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## Exploring the Economic and Social Determinants of Psychological and Psychosocial Health

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# Exploring the Economic and Social Determinants of Psychological and Psychosocial Health

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## ABSTRACT

# Exploring the Economic and Social Determinants of Psychological and Psychosocial Health\*

This paper explores the determinants of individuals' psychological and psychosocial health using recent Health Survey for England data. We find evidence that our dependent variables, defined, respectively, from the GHQ12 and Perceived Social Support scores, are negatively related to household poverty as well as acute and chronic physical health. Unemployment has a detrimental effect for both men and women, but this effect is mitigated for individuals residing in high employment deprivation areas, suggesting a 'social norm' effect. Our random effects (household) ordered probit modelling approach finds that unobserved intra-household characteristics play an important role in determining an individual's levels of psychological and psychosocial health.

JEL Classification: I1, I3

Keywords: Psychological health, psychosocial health, deprivation, intra-household effects, social norm, unemployment

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## 1. Introduction

The well-being, or happiness, of members of the resident population should, arguably, be the most important concern of a nation's policymakers (Oswald, 1997). Crucially, most governments recognise the socially contingent nature of individual well-being and devote considerable resources to facilitate the effective functioning of both local communities and society as a whole. Recently economists have demonstrated that economic factors, such as income and labour market status, are prime contributors to the psychological health of individuals (e.g. Clark and Oswald, 1994; Clark, 2000; Theodossiou, 1998). Importantly, the causal direction from, say, unemployment, to higher levels of psychological distress has been convincingly demonstrated using longitudinal and panel data (e.g. Clark et al., 2001; Korpi, 1997; Winkelmann and Winkelmann, 1998). However, these studies have paid little attention to the social determinants of psychological health. Potentially important social factors such as the happiness of other members of the household and the extent of deprivation in the surrounding area have been largely overlooked. Furthermore, psychosocial aspects of individual happiness have yet to be explored using multivariate statistical techniques.<sup>1</sup>

This paper aims to make several novel contributions to this literature. Our first objective is to investigate the extent to which an individual's psychological health, defined using the familiar General Household Questionnaire 12 score, can be explained by unobserved household characteristics. We do this by fitting ordered probit (household) random effects models utilising data, from the Health Surveys of England in 1998 and 1999, which contain information on psychological and psychosocial health from all adults in the household. Secondly, we explore the impact on psychological health of living in a socially deprived area, measured by a recently constructed index of multiple deprivation (IMD) produced by the UK government (Department for the Environment, Transport and the Regions, 2000). Thirdly we explore whether interdependent preferences influence the psychological and psychosocial health of unemployed individuals, using a new measure of peer group unemployment. Specifically, we examine whether, and to what extent, a social norm of employment results in unemployment workers, living in an area of low employment deprivation, experiencing greater psychological and psychosocial distress than similar unemployed individuals located in high employment deprivation areas. Fourthly, we investigate whether the findings from previous studies still hold when better and more extensive controls for physical health are employed. This is possible since the Health Survey of England contains comprehensive information on both acute and chronic physical illness.

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<sup>1</sup> Both the original and follow-up Health and Lifestyle Surveys (see Cox et al., 1987, 1993), and several Health Surveys of England (e.g. Erens and Primatesta, 1998), include descriptive analyses of measures of psychosocial health and social support focusing mainly on their links with physical health.

Finally, we explore, for the first time, the impact of all of these factors on individuals' psychosocial health. We define this alternative measure of an individual's psychological health as the Perceived Social Support score (PSS score), present in the Health Survey of England. It captures an individual's perceptions of the social support available to them from their family and friends. This social, or relationship driven, aspect of an individual's psychological well-being is an interesting and important aspect of personal health for policy, given the emphasis of much of recent government policy on the value of community, society and social inclusion.

The paper is organised as follows. In section 2 we review previous studies in the general area of individual psychological health, focusing on their findings concerning the impact of economic factors. Next, in section 3, we describe the source of our sample and its main characteristics, define more precisely our dependent variables and examine their raw distributions. Section 4 explains our empirical methodology. We discuss our estimates of the determinants of psychological and psychosocial health in section 5. Finally, we summarise our main findings and present our conclusions in section 6.

## **2. The Determinants of Well-being, Psychological Health and Life Satisfaction**

The investigation of the factors affecting human happiness is central to the discipline of psychology. Psychologists recognise that the best method to gain information about how 'happy' a person is with their life or work is to ask them directly. In contrast, it is well known that economists have traditionally been reluctant to use self-reported subjective measures of utility such as well-being, happiness or life satisfaction (Bertrand and Mullainathan, 2001). Economists are cautious about the interpretation of such variables and the validity of inter-personal comparisons (i.e. a cardinal measure). Moreover, economic theory typically provides little guidance on how to model such psychological outcomes, thus making the testing of economic theory difficult (Jahoda, 1982, 1988). Recent years, however, have seen a considerable increase in the willingness by economists to use such variables (See Oswald 1997, for an informative review). This is partly due to the high level of explanatory power attributable to such variables in models of labour market behaviour (e.g. absenteeism and turnover) and the 'sensible' nature of estimated determinants of well-being. Moreover, the great advantage of these well-being measures is that they can (with some caution) provide directly observable proxies for 'utility', which is a concept central to economic research, but is a dependent variable otherwise rarely available for empirical analysis.

