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Theory and Evidence**

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## ABSTRACT

### **Obesity, Unhappiness, and *The Challenge of Affluence*: Theory and Evidence\***

Is affluence a good thing? The book *The Challenge of Affluence* by Avner Offer (2006) argues that economic prosperity weakens self-control and undermines human well-being. Consistent with a pessimistic view, we show that psychological distress has been rising through time in modern Great Britain. Taking over-eating as an example, our data reveal that half the British population view themselves as overweight, and that happiness and mental health are worse among fatter people in both Britain and Germany. A 10-point move up in body mass index (BMI) is associated in the cross-section with a drop in psychological health of approximately 0.3 GHQ points. Comparisons also matter. For a given level of BMI, we find that people who are educated or who have high income are more likely to view themselves as overweight. We discuss problems of inference and argue that longitudinal data on BMI are needed. We suggest a theory of imitation – where utility depends on relative weight – in which there can be obesity spirals after only small drops in the price of food.

JEL Classification: D1, I12, I31

Keywords: body mass index, happiness, mental health, General Health Questionnaire, GHQ scores, BMI, well-being, obesity, BHPS, GSOEP, imitation, weight, relative income, comparisons

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## **Obesity, Unhappiness, and The Challenge of Affluence: Theory and Evidence**

*The rise of ... incomes has done little or nothing to improve the sense of well-being. Offer (2006), p.357*

*Disorders abound: family breakdown, addiction, stress, road and landscape congestion, obesity, poverty... p.2*

*The rise of body weight demonstrates how affluence can rise, and yet fail to deliver well-being. p. 138*

Is affluence a good thing? This article examines important ideas raised in a new book by Avner Offer (2006). In Offer's view, economic growth undermines well-being. The paradox of affluence is that a flow of new rewards impairs people's capacity to enjoy them.

Like the best social-science, The Challenge of Affluence is either important or wrong<sup>1</sup>. Ultimately, the issue will probably be settled by data that will come in only slowly over the next few decades. In the short run, therefore, readers must decide for themselves. But our instinct is that Offer is more right than wrong. The monograph persuades most vividly when read alongside the work of researchers like Daniel Gilbert of Harvard's psychology department who argues that people are poor at affective forecasting, that is, at deciding ex ante what will make them happy ex post.<sup>2</sup>

Offer's arguments are against mainstream economics thinking. In economics, a person is routinely assumed to be a shrewd judge of his or her best interests. Although it is not easy in a few lines to do justice to the breadth and especially the vibrancy of Avner Offer's writing, these are some of his conclusions:

1. Affluence has changed people's lives, but economic growth has not done much to make people happier<sup>3</sup>. Life is probably getting worse.

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<sup>1</sup> By contrast, most articles published in the Economic Journal are perhaps best viewed as unimportant (the majority will not be quoted a dozen times in their lifetimes) but correct (they have been refereed and will not be contradicted in any clear way by what goes later). This is normal science.

<sup>2</sup> Gilbert (2006), Gilbert et al (1998), Gilbert et al (2002).

<sup>3</sup> Earlier evidence is discussed in Easterlin (1974) and Oswald (1997). Ruhm (2005) argues that upswings in the business cycle can be deleterious for well-being.

2. The main reason is that choice is fallible. In particular, human beings want their pleasure now rather than tomorrow. They have trouble -- far more trouble than economics textbooks teach us -- in practising prudence. Myopia prevails to an unhappy extent. The world is full of hyperbolic discounting.

3. Human impatience causes bigger problems in wealthier societies. The outcome is disorders of self-control on a larger and larger scale – over-eating, family breakdown, and addictive behaviours.

4. Dangerously, economic growth leads to a faster flow of novelty. This is disorienting. It corrodes the informal norms, commitment devices and institutions that safely and gradually come into being when change is slow.

5. The huge amount of advertising in modern society has reduced trust and made genuine sincerity difficult.

6. Obesity<sup>4</sup>, divorce<sup>5</sup> and excessive TV-watching demonstrate how affluence can reduce happiness.

7. The author's intellectual case *"is not packaged into some grand multivariate statistical test... Instead there is a variety of quantitative and descriptive tests... I have woven the argument from the whole range of evidence: this is both social science and history."* p. 11.

