reference category.

Dependent variable: *Migraine*	**Model (1)**	**Model (2)**
Age	0.076***	
	(0.008)	
Age-squared	-0.001***	
	(0.000)	
Age 26-35		0.194***
		(0.051)
Age 36-45		0.244***
		(0.062)
Age 46-55		0.219***
		(0.069)
Age 56-65		-0.084
		(0.080)
Age 66-75		-0.496***
		(0.101)
Log of real equivalent income	-0.075***	-0.071***
	(0.021)	(0.021)
Disabled	0.766***	0.765***
	(0.065)	(0.065)
Unemployed	-0.116**	-0.127**
	(0.056)	(0.056)
Self-employed	-0.422***	-0.425***
	(0.080)	(0.080)
Retired	0.154**	0.072
	(0.071)	(0.068)
Not in the labor market	0.317***	0.277***
	(0.044)	(0.043)
Married	0.193***	0.238***
	(0.064)	(0.064)
Cohabiting	0.297***	0.342***
	(0.058)	(0.058)
Divorced	0.257***	0.310***
	(0.088)	(0.087)
Widowed/Widower	0.289**	0.293***
	(0.112)	(0.112)
Separated	0.211**	0.268***
	(0.104)	(0.104)

Completed higher degree	-0.079	-0.060
	(0.142)	(0.142)
Completed first degree	-0.300***	-0.277***
	(0.084)	(0.084)
HND/HNC/teaching qualification	-0.042	-0.028
	(0.090)	(0.090)
A-level qualifications	-0.119*	-0.108*
	(0.062)	(0.062)
O-level qualifications	0.042	0.045
	(0.054)	(0.054)
CSE qualifications	0.096	0.103
	(0.091)	(0.090)
Homeowner	-0.173***	-0.177***
	(0.041)	(0.041)
Number of days spent in the hospital last year	0.002	0.002
	(0.001)	(0.001)
Number of children aged under 16	0.015	0.035*
	(0.019)	(0.020)
Outer London	0.197	0.189
	(0.151)	(0.151)
Rest of South East	0.208	0.196
	(0.133)	(0.133)
South West	0.195	0.185
	(0.144)	(0.144)
East Anglia	0.096	0.083
	(0.162)	(0.162)
East Midlands	0.007	-0.003
	(0.144)	(0.144)
West Midlands Conurbation	0.190	0.177
	(0.157)	(0.157)
Rest of West Midlands	0.079	0.066
	(0.158)	(0.158)
Greater Manchester	0.079	0.072
	(0.186)	(0.186)
Merseyside	0.058	0.051
	(0.198)	(0.198)
Rest of North West	0.034	0.022
	(0.167)	(0.167)
South Yorkshire	0.326*	0.321
	(0.196)	(0.196)
West Yorkshire	0.226	0.217
	(0.165)	(0.165)
Rest of York and Humberside	0.000	-0.011
	(0.177)	(0.177)
Tyne and Wear	-0.091	-0.097
	(0.222)	(0.222)
Rest of North	0.173	0.168
	(0.172)	(0.172)
Wales	0.141	0.131
	(0.131)	(0.131)
Scotland	0.112	0.104
	(0.130)	(0.131)

Northern Ireland	-0.177	-0.182
	(0.134)	(0.134)
Constant	-3.228***	-2.089***
	(0.274)	(0.235)
Year dummies	Yes	Yes
Observations	213,011	213,011
Log-likelihood	-59641.145	-59700.759

Table S15. Job-Stress Equations for Australian Data. Longitudinal (fixed-effects) regression models of severe job stress on age, HILDA Survey (years 2002 to 2018). Respondents assigned an integer value between [1] "strongly disagree" and [7] "strongly agree" to each statement: (i) *I fear the amount of stress in my job will make me physically ill*; (ii) *My job is complex and difficult*; (iii) *My job is more stressful than I had ever imagined*. Averaged responses to the three statements form a combined '*Job Stress'* measure. The youngest age group [15-24] is the base reference category. Analysed sample is restricted to employed individuals; aged between 15 and 75; working between 5 and 90 hours per week. 'Year dummies' control for each of the 17 survey waves. 'Industry dummies' control for 19 different job-industry categories (e.g., manufacturing, construction, mining, financial services, healthcare, education, hospitality).