### *Unemployment*

By far the most heavily researched topic by economists (and psychologists) in this area concerns the psychological impact of unemployment. Much of this work has utilised longitudinal data that tracks

an individual's self-reported well-being over time. In this respect the British Household Panel Survey (Clark and Oswald, 1994; Clark et al., 1996; Theodossiou, 1998; Clark, 1999) and the German Socio-Economic Panel Study (Clark et al., 2001; Gerlach and Stephan, 1996; Kraft, 2000; Winkelmann and Winkelmann, 1998) have been widely used. In addition, Ravallion and Lokshin (2001) analysed data from the Russian Longitudinal Monitoring Survey, Korpi (1997) has used panel data from the Swedish Survey of Youth, Gerdtham and Johannesson (1997) have examined used cross-sectional data from Sweden's Level of Living Survey and Frey and Stutzer (2000) have used cross-sectional data from Switzerland to examine this issue. The use of panel data is important in this context since it has enabled the causality running from unemployment to happiness to be firmly established. Moreover, the effect of unobservable individual heterogeneity, which may be important in explaining variations in reported well-being levels, can also be tested and controlled for with longitudinal data. An important general result, however, is that estimates of the psychological impact of unemployment appear to be robust to concerns about individual heterogeneity (Oswald, 1997).

Whilst the above studies have used a variety of definitions of psychological well-being (e.g. life satisfaction in the Germany panel, symptoms of psychological distress in the British panel) there is a broad consensus that, for the 'majority population', unemployment leads to a significant deterioration in reported well-being. This 'stylised fact' is validated across countries, time periods and data sources, and has been widely used to support the belief that unemployment in Europe is predominately involuntary in nature (Clark and Oswald, 1994; Gerlach and Stephan, 1996; Oswald, 1997). The psychological cost of unemployment has been found to be higher for men than women (Kraft, 2000) and greatest for younger workers (aged less than 30 years according to Winkelmann and Winkelmann (1998) or aged 30 – 49 years according to Gerlach and Stephan (1996)). Theodossiou (1998) has found that joblessness leads to a marked rise in anxiety and depression with an associated loss of confidence and self-esteem. Winkelmann and Winkelmann (1998) found that the non-pecuniary costs of unemployment far exceed the pecuniary costs associated with loss of income. An important conclusion of these studies is that cost-benefit analyses of employment generating policies ought to take into account the non-pecuniary costs of unemployment.

#### *Differences amongst the unemployed*

Several studies have found that individuals partially adapt to being unemployed, with the associated deterioration in perceived well-being diminishing with unemployment duration (e.g. Clark and Oswald, 1994; Kraft, 2000; Winkelmann and Winkelmann, 1998). Clark et al. (2001) find evidence of both 'scarring' and 'habituation' effects of past unemployment: the reduction in happiness from a past unemployment spell lasts over three years, and current unemployment 'hurts' less for those

who have experienced unemployment in the past. For example, an unemployed male who has been unemployed for approximately 60% of his active months in the labour force over the last three years, was found to be currently indifferent between employment and unemployment. For women, however, it was always the case that the effect of unemployment on psychological well-being was negative.

Similarly, there is some evidence to suggest that the psychological cost of unemployment is lower for those living in high unemployment areas (Clark and Oswald, 1994). This might be because unemployment is harder to live with if one resides in an area where few people are jobless (e.g. stigma effects), or that it is easier to be unemployed if you are surrounded by many others in the same situation. The latter might be indicative of a ‘social norm’ of unemployment developing in high unemployment areas (Clark, 1999; Stutzer and Lalive, 2001). Overall, the results of the studies mentioned above have important implications for theories of hysteresis and the duration dependence of unemployment by changing individual tastes for work (Darity and Goldsmith, 1996). In this paper we investigate this issue using a more detailed measure of what constitutes the ‘social norm’ by which the unemployed compare themselves, namely the employment deprivation index<sup>2</sup> (DETR, 2000) of the District Health Authority (of which there are 100 in England) in which they reside. We also investigate, for the first time, whether individuals residing in more socially deprived District Health Authorities are more or less likely to enjoy better psychological and psychosocial health. Deprivation is measured using the recently released index of multiple deprivation (IMD) published by the Department of the Environment, Transport and the Regions (DETR, 2000). The DETR is constructed as a weighted average of the six domains of deprivation. The six deprivation domains (weights in brackets) are low income (25%), employment (25%), education and training (15%), poor health and disability (15%), poor housing (10%) and poor geographical access to services (10%). Table A1, in Appendix 1, provides a list of the District Health Authorities in England together with the values of the employment deprivation index and the IMD in each one. Finally, the number of observations, in our sample, for each DHA is noted.

### *Income and the Non-Pecuniary Value of Work*

A central component of economic theory is that utility is positively associated with (consumption) income. Consequently, there has been considerable interest in the relationship between income and self-reported levels of well-being. However, there exists no clear consensus that this central axiom of economic theory holds empirically. Campbell et al. (1976) and Easterlin (1974, 1995) found that

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<sup>2</sup> This is measured as the percentage of residents, in the DHA, who are not in employment. They may be unemployed (according to the claimant count definition), out of work but engaged in government sponsored training, aged 18-24 and on a New Deal option, receiving Incapacity Benefit or Severe Disablement Allowance (DETR, 2000).



income is a poor predictor of many measures of individual wellbeing. Oswald (1997) notes only a small happiness gain from economic growth in Europe and the USA in the post-war period, this result being supported in the empirical analysis of Blanchflower and Oswald (2000). The results from studies that have used survey data from one country to investigate this relationship are also mixed. Some studies have found a small positive relationship between income and happiness (Clark et al, 2001; Frey and Stutzer, 2000; Gerdtham and Johannesson, 1997; Gerlach and Stephan, 1996; Winkelmann and Winkelmann, 1998). Kraft (2000) found an inverse U-shape relationship with life satisfaction reaching a maximum at roughly 45,000DM per month. In contrast, Clark and Oswald (1994) were unable to find any robust effect, whilst Clark (1999) noted evidence of a significant negative relationship between income and happiness using data from the BHPS. An alternative, commonly held, viewpoint is that it is 'relative' rather than 'absolute' income that drives psychological wellbeing (Blanchflower and Oswald, 2000; Clark and Oswald, 1996; Easterlin, 1974, 1995; McBride, 2001; Oswald, 1997).<sup>3</sup>

Importantly, it is not just the loss of income, associated with unemployment, which leads to lower well-being, but rather psychologists have found that the benefits of 'work' are multi-faceted. Having a job may be a source of prestige and social recognition, and, as such, provide a basis for self-respect and self-worth. Going to work also gives structure to the day, maintains a sense of purpose and provides opportunities for social interaction (see Darity and Young, 1996).