Offer provides a fascinating tapestry of evidence. In our judgment, nevertheless, his interesting thesis makes too little of the role of relative income, and indeed of relative bodyweight. We suspect the reason that affluence fails to improve well-being is not the one -- self-control gets worse with riches -- favoured by the author of The Challenge of Affluence. It is, rather, that well-being depends on a person's relative income and ranked position. By definition, that cannot rise for everyone in a group as

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<sup>4</sup> See also Offer (1998, 2001).

<sup>5</sup> Offer's arguments on marital breakdown cannot be explored in detail here, but some recent work, such as Hawkins and Booth (2005) and Gardner and Oswald (2006,) suggests that divorcing couples actually benefit, even though the initial effect of divorce is negative. Stevenson and Wolfers (2006) document other welfare gains from divorce.

the group's members all go from having just one Ford on the driveway to having three Lexuses spilling out across the pavement. Avner Offer is aware of, and sympathetic to, this idea: "*a positive social ranking produces an inner glow*", p. 360. He quotes Duesenberry (1949), Easterlin (1974) and other writers on it. Yet he does not make it the dominating centrepiece of Offer (2006).

### Some evidence

A useful, focused example of Avner Offer's thesis can be found around food and over-eating: "*Obesity shows how abundance...[can] make a mockery of the rational consumer.*" p.169. Accordingly, and because for health reasons it is a matter of policy interest<sup>6</sup>, we consider the author's more general argument by looking in detail at weight-gain.

First, and as a backdrop, it is true, although Offer does not provide exactly this evidence, that mental well-being is worsening in a country like Britain. Figure 1 shows for representative samples of Britons that GHQ psychological distress scores<sup>7</sup> rose <sup>8</sup> from 1991. The increase is statistically significant at normal confidence levels. In a regression equation, pooling the years 1991-2004, we find that:

*GHQ = 0.01 time trend + constant + controls for age, gender, marital status, employment status, education level.*

Here the coefficient on the time trend has a t-statistic of approximately 2.3. Hence mental health in Great Britain is apparently gradually worsening, *ceteris paribus*, by approximately 0.1 GHQ point per decade.

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<sup>6</sup> See sources such as Burkhauser and Cawley (2004), Banks et al (2006), Bhattacharya (2005), Propper (2005), Finkelstein et al (2005), and Sanz-de-Galdeano (2005). Links between obesity and labour-market outcomes are studied in Sargent and Blanchflower (1994), Harper (2000), Cawley (2004) and Morris (2006). However, Kenkel et al (2006) does not find strong links between high-school completion and later obesity.

<sup>7</sup> Goldberg et al (1997) provides a discussion of the validity of the General Health Questionnaire GHQ-12 as a measure of mental health. It studies many countries and languages. There is evidence that lottery wins of medium size seem to improve later GHQ scores: see Gardner and Oswald (2007).

<sup>8</sup> Sacker and Wiggins (2002) present an alternative kind of evidence for two British birth-cohorts. Two studies of the Netherlands by Hodiament et al (2005) and Verhaak et al (2005), which came to our

Second, is there empirical support for the idea that people eat too much, namely, consume food beyond the point that is rational? Economists are generically loathe to believe so (Cutler et al, 2003). They assume that obese people are contentedly fat.<sup>9</sup> A simple first step, therefore, is to study if happiness is lower among heavier people. It is. New evidence is set out in the life-satisfaction equations of Tables 1 and 2, which find this negative correlation in modern British and German data (the two data sets each contain only a single cross-section on body mass index, BMI, so longitudinal analysis cannot be done). The tables use self-reported data to construct BMI figures.

How much does weight matter? In Tables 1 and 2, a (huge) move of 4 standard deviations in fatness, from close to the bottom of the BMI distribution to close to the top, is associated in the cross-section with a modest decrease of well-being of approximately one fifth of the size of the cross-sectional effect of marital separation. The regression equation for GHQ mental distress replicates the same sign, in Table 3, which means that psychological health is systematically lower among heavier Britons.<sup>10</sup> A large 10-point move up in BMI is associated in the cross-section with only a fairly small worsening, by around 0.3 points, in GHQ mental health. The negative sign in these equations is consistent with cross-sectional happiness evidence for the United States in Felton and Graham (2005), Switzerland in Stutzer (2006), and the Netherlands in Cornelisse-Vermaat et al (2006), and also with some of the longitudinal associations in Roberts et al (2000), (2002).