	Model (1)			**Model (2)**			**Model (3)**		
Dependent variable: *Severe Job Stress*	**β**	**95% CI**	***p***	**β**	**95% CI**	***p***	**β**	**95% CI**	***p***
Age group:									
25 to 34	0.52	[0.48, 0.56]	.00	0.23	[0.19, 0.26]	.00	0.10	[0.06, 0.14]	.00
35 to 44	0.67	[0.62, 0.72]	.00	0.35	[0.31, 0.40]	.00	0.14	[0.09, 0.20]	.00
45 to 54	0.77	[0.71, 0.83]	.00	0.40	[0.34, 0.45]	.00	0.13	[0.06, 0.20]	.00
55 to 64	0.72	[0.65, 0.78]	.00	0.38	[0.32, 0.45]	.00	0.05	[-0.03, 0.13]	.25
65 to 75	0.48	[0.39, 0.56]	.00	0.32	[0.23, 0.41]	.00	-0.08	[-0.19, 0.03]	.14
Income and job-related variables									
Log of household income				0.09	[0.07, 0.10]	.00	0.06	[0.05, 0.08]	.00
Work hours per week				0.02	[0.02, 0.03]	.00	0.02	[0.02, 0.03]	.00
Recently promoted				0.13	[0.11, 0.15]	.00	0.13	[0.11, 0.15]	.00
Recently changed jobs				-0.17	[-0.18, -0.15]	.00	-0.17	[-0.19, -0.15]	.00
Recently bankrupt				0.09	[0.03, 0.14]	.00	0.09	[0.04, 0.14]	.00
Recently received a major financial gain				-0.02	[-0.05, 0.02]	.36	-0.02	[-0.05, 0.02]	.32
Education level									
Masters or doctorate							0.25	[0.13, 0.37]	.00
Bachelor or honors							0.32	[0.21, 0.43]	.00
Grad diploma/certificate							0.24	[0.16, 0.32]	.00
Advanced diploma							0.10	[0.01, 0.19]	.23
Professional qualification							0.02	[-0.04, 0.08]	.50
Completed high-school							-0.08	[-0.13, -0.02]	.00
Currently a full-time student							-0.05	[-0.09, -0.01]	.02
Marital status									
Married							0.06	[0.02, 0.11]	.01
De facto							0.03	[-0.01, 0.07]	.14
Separated							0.01	[-0.07, 0.08]	.84
Divorced							-0.01	[-0.09, 0.07]	.78
Widowed							0.01	[-0.14, 0.15]	.91
Number of dependent children									
# children under the age of 4							0.00	[-0.02, 0.02]	.74
# children aged 5-14							0.01	[-0.00, 0.03]	.16
Lifestyle variables									
Long-term health issues							0.03	[0.01, 0.05]	.00
Non-smoker							-0.02	[-0.05, 0.01]	.19
Drink alcohol everyday							0.06	[0.01, 0.10]	.00

Constant	2.67 [2.63, 2.71] .00	0.92 [0.77, 1.08] .00	1.21 [1.05, 1.38] .00
Year dummies	No	No	Yes
Industry dummies	No	Yes	Yes
Overall R^2	.03	.15	.17
Number of individuals	20,648	20,648	20,648
Number of observations	127,199	127,199	127,199

Table S16. Linear Regression Models of Concentration Problems and Forgetfulness. Adult Psychiatric Morbidity Survey (APMS) in the Year 2014. As indicated on the symptom scores administered as part of the Clinical Interview Schedule Revised (CIS-R).