### *Individual Characteristics*

A number of recent studies have focussed on the relationship between individual characteristics and well-being or happiness levels. For example, it is now widely accepted that a U-shaped relationship exists between age and each of the measures of well-being used. Well-being initially deteriorates with age, reaching a minimum in the mid-30s amongst the British (Clark et al., 1996; Clark and Oswald, 1994; Theodossiou, 1998) or in the 40s for the Germans and the Swedes (Clark et al, 2001; Gerdtham and Johannesson, 1997; Kraft, 2000), and then increases thereafter. It has also been universally found that binary measures of poor physical health or disability are significantly associated with lower levels of self-reported happiness (some studies have also found that individuals may partly adapt to disability). Most of these studies, including all those using British survey data, capture physical ill health with simple subjective self-assessed indicators of excellent or good health.<sup>4</sup> These indicators capture both psychological and physical aspects of poor health,

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<sup>3</sup> See Diener and Oishi (2000) for a review of the relationship between income and happiness found in the psychology literature.

<sup>4</sup> Physical health measures (of self-reported excellent or good health) are included amongst the explanatory variables by Clark (1999) and Clark and Oswald (1994), but not by Theodossiou (1998). Both the former studies estimate large, positive and highly significant coefficients for these variables.

and are therefore problematic given the psychological nature of the dependant variable. In this study we explore for the first time the impact of a number of more specific physical health indicators, as well as differentiating between acute and chronic conditions, and individuals' psychological and psychosocial health.

The relationship between other individual characteristics and well-being is less clear. One such example is that of gender. Clark and Oswald (1994), Clark et al. (1996) and Theodossiou (1998) have found that men are more likely than women to be observed at the higher end of the well-being or happiness index. The latter author argues that his finding is consistent with the belief held by psychologists that women are typically more critical of themselves and devalue themselves much more than men (Back, 1971; Lowenthal et al., 1975). However, Gerdtham and Johannesson (1997) found the opposite result using Swedish data, whilst Frey and Stutzer (2000) identified no gender difference using Swiss data. In contrast, Shields and Wailoo (2001) found that ethnicity was an important determinant of psychological well-being using recent British data.

Similarly, whilst some studies have found that well-being is positively related to education (Clark et al., 2001; Frey and Stutzer, 2000; Gerdtham and Johannesson, 1997), other studies have found the converse (Clark and Oswald, 1994). The latter authors argue that the more highly educated have greater life expectations, which if not satisfied, lead to unhappiness. It has also been found that marriage leads to a welfare gain over being single, and that the experience of divorce or separation significantly reduces well-being levels (Clark and Oswald, 1994; Clark et al., 2001; Gerlach and Stephan, 1998; Theodossiou, 1998; Winkelmann and Winkelmann, 1998). In this respect, Kraft (2000) claims that a rise of 6000DM per month would be needed to produce a rise in happiness that would exactly offset the loss associated with separation. A final interesting result is that having children does not necessary lead to a happiness gain. Clark and Oswald (1994), Gerdtham and Johannesson (1997) and Theodossiou (1998) find that being responsible for children significantly reduces reported happiness amongst British and Swedish individuals.

In this paper we attempt to examine the statistical associations between many of these individual characteristics and our measure of psychological health. In addition, we provide the first econometric evidence on the determinants of psychosocial health. In both these statistical investigations we examine, for the first time, the effect of household-specific unobservable characteristics and we use a new and much more disaggregated definition of regional deprivation.

### **3. Data, Definitions and Sample Characteristics**

Our data source is the Health Survey for England (HSE), commissioned by the Department of Health and carried out by the Joint Health Surveys Unit of Social and Community Planning Research and the Department of Epidemiology and Public Health at University College London.

Beginning in 1992, the HSE is an annual survey designed to monitor trends in the nation's health. The survey collects detailed information on individual and household demographic characteristics that are likely to be important factors in determining health outcomes. The survey covers both adults and children living in England, and data are collected by a combination of face-to-face interviews, self-completion questionnaires and medical examinations. Importantly, every adult member of the household is interviewed. Using the Postcode Address File as a sampling frame, the HSE typically generates a sample size of approximately 16,000 adults per survey year. The data is generally considered representative of England.<sup>5</sup> In this study we use data from the 1998-1999 sweeps of the survey, since earlier sweeps did not collect information on both household income and the variables used to form our psychosocial health measure. These two years worth of HSE data allow reliable econometric estimation of the determinants of both psychological and psychosocial health amongst the 11241 men and women. The full sample characteristics are provided in Table A2 in Appendix 1 but are not discussed here.

Our measure of psychological health (also referred to as happiness or well-being in the economics literature) is the inverse of the General Health Questionnaire 12 score (Goldberg, 1972), or GHQ12 score, which is widely recognised to be a reliable measure of psychological well-being (Argyle, 1989). It is an ordered ranking of psychological health based on the responses to 12 questions (see Appendix 2 for details) about an individual's general level of mental well-being, including self-reported levels of anxiety, depression, happiness and sleep deprivation. Specifically, we utilise the 'caseness score', following previous studies using UK data (e.g. Clark and Oswald, 1994, Oswald, 2001), which assigns a binary value (0 indicating poor psychological health; 1 otherwise) to the response from each question.<sup>6</sup> Thus an individual scoring 12 (out of a possible 12) responded to all of the questions with an answer indicating good psychological health.