While evocative, and consistent with the general Offer hypothesis of self-control problems, this negative correlation between happiness and BMI does not establish causality. It is simply a cross-section pattern; ignores the difference between marginal and average preferences in the population; could be driven by the fact that

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attention after early drafts of this paper, conclude that Dutch GHQ distress scores have risen since the 1980s. Levi et al (2003) studies the (mixed) international evidence on suicide trends.

<sup>9</sup> Interestingly, Stutzer (2006) demonstrates that obesity is associated with reduced well-being most especially among a sub-sample of people who report that they have limited self-control.

<sup>10</sup> Standard controls are included in these equations, though are not discussed in detail here; the literature includes Blanchflower and Oswald (2004), Di Tella et al (2001), Easterlin (2003), Frey and Stutzer (2000), Powdthavee (2005a,b), Van Praag and Ferrer-I-Carbonell (2004), and Winkelmann and Winkelmann (1998). Clark and Oswald (1994) provides an early GHQ regression equation for Britain in the year 1991. Jorm et al (2003), Stunkard et al (2003) and Simon et al (2006) find a correlation

unhappy people feel compelled to eat; or could simply reflect the fact that a rational eater's utility may be increasing in the flow of eating but decreasing in the stock of fatness<sup>11</sup>.

Third, our data find that half of Britain's population describe themselves as overweight. See Table 4.

This fact can be set alongside Offer's interesting argument: *In the rational choice approach there is no such thing as 'overweight'. p.143*. Moreover, individuals' perceptions depend on their characteristics. For example, highly educated people view themselves as thin when we do not control for BMI in Table 5, but see themselves as overweight once BMI is held constant in the equation specification. This implies that people have different comparison groups. In our data, someone who is 200 pounds is more likely to see himself or herself as overweight if educated and rich than if poorly educated and on a low income.

#### Relative weight and obesity spirals

Comparisons thus matter. If it is easier to be fat in a fat society, utility will depend on relative weight. This seems reminiscent of Clark (2003) and Powdthavee (2006): the data suggest that it is psychologically preferable to be unemployed in an area where there are many jobless people.

Avner Offer argues that obesity has been generated by falling food prices<sup>12</sup>. Yet it is hard to see how this trigger can be large enough to match the data.

It is possible to think of a model where it is concern for relative weight that leads to obesity spirals, and where this happens after only small drops in the price of food. In a world of comparisons, as in Duesenberry (1949), Clark and Oswald (1996) and Luttmer (2005), people will often emulate each other, so fatness can spread as though

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between obesity and depression, and debate whether it is a causal connection. Doll et al (2000) uncover stronger links to physical, rather than emotional, health.

<sup>11</sup> Eating influences the flow of calories, and a differential equation thus explains  $\text{dBMI}/\text{dt}$ .

<sup>12</sup> Chou et al (2004) examines the role of restaurant-food prices. Gruber and Frakes (2006) are doubtful that the secular decline in smoking is what has raised obesity.



in a contagious way. However, we show below that deviant slimness will emerge rationally among some in the population, and the sign of the second derivative<sup>13</sup> of the utility function (with respect to relative weight) turns out to be crucial.

Imagine that relative slimness confers status. If there are gains from such status -- perhaps better mates -- then if I have diminishing returns I will invest in status less the more status I have. Thus, when my neighbour gets a little fatter, I rationally myself become a little fatter (since I do not now need to be so slim in order to compete). This logic is based on the assumption of a concave utility function. The concavity leads me to copy the increasingly fatter Jones family in the house opposite mine.

Yet if I have a convex utility function over the status from being slim, I will act deviantly. When my neighbour becomes fatter, my marginal utility from slimness now rises, and I invest more in slimness. I diet in the face of societal gluttony. Two social phenomena, in opposite directions, will appear together: a spiral in obesity while some people deliberately choose to be thinner and thinner.

Define an individual's body mass,  $b$ . Assume that it is distributed  $f(x)$  in the population. Assume the person rationally chooses body weight. He or she picks  $b$  to maximize, say, a utility function

$$V = u(b) + v(r(b)) - cb \quad (1)$$

subject to

$$r(b) = \int_b^{\bar{b}} f(x) dx \quad (2)$$

where  $r$  is ordinal rank in the slimness distribution in society,  $v(r)$  is the utility from that rank,  $u(b)$  is the direct benefit from high body weight, and a constant  $c$  is the marginal cost of body weight. Here zero is the normalized lowest feasible  $b$  in the population, and, as a further normalization, the size of the population is set to unity. The form of equation (2) means that I like there to be lots of people fatter than<sup>14</sup> me.