	Model (1)				Model (2)			
Dependent variable: *Concentration Problems and Forgetfulness*	**b**	**SE**	**95% CI**		**b**	**SE**	**95% CI**	
Age group								
25-34	-0.004	(0.017)	-0.037	0.029	0.028	(0.018)	-0.008	0.063
35-44	0.016	(0.017)	-0.017	0.049	0.058	(0.019)	0.020	0.096
45-54	0.017	(0.016)	-0.016	0.049	0.055	(0.019)	0.017	0.093
55-64	-0.002	(0.016)	-0.034	0.030	0.015	(0.020)	-0.023	0.054
65-74	-0.055	(0.015)	-0.085	-0.025	-0.084	(0.021)	-0.125	-0.042
75+	-0.047	(0.015)	-0.077	-0.017	-0.101	(0.022)	-0.145	-0.057
Sex								
Female					0.028	(0.008)	0.012	0.043
Marital status								
Single					0.021	(0.013)	-0.004	0.046
Divorced/Separated/Widowed					0.030	(0.010)	0.010	0.051
Children								
Children in household					-0.006	(0.011)	-0.027	0.016
Employment status								
Unemployed					0.059	(0.029)	0.002	0.116
Economic inactivity					0.103	(0.012)	0.079	0.126
Educational qualification								
Teaching/HND/nursing					0.004	(0.013)	-0.023	0.030
A Level					0.009	(0.012)	-0.014	0.033
GCSE/equivalent					0.031	(0.011)	0.009	0.054
Other/foreign					0.020	(0.019)	-0.018	0.058
None					0.023	(0.011)	0.001	0.046
Tenure								
Social renter					0.071	(0.014)	0.043	0.098
Private or other renter					0.031	(0.011)	0.009	0.052
Constant	0.104	(0.013)	0.078	0.131	-0.030	(0.023)	-0.076	0.015
Overall R^2		0.007				0.050		
Number of individuals		7,546				7,438		

Table S17. Linear Regression Models of Concentration Problems and Forgetfulness. Adult Psychiatric Morbidity Survey (APMS) in the Year 2000. As indicated on the symptom scores administered as part of the Clinical Interview Schedule Revised (CIS-R).

	Model (1)				Model (2)			
Dependent variable: *Concentration Problems and Forgetfulness*	**b**	**SE**	**95% CI**		**b**	**SE**	**95% CI**	
Age group								
25-34	0.024	(0.013)	-0.001	0.049	0.037	(0.013)	0.010	0.063
35-44	0.030	(0.013)	0.005	0.056	0.046	(0.015)	0.018	0.075
45-54	0.040	(0.015)	0.011	0.068	0.056	(0.017)	0.022	0.089
55-64	0.008	(0.013)	-0.018	0.034	-0.003	(0.017)	-0.037	0.030
65-74	-0.020	(0.013)	-0.045	0.005	-0.068	(0.018)	-0.104	-0.032
Sex								
Female					0.004	(0.007)	-0.011	0.018
Marital status								
Separated					0.062	(0.022)	0.019	0.105
Single					0.013	(0.011)	-0.009	0.035
Divorced					0.030	(0.013)	0.005	0.055
Widowed					0.032	(0.015)	0.001	0.062
Children								
Children in household					-0.002	(0.010)	-0.021	0.018
Employment status								
Unemployed					0.010	(0.019)	-0.028	0.048
Economic inactivity					0.078	(0.010)	0.058	0.098
Educational qualification								
Teaching/HND/nursing					0.019	(0.015)	-0.010	0.047
A Level					0.023	(0.014)	-0.003	0.050
GCSE/equivalent					0.017	(0.011)	-0.004	0.038
None					0.030	(0.012)	0.006	0.053
Tenure								
Social renter					0.020	(0.011)	1.810	0.070
Private or other renter					0.031	(0.013)	2.410	0.017
Constant	0.080	(0.010)	0.060	0.101	0.015	(0.020)	-0.024	0.054
Overall R^2		0.004				0.023		
Number of individuals		8,580				8,495		

Table S18. Linear Regression Models of Alcohol Dependence. Adult Psychiatric Morbidity Survey (APMS) in the Year 2014. Alcohol dependence indicated by an AUDIT score of 16 or more.