As an indicator of psychosocial health we use the Perceived Social Support (PSS) Score, which is derived from the answers to seven questions included in the HSE (see Appendix 2 for details).<sup>7</sup> Individuals are asked whether they consider these statements – concerning how they feel about their relationships with family and friends – to be not true (assigned a value of 1), partly true (= 2) or certainly true (=3). The sum of the values of the answers to these seven questions gives an ordinal

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<sup>5</sup> Additional details of the sampling procedures can be found in Erens and Primatesta (1998) and Erens et al. (1999).

<sup>6</sup> The questions are asked in a booklet which respondents are asked to complete in the presence of an interviewer. An individual has four possible responses to each question generally indicating whether they agree with the statement “not at all”, “no more than usual”, “rather more than usual” or “much more than usual”. The specific wording of these four categories of possible answer does vary according to the particular question (see Appendix 2). Since we are using the inverse of the GHQ12 score we assign a score of 0 to a response indicating poor psychological health (poorest two categories) and a 1 to the responses in the other two categories. See Goldberg and Williams (1988, pp. 11-12) for a detailed discussion of the scoring method.

<sup>7</sup> This measure was derived from a study with a distinct purpose (Davidson et al., 1961) and has previously been used in this context in the Health and Lifestyle Surveys (see Cox et al., 1987, 1993).

measure of psychosocial health ranging from 7 to 21. The highest score indicates no lack of perceived social support and, hence, full psychosocial health. This measure captures both psychological (given that it is based on self-perceptions and subjective feelings) and social (since the questions focus on the effect of relationships with family and friends) aspects of individuals' health and hence we use the term psychosocial health. We use it as an alternative proxy for individual 'utility', specifically one that captures its socially contingent aspects. We view it as a complimentary, but distinct, measure of individual well-being given that the correlation between our two measures is quite low (correlation coefficient = 0.23).<sup>8</sup>

The distributions of our two measures of health are provided, by gender, in Figures 1 and 2. It is clear that the majority of both male and female survey respondents report very good psychological and psychosocial health. Only around 10% of the sample reports a score one category below maximum scores with declining proportions attaining each successive lower score. Clearly the main threshold of interest is that between complete psychological or psychosocial health and anything less. Hence when we report the marginal effects from our later statistical models, they are calculated at these frontiers.

The mean values of our dependent variables, for the main economic categories of interest, are reported in Table 1. On average individuals in our sample have high psychological and psychosocial health with the mean values of the scores very close to the two respective maxima. Interestingly, the men in our sample have greater levels of psychological health, but lower levels of psychosocial health, than the women. The descriptive statistics indicate that this observation holds not only for the overall mean levels, but also for every single category reported in Table 1. In Sections 4 and 5 we shall examine whether this finding is robust once controls for differences in characteristics are made. The mean level of psychological and psychosocial health varies considerably with labour market activity. Individuals, who are long-term sick have the lowest health scores followed by the unemployed and non-participants, using both measures. All these groups experience significantly lower levels of psychological and psychosocial health when compared to those who are employees. There are generally no mean differences in these scores between the self-employed and the employee groups.

Unemployed individuals, who reside in a District Health Authority (DHA) in the highest quartile of employment deprivation, have on average better psychological health, but lower levels of psychosocial health, than those in the lowest quartile. However, living in a high overall deprivation (IMD) DHA significantly reduces both psychological and psychosocial health, regardless of gender. Finally, members of households with low income (<£5200 per annum) have significantly worse health scores than households with higher reported incomes. With regard to

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<sup>8</sup> We discuss the implications of whether or not these two measures are independent at the end of section 4 below.

psychological health, there is some evidence, from these descriptive statistics, of an inverse U-shaped profile with household income. This measure of health appears to peak at income levels between £20,800 and £31,200, whereas no such pattern is evident for our measure of psychosocial health. We now turn to a multivariate investigation of the factors that may be associated with psychological and psychosocial health.

#### 4. Empirical Models of Psychological and Psychosocial Health

The empirical models we specify need to account for a number of characteristics of our data. Firstly, our dependent variables, psychological and psychosocial health, are ordered in nature. Secondly, given the theory and evidence from previous studies, we expect that variations in individuals' probabilities of both psychological and psychosocial health will be statistically associated with their observable personal, family-related, work-related and locational characteristics. Thirdly, we might expect that, to some extent, psychological and psychosocial health are jointly determined in the household rather than being solely individually determined. This possibility has not previously been discussed in detail in the economics literature. One advantage of using the HSE data is that we are able to control for potential unobservable household characteristics in our empirical models, since every adult household member is interviewed.

##### *Statistical Framework*

We have two indicators of perceived health:  $Ppsy \in \{0, \dots, 12\}$  is an ordinal indicator of psychological health (the GHQ12 Score) and  $Psoc \in \{0, \dots, 12\}$  is an ordinal indicator of psychosocial health (based on the PSS score). These are available for a set of individuals indexed by  $i = 1, \dots, n$ . Each individual is observed in a given household indexed by  $h = 1, \dots, H$ . For every individual where  $Ppsy_{ih}$  and  $Psoc_{ih}$  are observed, we also observe a (row) vector  $x_{ih}$  containing personal, family-related, work-related and locational covariates describing the characteristics and situation of individual  $i$  in household  $h$ .