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<sup>13</sup> For this kind of mathematics in other imitative settings, see Clark and Oswald (1998).

<sup>14</sup> In interesting work, drawn to our attention after the early versions of this paper, Burke and Heiland (2006) assume that people try to minimize the deviation of their own weight from some average or socially acceptable weight, and Ellaway et al (1997) find that the area itself affects obesity.

Offer argues that people act as though they overestimate  $u(b)$ , the direct benefits of body weight. Hence they over-eat.

How heavy should I optimally decide to be? There are two natural ways to set up the individual's utility maximization problem. If the rank of body mass is what gives status<sup>15</sup> then, using equation (2) within maximand (1), the first-order condition is

$$\frac{\partial V}{\partial b} = u'(b) - v'(r(b))f(b) - c = 0 \quad (4)$$

and thus if society becomes marginally heavier, in the particular sense that the very highest body weight increases, then, by standard comparative statics, the response of this rational individual is determined by the sign of the cross-partial

$$\frac{\partial^2 V}{\partial b \partial \bar{b}} = -v''(r(\bar{b}))f(\bar{b})f(b). \quad (5)$$

Someone with a concave utility function will therefore rationally imitate the herd – thereby becoming fatter too.

An alternative is to imagine that status over being slim comes in a different way, and depends smoothly on the gap between average weight and one's own<sup>16</sup>. Define mean body mass,  $m$ , as:

$$m = \int_0^{\bar{b}} bf(b)db. \quad (6)$$

Now take the individual's maximand to be instead the utility function

$$W = u(b) + \mu(m - b) - cb, \quad (7)$$

so the first-order condition is

$$\frac{\partial W}{\partial b} = u'(b) - \mu'(m - b) - c = 0. \quad (8)$$

In this case, if society becomes heavier in the sense that the mean of the weight distribution goes up, rational individuals will imitate if they have a concave utility function, because

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<sup>15</sup> As in wages in Brown et al (2005) and a consumption good in Hopkins and Kornienko (2004, 2006).

<sup>16</sup> Relative concerns raise questions -- eg, Oswald (1983), Frank (1985) -- about how optimally to design the progressivity of tax schedules.

$$\frac{\partial^2 W}{\partial b \partial m} = -\mu''(m-b). \quad (9)$$

Like its equivalent, equation (5), this is positive under concavity. Hence the existence of imitative keeping-up-with-the-Jones' in body weight will occur among those with a utility function that exhibits diminishing marginal utility in relative body weight, namely, when the right hand side of this function is positive. Obesity spirals up.

Some individuals, though, will diet obsessively. The people who choose to become slimmer in the face of rising body weights around them will be those with convex utility functions. If utility convexity in status is more likely close to the top of the distribution (think of Wimbledon tennis champions, as they move from being ranked third to second to actually winning the tournament), then anorexic dieting will occur particularly among the elite in society, because, by being already close to the top, they have the most to gain.

These ideas on herd behaviour in weight are complementary to, rather than a substitute for, those of Avner Offer. Perhaps one advantage is that they suggest why small declines in food prices can have surprisingly large consequences. Moreover, the emphasis on relativities (here in feelings about weight)<sup>17</sup> fits with the approach of Richard Easterlin and others that says relative concerns in the utility function are why western society does not see its citizens reporting rising happiness scores through the decades.

It is not possible to capture the entire contribution of Offer (2006) by looking at obesity and food consumption alone. It is too rich a monograph.

Nevertheless, we hope this example gives some of the spirit of the book's important general argument. Moreover, these self-control issues of eating and obesity seem independently interesting, at the time of writing, because they are the subject of public debate in the industrialized nations.

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<sup>17</sup> Paradoxically, in this model it is the thin elite who create bad (psychological) 'externalities' on others; they make fat people feel lower in status.

## Conclusion

Most economists welcome affluence. They do not know facts like the rise in GHQ psychological distress captured in Figure 1. They teach their students -- perhaps more out of habits of thought than by reference to data -- that life is getting better in western society.