	Model (1)				Model (2)			
Dependent variable: *Alcohol Dependence*	**b**	**SE**	**95% CI**		**b**	**SE**	**95% CI**	
Age group								
25-34	0.001	(0.012)	-0.022	0.025	0.019	(0.013)	-0.007	0.045
35-44	0.000	(0.011)	-0.020	0.021	0.028	(0.013)	0.003	0.054
45-54	-0.014	(0.011)	-0.036	0.008	0.011	(0.013)	-0.014	0.035
55-64	-0.014	(0.011)	-0.035	0.007	0.006	(0.013)	-0.019	0.031
65-74	-0.031	(0.010)	-0.051	-0.011	-0.010	(0.012)	-0.034	0.014
75+	-0.040	(0.010)	-0.059	-0.021	-0.019	(0.013)	-0.043	0.006
Sex								
Female					-0.023	(0.005)	-0.033	-0.014
Marital status								
Single					0.028	(0.008)	0.013	0.044
Divorced/Separated/ Widowed					0.005	(0.005)	-0.005	0.016
Children								
Children in household					-0.022	(0.006)	-0.034	-0.010
Employment status								
Unemployed					0.015	(0.019)	-0.022	0.051
Economic inactivity					-0.001	(0.006)	-0.014	0.012
Educational qualification								
Teaching/HND/nursing					-0.004	(0.010)	-0.023	0.016
A Level					-0.003	(0.008)	-0.020	0.013
GCSE/equivalent					0.006	(0.008)	-0.010	0.022
Other/foreign					0.008	(0.016)	-0.023	0.038
None					0.002	(0.007)	-0.012	0.017
Tenure								
Social renter					0.008	(0.008)	-0.007	0.023
Private or other renter					0.011	(0.008)	-0.005	0.027
Constant	0.042	(0.010)	0.024	0.061	0.052	(0.017)	0.019	0.085
Overall R^2		0.006				0.020		
Number of individuals		7,264				7,164		

Table S19. Linear Regression Models of Alcohol Dependence. Adult Psychiatric Morbidity Survey (APMS) in the Year 2000. Alcohol dependence indicated by an AUDIT score of 16 or more. Note that this table has large standard-error bands.

	Model (1)				Model (2)			
Dependent variable: *Alcohol Dependence*	**b**	**SE**	**95% CI**		**b**	**SE**	**95% CI**	
Age group								
25-34	-0.035	(0.012)	-0.058	-0.012	-0.008	(0.013)	-0.034	0.017
35-44	-0.051	(0.012)	-0.074	-0.028	-0.012	(0.013)	-0.037	0.014
45-54	-0.064	(0.011)	-0.086	-0.041	-0.031	(0.013)	-0.057	-0.005
55-64	-0.071	(0.011)	-0.093	-0.048	-0.042	(0.013)	-0.068	-0.015
65-74	-0.074	(0.011)	-0.096	-0.052	-0.046	(0.014)	-0.074	-0.018
Sex								
Female					-0.036	(0.004)	-0.045	-0.028
Marital status								
Separated					0.037	(0.013)	0.011	0.063
Single					0.035	0.007)	0.021	0.049
Divorced					0.028	(0.008)	0.013	0.043
Widowed					0.011	(0.005)	0.001	0.021
Children								
Children in household					-0.020	(0.006)	-0.033	-0.008
Employment status								
Unemployed					0.042	(0.020)	0.002	0.082
Economic inactivity					0.002	(0.005)	-0.008	0.013
Educational qualification								
Teaching/HND/nursing					0.014	(0.010)	-0.006	0.034
A Level					0.012	(0.008)	-0.004	0.029
GCSE/equivalent					0.009	(0.007)	-0.004	0.022
None					0.009	(0.007)	-0.005	0.023
Tenure								
Social renter					0.008	(0.006)	1.330	0.185
Private or other renter					0.012	(0.010)	1.130	0.259
Constant	0.082	(0.011)	0.061	0.103	0.091	(0.016)	0.059	0.123
Overall R^2		0.017				0.042		
Number of individuals		8,538				8,467		