The statistical model for each of the two health outcomes is a random effects ordered probit structure defined as follows (using psychological health as an illustration):

$$Ppsy_{ih}^* = \mathbf{b}'x_{ih} + \mathbf{e}_{ih}, \quad i = 1, \dots, N, \quad h = 1, \dots, H \quad (1)$$

$$\text{where } \mathbf{e}_{ih} = \mathbf{u}_{ih} + u_h$$

$$\text{Var}(\mathbf{e}_{ih}) = \mathbf{S}_n^2 + \mathbf{S}_u^2 = 1 + \mathbf{S}_u^2$$

$$\text{Corr}(\mathbf{e}_{ih}, \mathbf{e}_{i's}) = \mathbf{r} = \frac{\mathbf{S}_u^2}{1 + \mathbf{S}_u^2}$$

where  $Ppsy_{ih}^*$  is the unobserved propensity for psychological (or psychosocial) health for individual  $i$ , in household  $h$ . As is standard, we assume that (a) the unique term,  $\mathbf{n}_{ih}$  is distributed as  $N[0,1]$ , (b) that  $\mathbf{n}_{ih}$  are independent of  $x_{ih}$ , and (c) that the household specific term  $u_h$  is distributed as  $N[0, \mathbf{S}^2]$  and is independent of  $\mathbf{n}_{ih}$  and  $x_{ih}$ . Given the nature of the data, what we actually observe is the usual ordered structure:

$$PPSY_{ih} \begin{cases} 0 & \text{if } Ppsy_{ih}^* < \mathbf{m}_0 \\ 1 & \text{if } \mathbf{m}_0 < Ppsy_{ih}^* < \mathbf{m}_1 \\ 2 & \text{if } \mathbf{m}_1 < Ppsy_{ih}^* < \mathbf{m}_2 \\ \cdot & \\ \cdot & \\ J & \text{if } \mathbf{m}_{J-1} < Ppsy_{ih}^* \end{cases}$$

The associated log-likelihood function for this model can be generalised from the arguments made by Butler and Moffitt (1982), and heterogeneity is handled by using Gauss- Hermite quadrature (20-points were chosen) to integrate the effect out of the joint density. Frechette (2001) provides a derivation of the likelihood function for this model and a further discussion of the Gauss-Hermite quadrature estimation.

### *Model Assumptions*

The models considered assume that  $u_h$  and  $\mathbf{u}_{ih}$  are independent of the observable  $x_{ih}$  for all  $i$  and  $h$ . If these assumptions are violated our estimates may be biased. An alternative modelling approach is to fit conditional fixed-effects models that allow for potential endogeneity. Unfortunately, it is widely accepted that the fixed-effect estimator cannot be readily applied to ordinal outcomes. A commonly used alternative approach in this literature is to collapse the ordinal index of well-being (or happiness, life or job satisfaction) into an arbitrary binary indicator (i.e. happy or not). Conditional fixed-effect logit models, which are not subject to the above assumption, are then fitted (recent examples include, Gerlach and Stephan, 1996; Clark, 1999; Clark et al., 2001; Winkelmann and Winkelmann, 1998). This approach has the advantage of being able to allow for unobservable individual heterogeneity. However it also has several major disadvantages. Firstly, a great deal of information about well-being is lost when the naturally ordinal measure is collapsed down. Secondly, this modelling strategy provides no estimate of the effect of the individual time invariant characteristics on reported well-being,<sup>9</sup> which are often the most interesting for policy.

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<sup>9</sup> In our case the effect of household-invariant characteristics such as income, number of children and locational factors would be unknown.

Furthermore, in our context this approach may well be unnecessary. In contrast to the normal panel context (with repeated observations on an individual), it is not altogether clear whether the independence assumption is violated in the case where the ‘panel’ is defined over repeated sampling of individuals in the household. Some support for our random effect approach is gained from conducting Hausman Tests, the results being that we could not reject four out of our six models.<sup>10</sup> The whole sample estimates of the determinants of both psychological health and psychosocial health are robust to potential criticisms, as are the separate gender models for psychosocial health. Only in the case of the male and female determinants of psychological health does the  $\chi^2$  statistic indicate that some caution should be exercised in the interpretation of the estimated coefficients.

In this paper we fit separate random effects ordered probit models for psychological and for psychosocial health. It may, however, be argued that these two outcomes are jointly determined, even though they are not that highly correlated (recall the correlation coefficient = 0.23). Moreover, we cannot firmly establish the line of causality between the two health measures with our data; high levels of psychosocial health could lead to higher psychological health, but it is also reasonable to suggest that psychological health might, to a lesser extent, determine psychosocial health. Any attempt to empirically evaluate the direction of causality would need strong identification restrictions, which should preferably be justified from an underlying theoretical model. We are unaware of such a theoretical framework and the data does not contain any obvious valid instruments. It is therefore important to note that our parameter estimates remain statistically consistent, but that modelling our two outcomes separately may result in some loss of efficiency.

### *Explanatory Variables*

Following previous studies of individual psychological health, particularly those undertaken using data from the United Kingdom (Clark, 1999, Clark and Oswald, 1994, Theodossiou, 1998), we include the following explanatory variables in our models: age and its square, ethnic origin, marital status, highest qualification and labour market status. Our controls for the number of children allow for a differential well-being effect from younger (infants) and older (aged > 2) children. Importantly, given our interest in the relationship between poverty and well-being, we also control for household income. In addition, we include extensive controls for self-reported, acute and chronic (long-term), physical health. Furthermore, we allow for the possibility that our measures of individual health will vary according to the deprivation of the District Health Authority and, for the

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<sup>10</sup> To be able to conduct the Hausman Test we have treated our two health outcomes as continuous (rather than ordered variables) and estimated both random and fixed effects models. Although this approach is not ideal, we also find that the sign and significance of the estimated coefficients from these models are very similar to those from the ordered probit models.

unemployed, by the average level of unemployment deprivation (also at the DHA level). Importantly, as outlined above, we also allow for intra-household correlations in individual health outcomes. Finally, we estimate models using the whole sample, and separately for males and females (allowing for gender-specific intra-household correlations), using both our dependent variables.