These economists may be right. Our instinct, however, is different. It is that Avner Offer's valuable and darker thesis is largely correct, even though, in our eyes, his beautifully written book plays down relativities in utility functions rather too much. Offer instead stresses self-control, and more precisely its absence. Yet if people care about relative income, and relative body weight, then it seems possible to explain the observed facts of western society. Approximately flat levels of happiness through time, and obesity spirals, both emerge from such a theory.

For concreteness, this article has concentrated on one particular area of life: eating and food. We have provided simple evidence that happiness and mental health are worse among fatter people in Britain and Germany; that half the population see themselves as overweight; and that, for any given level of body mass index (BMI), a person's perception of whether they are over-weight depends on their education and income. More evidence on the interesting Offer thesis, especially longitudinally on behaviours such as eating, and on the possible existence of hyperbolic discounting, is needed. This will allow deep questions of causality to be studied. But it already seems unwise to presume that affluence is making us happier.

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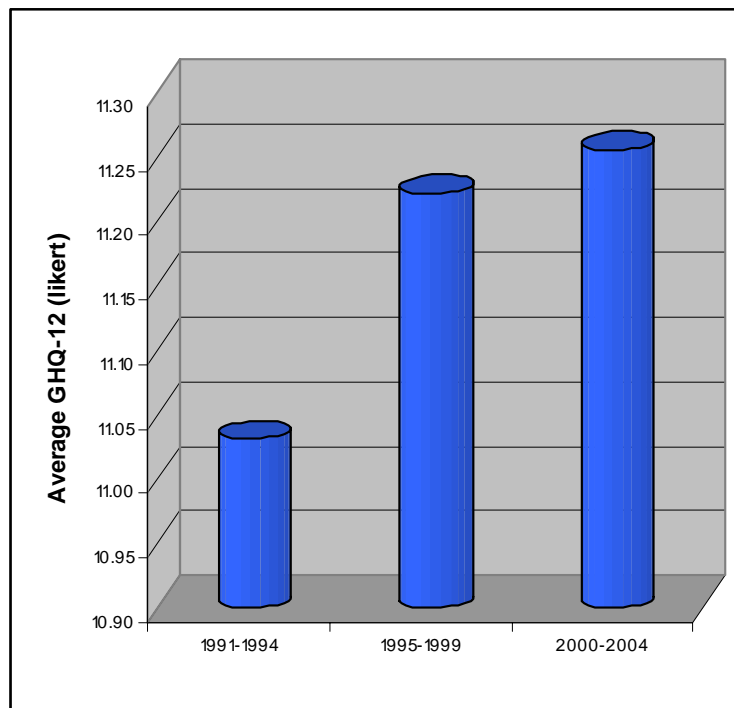
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**Figure 1: Average GHQ Psychological Distress Levels Over Time in Britain: BHPS, 1991-2004**



**Note:** A GHQ score is a standard measure of psychological ill-health. It amalgamates answers to 12 separate mental-distress questions: “Have you lost much sleep over worry?”; “Been able to concentrate on things?”; “Felt you are playing a useful part in things?”; “Felt capable of making decisions about things?”; “Felt constantly under strain?”; “Felt you could not overcome your difficulties?”; “Been able to enjoy your normal day-to-day activities?”; “Been able to face up to your problems?”; “Been feeling unhappy and depressed?”; “Been losing confidence in yourself?”; “Been thinking of yourself as a worthless person?”; “Been feeling reasonably happy all things considered?”. These data are on representative samples of Britons, from the British Household Panel Surveys (BHPS).