Table S20. Linear Regression Models of Suicidal Thoughts in the Past Year. Adult Psychiatric Morbidity Survey (APMS) in the Year 2014. The question is: *"There may be times in everyone's life when they become very miserable and depressed and may feel like taking drastic action because of these feelings. Have you ever thought of taking your life, even if you would not really do it?"* Note that this table has large standard-error bands.

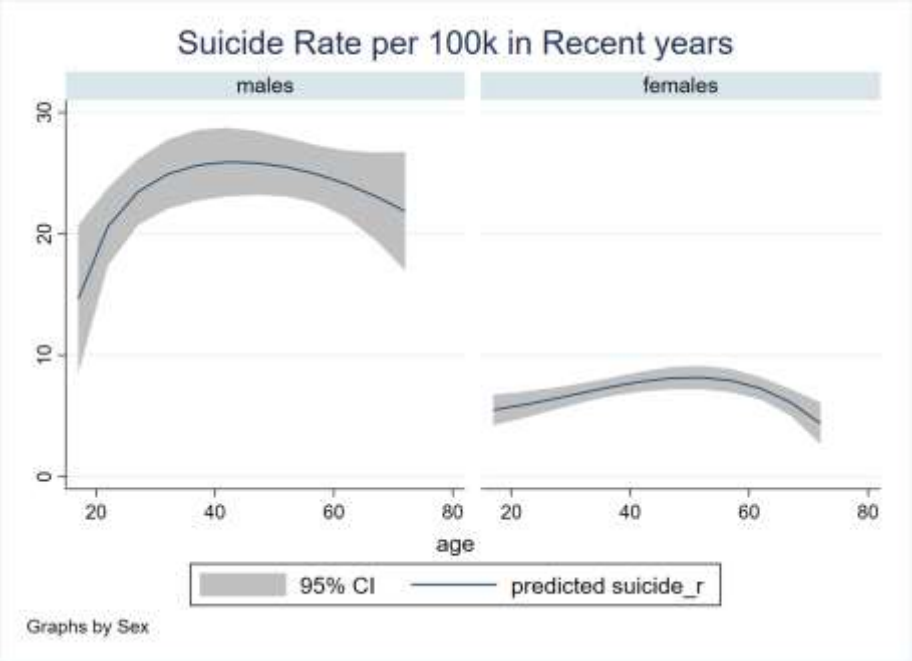
	Model (1)				Model (2)			
Dependent variable: *Suicidal Thoughts in the Past Year*	**b**	**SE**	**95% CI**		**b**	**SE**	**95% CI**	
Age group								
25-34	-0.029	(0.015)	-0.058	0.000	0.003	(0.017)	-0.030	0.036
35-44	-0.032	(0.014)	-0.061	-0.004	0.011	(0.017)	-0.022	0.044
45-54	-0.031	(0.014)	-0.058	-0.003	0.008	(0.016)	-0.024	0.039
55-64	-0.035	(0.014)	-0.062	-0.008	-0.011	(0.016)	-0.043	0.021
65-74	-0.066	(0.013)	-0.092	-0.041	-0.061	(0.018)	-0.096	-0.026
75+	-0.065	(0.013)	-0.090	-0.041	-0.075	(0.018)	-0.110	-0.039
Sex								
Female					-0.004	(0.006)	-0.017	0.008
Marital status								
Single					0.036	(0.011)	0.014	0.058
Divorced/Separated/ Widowed					0.034	(0.007)	0.019	0.048
Children								
Children in household					-0.017	(0.009)	-0.034	0.000
Employment status								
Unemployed					0.062	(0.027)	0.009	0.115
Economic inactivity					0.043	(0.009)	0.026	0.060
Educational qualification								
Teaching/HND/nursing					-0.012	(0.009)	-0.030	0.006
A Level					-0.007	(0.010)	-0.027	0.014
GCSE/equivalent					0.011	(0.009)	-0.007	0.029
Other/foreign					-0.024	(0.009)	-0.043	-0.005
None					0.010	(0.009)	-0.008	0.027
Tenure								
Social renter					0.027	(0.011)	0.006	0.048
Private or other renter					0.011	(0.009)	-0.006	0.028
Constant	0.084	(0.012)	0.060	0.108	0.033	(0.019)	-0.005	0.071
Overall R^2		0.008				0.031		
Number of individuals		7,546				7,438		