## 5. Empirical Results

The estimated coefficients, and associated standard errors, resulting from the fitting of our ordered probit household random effects models of psychological and psychosocial health are presented in Tables 2 and 3, respectively. Since the estimated coefficients from such models are difficult to interpret, and cannot be directly compared across models, we have simulated the quantitative effects of each of the explanatory variables. We report the Marginal Effect (ME) on the predicted probability of an otherwise average individual, reporting a GHQ12 score of 12 (or a PSS score of 21), rather than a lower score on either scale, when a particular characteristic holds compared to when the relevant base characteristic is present. These numbers show the separate effect of particular explanatory variable on an average individual's probability of being fully psychologically, or psychosocially, healthy compared to being less than completely healthy. We now discuss these results, as well as the sign and significance of the estimated coefficients, in three sub-sections focussing on personal characteristics, physical health indicators and economic and social factors, in turn.

### *Personal Characteristics*

In common with previous studies using UK data we find a U-shaped relationship between an individual's age and their psychological health, with a minimum occurring at age 33 (36 for men, 30 for women), and a significantly positive coefficient for male gender (ME = 0.070). A similar U-shaped association is found between age and psychosocial health, but the minimum is reached at a far later age of 47 (52 for men, 39 for women). In contrast to the psychological health effect, we find that males are significantly less likely to report good psychosocial social health than females (ME = -0.126). Earlier studies have suggested that the positive male coefficient, for psychological health, can be explained by a systematic underreporting of personal well-being by females (e.g. Theodossiou, 1998). However, our converse finding, when our measure of psychosocial health is the dependent variable, casts some doubt upon this hypothesis. Alternatively, it may be the case that females value the support they get from family and friends more highly than males making them more likely to invest significant resources in extending and deepening such relationships. To explore this issue further we estimated separate probit models of each of the elements of our two



dependent variables (12 binary probits for the GHQ12 questions and 7 ordered probits for the PSS questions). The positive male coefficient was statistically significant in all but two of the 12 GHQ score element models (the exceptions being those based on questions 3 and 7; see Appendix 2), whilst the significantly negative male coefficient was present in all 7 of the PSS score element models. These separate estimates indicate that our main model findings are not driven by just one or two elements of the dependent variable scores.

Regardless of gender, there is little evidence of any ethnic differences in psychological health or of an individual's highest qualification influencing their self-reported happiness. Amongst males there is some evidence that having a degree (or higher) or an 'A'-level (or equivalent) highest qualification slightly reduces the probability of reporting good psychological health (MEs = -0.033 and -0.059, respectively). These findings are dramatically different when psychosocial health is used as the dependent variable. Members of every ethnic minority group are significantly less likely to report higher levels of psychosocial health, with the largest marginal effects affecting South Asian (-0.322) and Chinese (-0.257) individuals. This is line with the descriptive findings reported by Erens et al. (1999, ch. 2) and is quite surprising given the importance of the extended family amongst these groups.<sup>11</sup>

Educational level is clearly positively associated with psychosocial health, regardless of gender, with the probability of reporting a PSS score of 21 increasing the higher the qualification achieved. The marginal effect is also substantial, with graduates having a 0.172 higher probability of reporting excellent psychosocial health. It may be the case that better communications skills, which are normally associated with individuals who have attained a high level of education, contribute to more effective relationships with family and friends increasing their social support value to such individuals.

Post-marital states clearly have a strong negative association with an individual's psychological health, more significantly so for men than women. Being separated reduces the probability of scoring 12 on the GHQ 12 score by 0.138, compared to being single. This effect is over double that for being divorced (ME = -0.061), and that for being widowed (-.057), which may reflect the relative proximity of the marital break-up amongst separated individuals. With regard to

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<sup>11</sup> Of course it may be the case that the estimated coefficients reflect an increased willingness by ethnic minority groups to report this particular aspect of their health. However, given that we find no significant ethnic differences for our measure of psychological health we do not find this argument convincing. Alternatively, our findings may be caused by systematic ethnic differences in the interpretation of these questions, for reasons of language or culture (Erens et al., 1999, ch. 2). Since the 1999 Health Survey of England over-sampled ethnic minorities we were able to examine this hypothesis. We found no evidence of a significant association between our dependent variables and either self-reported English language speaking or the language of interview (English or otherwise), amongst these groups. Clearly more research is needed into this specific area. Nevertheless it is interesting to note that the insignificant ethnic minority dummies in the psychological health model, and their significance in the psychosocial health model, are also present in all of the separate element (of each dependent variable score) model estimates.

psychosocial health, married or co-habiting men and women are significantly more likely to achieve a very high PSS score (MEs = 0.151 and 0.100, respectively), than their single counterparts. Clearly successful marital relationships and co-habitations provide an important form of social support for the individuals involved. Interestingly, women who are separated, divorced or widowed also have significantly better psychosocial health than single women, which is not the case for men. The greater the number of children (aged > 2) the more enhanced is the psychological health of women but not men (ME of an additional child is 0.043). However, the number of infants (aged < 3) has no overall effect on psychological health suggesting that the stresses and strains associated with having a young family is just compensated for by increase in happiness that infants provide to their parents. There is weak evidence of a slight reduction in psychosocial health (ME = -0.012) from having more children.