**Table 1: British Life-Satisfaction Regression Equations including a Body Mass Index Variable (BMI), BHPS 2004**

| <b>Dependent variable: Life satisfaction</b> | <b>(1)</b>          | <b>(2)</b>          | <b>(3)</b>          | <b>(4)</b>          |
|--|---------------------|---------------------|---------------------|---------------------|
| Body Mass Index                              | -0.009<br>[0.003]** | -0.009<br>[0.003]** | -0.007<br>[0.003]** | -0.008<br>[0.003]** |
| Male   |                     | 0.025<br>[0.021]    | -0.024<br>[0.022]   | -0.025<br>[0.023]   |
| Age  |                     | -0.013<br>[0.004]** | -0.025<br>[0.005]** | -0.025<br>[0.005]** |
| Age-squared/100                              |                     | 0.020<br>[0.004]**  | 0.029<br>[0.005]**  | 0.029<br>[0.005]**  |
| Living as couple                             |                     |                     | -0.076<br>[0.039]*  | -0.075<br>[0.040]   |
| Widowed                                      |                     |                     | -0.437<br>[0.060]** | -0.437<br>[0.060]** |
| Divorced                                     |                     |                     | -0.513<br>[0.057]** | -0.498<br>[0.058]** |
| Separated                                    |                     |                     | -0.714<br>[0.094]** | -0.690<br>[0.098]** |
| Never married                                |                     |                     | -0.356<br>[0.042]** | -0.345<br>[0.043]** |
| Unemployed                                   |                     |                     | -0.531<br>[0.085]** | -0.492<br>[0.087]** |
| Self-employed                                |                     |                     | 0.058<br>[0.039]    | 0.091<br>[0.041]*   |
| Retired                                      |                     |                     | -0.105<br>[0.051]*  | -0.062<br>[0.053]   |
| Student                                      |                     |                     | 0.101<br>[0.066]    | 0.115<br>[0.069]    |
| Disabled                                     |                     |                     | -1.182<br>[0.073]** | -1.142<br>[0.075]** |
| Look after home                              |                     |                     | -0.214<br>[0.053]** | -0.185<br>[0.055]** |
| Household size                               |                     |                     | -0.042<br>[0.012]** | -0.027<br>[0.012]*  |
| Own home outright                            |                     |                     | 0.183<br>[0.032]**  | 0.174<br>[0.033]**  |
| Log of household income                      |                     |                     |                     | 0.087<br>[0.021]**  |
| Constant                                     | 5.474<br>[0.074]**  | 5.606<br>[0.099]**  | 6.280<br>[0.159]**  | 5.441<br>[0.252]**  |
| <b>Education dummies included</b>            | No                  | No                  | Yes                 | Yes                 |
| <b>Regional dummies included</b>             | No                  | No                  | Yes                 | Yes                 |
| <b># Observations</b>                        | 12616               | 12616               | 12616               | 12127               |
| <b>R-squared</b>                             | 0.0000              | 0.0100              | 0.0900              | 0.0900              |

Robust standard errors in brackets

\* significant at 5%; \*\* significant at 1%

**Notes:** Each of the four columns is a separate regression equation. The first column has only BMI as an independent variable; the fourth column includes all the variables shown. The mean (s.d.) of BMI is 25.9 (4.7). The mean (s.d.) of life satisfaction, which is reported on a scale from 1 to 7, is 5.2 (1.3). For pedagogical purposes, these and later regressions are estimated by ordinary least squares and assume a cardinal dependent variable that takes the values 1, 2, 3, ... Ordered estimators give similar results. The omitted reference groups here are the married and those in full-time employment.

**Table 2: German Life-Satisfaction Regression Equations including a Body Mass Index Variable (BMI), GSOEP 2002**

| <b>Dependent variable: Life satisfaction</b> | <b>(1)</b>          | <b>(2)</b>          | <b>(3)</b>          | <b>(4)</b>          |
|--|---------------------|---------------------|---------------------|---------------------|
| Body Mass Index                              | -0.030<br>[0.003]** | -0.024<br>[0.003]** | -0.015<br>[0.003]** | -0.010<br>[0.003]** |
| Male   |                     | 0.030<br>[0.019]    | -0.057<br>[0.020]** | -0.074<br>[0.019]** |
| Age  |                     | -0.012<br>[0.004]** | -0.060<br>[0.006]** | -0.057<br>[0.006]** |
| Age-squared/100                              |                     | 0.008<br>[0.004]    | 0.061<br>[0.006]**  | 0.059<br>[0.006]**  |
| Single                                       |                     |                     | -0.277<br>[0.042]** | -0.134<br>[0.042]** |
| Widowed                                      |                     |                     | -0.363<br>[0.061]** | -0.173<br>[0.062]** |
| Divorced                                     |                     |                     | -0.523<br>[0.054]** | -0.300<br>[0.054]** |
| Separated                                    |                     |                     | -1.171<br>[0.114]** | -0.914<br>[0.113]** |
| Unemployed                                   |                     |                     | -0.261<br>[0.029]** | -0.154<br>[0.028]** |
| High school                                  |                     |                     | 0.277<br>[0.035]**  | 0.216<br>[0.034]**  |
| More than high school                        |                     |                     | 0.577<br>[0.041]**  | 0.395<br>[0.041]**  |
| Disabled                                     |                     |                     | -0.809<br>[0.046]** | -0.773<br>[0.045]** |
| Log of household income                      |                     |                     |                     | 0.454<br>[0.023]**  |
| Constant                                     | 7.81<br>[0.076]**   | 8.022<br>[0.099]**  | 8.754<br>[0.190]**  | 3.79<br>[0.311]**   |
| <b>Regional dummies included</b>             | No                  | No                  | Yes                 | Yes                 |
| <b># Observations</b>                        | 23643               | 23643               | 23643               | 23636               |
| <b>R-squared</b>                             | 0.01                | 0.01                | 0.09                | 0.11                |