Table S21. Linear Regression Models of Suicidal Thoughts in the Past Year. Adult Psychiatric Morbidity Survey (APMS) in the Year 2000. The question is: *"There may be times in everyone's life when they become very miserable and depressed and may feel like taking drastic action because of these feelings. Have you ever thought of taking your life, even if you would not really do it?"* Note that this table has large standard-error bands.

	Model (1)				Model (2)			
Dependent variable: *Suicidal Thoughts in the Past Year*	**b**	**SE**	**95% CI**		**b**	**SE**	**95% CI**	
Age group								
25-34	-0.026	(0.011)	-0.048	-0.003	-0.015	(0.012)	-0.039	0.008
35-44	-0.025	(0.011)	-0.047	-0.003	-0.010	(0.013)	-0.036	0.015
45-54	-0.033	(0.012)	-0.055	-0.010	-0.019	(0.014)	-0.046	0.008
55-64	-0.049	(0.010)	-0.070	-0.029	-0.048	(0.012)	-0.072	-0.023
65-74	-0.059	(0.010)	-0.079	-0.039	-0.074	(0.013)	-0.100	-0.049
Sex								
Female					-0.002	(0.005)	-0.011	0.008
Marital status								
Separated					0.051	(0.015)	0.021	0.081
Single					0.018	(0.007)	0.004	0.032
Divorced					0.020	(0.007)	0.006	0.035
Widowed					0.038	(0.012)	0.015	0.061
Children								
Children in household					-0.003	(0.006)	-0.016	0.010
Employment status								
Unemployed					0.016	(0.017)	-0.017	0.050
Economic inactivity					0.031	(0.007)	0.017	0.045
Educational qualification								
Teaching/HND/nursing					-0.015	(0.008)	-0.031	0.001
A Level					-0.003	(0.009)	-0.021	0.015
GCSE/equivalent					-0.004	(0.007)	-0.019	0.010
None					0.004	(0.009)	-0.013	0.021
Tenure								
Social renter					0.018	(0.008)	2.230	0.026
Private or other renter					0.008	(0.010)	0.790	0.430
Constant	0.069	(0.010)	0.049	0.088	0.045	(0.015)	0.015	0.074
Overall R^2		0.008				0.022		
Number of individuals		8,572				8,489		

Table S22. Suicide Data for the OECD Countries. This is designed as a supplement to the suicide section in the main part of the paper (which has to stop at 2015 for consistency across nations).

Country
Canada
Mexico
United States of America
Israel
Austria
Belgium
Denmark
Finland
France
Greece
Hungary
Ireland
Italy
Netherlands
Norway
Poland
Portugal
Spain
Sweden
Switzerland
United Kingdom, England and Wales
United Kingdom, Northern Ireland
United Kingdom, Scotland
Australia
New Zealand
Latvia
Slovenia
Czech Republic
Germany
Slovakia



Note: This supplementary figure is created using the most recent data available to us, as of mid-2021, for the countries in the OECD listed above.

Supplementary References

Lauderdale DS, Knutson KL, Yan LL, Liu K, Rathouz PJ (2008). Self-reported and measured sleep duration: how similar are they? *Epidemiology* 19(6), 838-84.