### *Physical Health Indicators*

Both acute and chronic physical health indicators are highly and significantly correlated with psychological health, but not psychosocial health, regardless of gender. Recent acute illness, lasting less than 3 days, reduces the probability of a high GHQ 12 score by 0.160 whilst a longer episode lowers the same probability by 0.300, on average, for the pooled sample. However, the latter effect is far larger for women (ME = -0.365) than for men (ME = -0.255). Having been an in-patient in hospital during the previous year also significantly lowers self-reported psychological health (marginal effect = -0.101), for both men and women, and has a weak detrimental effect on psychosocial health (-0.032). Clearly recent experiences of severe physical ill health are a crucial determinant of individuals' psychological health.

The long-term physical conditions with the most severe adverse effects on psychological health are muscular, arthritic and rheumatic conditions (ME = - 0.127), followed by those concerning the stomach, colon, bowel and digestive system (-0.086), cancer (-0.074), heart conditions (-0.073), migraine or epilepsy (-0.072) and respiratory problems (-0.071). These findings are generally similar for both genders with the exceptions being that hypertension or high blood pressure conditions only significantly reduce female psychological health whilst heart attacks or strokes and sight or hearing problems only affect male GHQ12 scores. Evidently long-term ill health is detrimental to psychological well-being but the relative size of the respective marginal effects indicate that individuals are much more affected by recent episodes of severe illness than ongoing physical health problems. In both cases our estimates show that physical health cannot be ignored when the determinants of psychological health are being explored. The only chronic condition to have a consistently significant impact on psychosocial health, across our three groups, is having a stomach, colon, bowel and digestive system disorder. In contrast to the findings for psychological

health, but in line with previous descriptive analyses (see Cox et al., 1993, ch. 15), there is no evidence of a strong link between physical and psychosocial health.

### *Economic and Social Factors*

Our results indicate that work is clearly beneficial for an individual's psychological, and to a lesser extent, psychosocial health. For both males and females any labour force state, other than being an employee or self-employed, significantly reduces their GHQ12 score. Specifically, being in unemployment reduces the probability of reporting full psychological health by 0.241, with the marginal effect being twice as large for females (-0.317) than males (-0.165), compared to being an otherwise identical employee. This confirms the findings of previous studies using British data that have found evidence to support the hypothesis that unemployment is largely involuntary (Clark and Oswald, 1994, Shields and Wailoo, 2001, Theodossiou, 1998). We also find some evidence of a negative impact on male psychosocial health (ME = -0.096) suggesting that relationships with family and friends may suffer during unemployment.

Being out of the labour force due to long-term sickness is severely detrimental to both (male and female) psychological (ME = -0.255) and psychosocial (-0.078) health outcomes. For males the impact of inactivity caused by long-term sickness on psychological health is much more severe than that of unemployment. In contrast, for females the marginal effect of unemployment is larger than that of sickness-induced inactivity. The reverse orders of importance are found in the case of psychosocial health, for both genders.

Importantly, we find that being a non-participant in the labour force significantly reduces the probability of both males and females reporting excellent psychological health, but not their likelihood of attaining full psychosocial health, compared to a similar employee. However, the marginal effects are far smaller than for the unemployed or long-term sick (-0.070 for males, -0.061 for females). The estimates show that those non-working individuals in England whose inactivity has no physical health cause are clearly distinguishable, in terms of their psychological health, from those who are actively seeking employment. However, our findings suggest that the labour market status of these non-participants is somewhat involuntary, though considerably less so than the unemployed.<sup>12</sup> This finding contrasts with that of Goldsmith et al. (1995) who find that there is no difference in psychological well-being between individuals in these two labour market states in the US.<sup>13</sup> If robust, our estimates provide some evidence of differential labour market behaviour

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<sup>12</sup> These estimates show the importance of clearly distinguishing between these three non-employment states: unemployment, voluntary non-participation and long-term sick - in these analyses. As far as we are aware this has not previously been done in the existing literature.

<sup>13</sup> However, it is not clear whether or not Goldsmith et al. (1995) exclude the long-term sick from their analysis. If they are included in the out of the labour force group, and we had used similar definitions, clearly our findings would not differ. Furthermore, they are able to control for previous labour market history, which we cannot do, so it may be the

between residents of England and the US, which may help explain the differences in aggregate unemployment experiences in the two countries' labour markets.

Amongst the unemployed we find evidence that the extent of employment deprivation in the District Health Authority Area (DHA) impacts on their psychological, but not psychosocial health.<sup>14</sup> The greater the extent of employment deprivation in the DHA the greater is the psychological health of the individual, holding labour market status constant, providing further confirmation of Clark and Oswald's (1994) finding. This suggests that the negative psychological impact of unemployment is least for those who are living in areas where unemployment is commonplace. This is evidence in favour of the hypothesis of a social norm of employment (Clark, 1999, Stutzer and Lalive, 2001) that supports a psychological explanation for unemployment hysteresis (Darity and Goldsmith, 1996). Importantly, we have calculated how great the extent of employment deprivation would have to be in order for its positive impact on individuals' psychological health to mitigate the negative effect of being unemployed. We find that an, otherwise average, unemployed person who lived in an area with an employment deprivation index of greater than 22%, such as Liverpool (28.26%), Manchester (24.58%), St. Helens (24.01%) or East London and the City (23.39%), is estimated to have at least the same level of psychological health as an equivalent employee. The unemployed that live in areas like Sunderland (21.35%), Barnsley (20.75%), Gateshead (20.51%) or Tees (20.33%) are predicted to have only slightly reduced levels of psychological health than similar employees. This is further evidence to suggest that employment promotion policies and measures to encourage more effective job search should initially be focussed in the areas of greatest employment deprivation.