Robust standard errors in brackets

\* significant at 5%; \*\* significant at 1%

**Notes:** The mean (s.d.) of BMI is 25.2 (4.3). The mean (s.d.) of life satisfaction, which is reported on a scale from 1 to 10, is 7.0 (1.7). Reference groups are married, in full-time employment, and less than high school education. The data are from the German Socioeconomic Panel Surveys (GSOEP).

**Table 3: British Psychological-Distress GHQ Regression Equations including a Body Mass Index Variable (BMI), BHPS 2004**

| Dependent variable: GHQ-12 (likert) | (1)                | (2)                 | (3)                 | (4)                 |
|-------------------------------------|--------------------|---------------------|---------------------|---------------------|
| Body Mass Index                     | 0.046<br>[0.013]** | 0.044<br>[0.013]**  | 0.028<br>[0.012]*   | 0.028<br>[0.012]*   |
| Male                                |                    | -1.441<br>[0.092]** | -1.239<br>[0.099]** | -1.230<br>[0.101]** |
| Age                                 |                    | 0.051<br>[0.015]**  | 0.033<br>[0.020]    | 0.032<br>[0.021]    |
| Age-squared/100                     |                    | -0.042<br>[0.015]** | -0.032<br>[0.021]   | -0.031<br>[0.021]   |
| Living as couple                    |                    |                     | 0.183<br>[0.182]    | 0.156<br>[0.187]    |
| Widowed                             |                    |                     | 0.665<br>[0.241]**  | 0.653<br>[0.242]**  |
| Divorced                            |                    |                     | 0.490<br>[0.246]*   | 0.461<br>[0.252]    |
| Separated                           |                    |                     | 1.542<br>[0.445]**  | 1.521<br>[0.463]**  |
| Never married                       |                    |                     | -0.008<br>[0.182]   | -0.054<br>[0.187]   |
| Unemployed                          |                    |                     | 2.167<br>[0.365]**  | 2.130<br>[0.380]**  |
| Self-employed                       |                    |                     | -0.196<br>[0.175]   | -0.160<br>[0.182]   |
| Retired                             |                    |                     | 0.512<br>[0.210]*   | 0.394<br>[0.213]    |
| Student                             |                    |                     | -0.134<br>[0.292]   | -0.190<br>[0.303]   |
| Disabled                            |                    |                     | 5.187<br>[0.323]**  | 5.051<br>[0.330]**  |
| Look after home                     |                    |                     | 1.155<br>[0.231]**  | 1.089<br>[0.238]**  |
| Household size                      |                    |                     | -0.003<br>[0.045]   | -0.039<br>[0.048]   |
| Own home outright                   |                    |                     | -0.421<br>[0.128]** | -0.390<br>[0.130]** |
| Log of household income             |                    |                     |                     | -0.197<br>[0.093]*  |
| Constant                            | 9.973<br>[0.330]** | 9.338<br>[0.420]**  | 9.741<br>[0.685]**  | 11.567<br>[1.104]** |
| <b>Education dummies included</b>   | No                 | No                  | Yes                 | Yes                 |
| <b>Regional dummies included</b>    | No                 | No                  | Yes                 | Yes                 |
| <b># Observations</b>               | 12436              | 12436               | 12436               | 11962               |
| <b>R-squared</b>                    | 0.0000             | 0.0200              | 0.0700              | 0.0700              |

Robust standard errors in brackets

\* significant at 5%; \*\* significant at 1%

**Notes:** The mean (s.d.) of BMI is 25.9 (4.7). The mean (s.d.) of GHQ distress, which is measured on a scale from 1 to 36, is 11.2 (5.4). Reference groups are married and in full-time employment.

**Table 4: People's Perceptions of Being Overweight: % in the British Population**

| Perception of own weight | Freq.  | Percent | Cum.  |
|--------------------------|--------|---------|-------|
| Underweight              | 894    | 6.24    | 6.24  |
| About right weight       | 5,530  | 38.62   | 44.86 |
| Slightly overweight      | 5,888  | 41.12   | 85.98 |
| Very overweight          | 2,008  | 14.02   | 100   |
| Total                    | 14,320 | 100     |       |

The survey question wording (number M41) was “*Would you say that for your height you are...?*”

**Table 5: Perception-of-Own-Weight Regression Equations, BHPS 2004**

| Dependent variable: Perception of being overweight |                     |                     |
|--|---------------------|---------------------|
| Body Mass Index                                    |                     | 0.123<br>[0.002]**  |
| Living as couple                                   | -0.026<br>[0.025]   | -0.009<br>[0.017]   |
| Widowed  | -0.071<br>[0.031]*  | -0.057<br>[0.022]** |
| Divorced   | -0.076<br>[0.033]*  | -0.03<br>[0.022]    |
| Separated  | -0.075<br>[0.055]   | -0.011<br>[0.038]   |
| Never married                                      | -0.094<br>[0.025]** | -0.046<br>[0.018]** |
| Male   | -0.211<br>[0.014]** | -0.256<br>[0.010]** |
| Age  | 0.046<br>[0.003]**  | 0.01<br>[0.002]**   |
| Age-squared/100                                    | -0.044<br>[0.003]** | -0.009<br>[0.002]** |
| Unemployed   | -0.113<br>[0.042]** | -0.077<br>[0.031]*  |
| Self-employed                                      | -0.065<br>[0.026]*  | -0.055<br>[0.018]** |
| Retired  | 0.022<br>[0.029]    | -0.021<br>[0.021]   |
| Student  | -0.049<br>[0.037]   | 0.065<br>[0.029]*   |
| Disabled   | 0.062<br>[0.039]    | -0.056<br>[0.029]   |
| Look after home                                    | -0.065<br>[0.031]*  | -0.033<br>[0.021]   |
| Education: Other qualification                     | -0.068<br>[0.077]   | 0.031<br>[0.061]    |

|                                      |                     |                     |
|--------------------------------------|---------------------|---------------------|
| Education: Apprenticeship            | 0.036<br>[0.048]    | 0.052<br>[0.035]    |
| Education: CSE grade 2-5             | 0.026<br>[0.045]    | 0.076<br>[0.034]*   |
| Education: Commercial qf, no O-level | 0.081<br>[0.047]    | 0.072<br>[0.033]*   |
| Education: GCE O-level               | 0.008<br>[0.024]    | 0.062<br>[0.017]**  |
| Education: GCE A-level               | 0.025<br>[0.027]    | 0.083<br>[0.019]**  |
| Education: Nursing qualification     | 0.069<br>[0.066]    | 0.049<br>[0.045]    |
| Education: Other HE qf               | -0.014<br>[0.023]   | 0.058<br>[0.017]**  |
| Education: Teaching qualification    | -0.032<br>[0.044]   | 0.057<br>[0.031]    |
| Education: First degree              | -0.052<br>[0.028]   | 0.094<br>[0.020]**  |
| Education: Higher degree             | -0.114<br>[0.042]** | 0.067<br>[0.031]*   |
| Household size                       | 0.01<br>[0.007]     | 0.009<br>[0.004]*   |
| Own home outright                    | -0.021<br>[0.018]   | 0.008<br>[0.012]    |
| Log of household income              | 0.011<br>[0.013]    | 0.019<br>[0.009]*   |
| Constant                             | 0.538<br>[0.152]**  | -1.935<br>[0.119]** |
| <b>Regional dummies included</b>     | Yes                 | Yes                 |
| <b># Observations</b>                | 13717               | 12057               |
| <b>R-squared</b>                     | 0.08                | 0.58                |

Robust standard errors in brackets

\* significant at 5%; \*\* significant at 1%

**Notes:** The mean (s.d.) of BMI is 25.9 (4.7). The mean (s.d.) of overweight perception is 1.6 (0.8). Reference groups are married, in full-time employment, and less than high-school education