We find considerable evidence that household poverty, defined here in terms of very low household income, significantly increases the probability of an individual reporting lower levels of psychological and psychosocial health. With regard to the former measure, our estimates indicate an inverse U-shaped pattern with increasing household income. Higher levels initially raise reported GHQ12 scores, with a peak at £20,800 - £31,200, but thereafter are associated with declining psychological health scores. Generally, for both males and females, household poverty reduces the probability of achieving a maximum GHQ12 score by between 0.04 and 0.08. Interestingly, increased household income is clearly associated with improved psychosocial health, for both genders, with the marginal effect continually rising from 0.066, for incomes in the £5,200 - £10,400

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case that our different findings reflect this omission. Theodossiou (1998) also found substantial differences between the psychological well-being of the unemployed and those out of the labour force using British data. Here again it is unclear whether the long-term sick were included in the latter category or not.

<sup>14</sup> Importantly, we find evidence of this effect at a much more disaggregated level than in the study by Clark (1999). He uses the 11 major regions of Great Britain (just 9 regions in England) whereas our employment deprivation index is calculated at the (100) District Health Authority level. Furthermore, this positive and significant interaction is present in all of the 12 separate GHQ12 element model estimates discussed earlier.

range, to 0.209 for households with the highest incomes. These findings suggest that, for an individual with average sample characteristics, household poverty has a much larger detrimental effect on their psychosocial health than psychological health. One policy implication is that measures to alleviate household poverty will not only lead to improved material well-being but also will enhance the psychological, and especially the psychosocial, health of the affected individuals. The value of these additional benefits should be included in cost-benefit analyses of poverty reduction programmes.

The index of multiple deprivation (IMD) score, at the district health authority (DHA) level, is significantly associated with reported psychological health in both the whole sample estimates and amongst males.<sup>15</sup> As illustrated in Figure 3, an inverse U-shaped pattern is evident indicating that the marginal effect on the probability of attaining 12 on the GHQ12 score initially increases with the extent of deprivation. It reaches a maximum for the whole sample at an IMD value of 14 (31 for males) and thereafter is adversely affected by living in areas with greater deprivation. In particular, beyond an IMD value of 21 all individuals are less likely to be fully psychologically healthy than those in the DHA with the least deprivation (East Surrey; IMD value = 7.91). Controlling for all the other characteristics in our models, the male model estimates indicate that only those men living in Liverpool (IMD = 58.05), East London & the City (57.71) and Manchester (55.92) have a lower likelihood of reporting full psychological health than residents of the least deprived area. This suggests that there may be positive psychological health externalities from policies directed at reducing deprivation levels, particularly in the worst affected areas. We find no such evidence for females or for an impact of deprivation on male psychosocial health.

We find some evidence of a U-shaped association between increased levels of deprivation and better psychosocial health amongst females (with a minimum value of 25). As Figure 3 shows female residents of the Barnsley (IMD value = 42.53), Sunderland (42.58), Sandwell (42.70) and St Helens & Knowsley (47.77) DHAs, as well as the three most deprived areas mentioned above, have an increased probability of reporting complete psychosocial health, compared to residents of East Surrey DHA. This may be due to females turning to family and friends for more support where the external environment is harshest. Controlling for local deprivation there is little evidence of significant differences between the psychological or psychosocial health of rural, urban or suburban residents.

Importantly, we have fitted econometric models that allow for intra-household correlations in unobserved characteristics to influence our estimated results. Our estimates show that neglecting these effects is a serious omission. Unobserved intra-household correlations explain over 50% of

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<sup>15</sup> A variety of functional forms were tested for the effect of IMD on psychological and psychosocial health. The final form was chosen to maximise the log likelihood.

the residual variance in our measure of psychological health and over 60% of that for our psychosocial health variables. Amongst females these effects (i.e. the unobserved correlations amongst only females members of the same household) are even more important – they explain over 77% of the residual variance in both dependent variables. The comparable figures for males (in the same household) are over 25% of the residual variance in GHQ12 scores and over 45% of that of the PSS scores. These highly important unobserved intra-household correlations, together with all our estimates of the determinants of psychosocial health, unequivocally demonstrate the socially contingent nature of individual well-being and its importance as an area for future research.

## **6. Conclusion**

In this paper we have examined the economic and social determinants of male and female psychological and psychosocial health using a sample from the 1998 and 1999 Health Surveys of England. This is the first time that the factors affecting psychosocial health have been empirically established, and is important given the growing importance of social inclusion in UK policy debates. The paper also provides new evidence about the importance of unobserved intra-household characteristics in explaining individual differences in health, and we have also been able to utilise recently available indices of employment and multiple deprivation to show the significance of locational characteristics in determining psychological and psychosocial health. Finally, we have extensively explored the statistical associations between physical health and our well-being measures, showing in particular the relative importance of recent acute illness, as compared to long-term chronic conditions, in determining psychological health.

Our main findings are that:

- Females report significantly lower levels of psychological health but significantly higher levels of psychosocial health.
- Education is positively related to reported psychosocial health, but plays no consistent role in determining psychological health.
- Marital dissolution is associated with significantly lower psychological health, more so for those separated than divorced or widowed and for men than women, whilst married or cohabiting individuals report significantly higher levels of psychosocial health than those who are single.
- Recent spells of severe illness are associated with a large and significant reduction in psychological health, more so for women than men. Long-term chronic conditions also have adverse consequences for psychological health, with the most detrimental form being

muscular-skeletal conditions, followed, in turn by, stomach and digestive complaints, migraine or epilepsy, respiratory system conditions, cancer and heart problems.

- Unemployment significantly reduces the probability of reporting high levels of both health measures but a much larger impact on psychological than psychosocial health.
- The detrimental effect of unemployment on psychological health is greater in areas of low levels of employment deprivation than highly deprived areas. This is indicative of a ‘social norm’ of employment in certain District Health Authorities in England.
- Non-participants and, more significantly, those unable to work due to long-term sickness or disability report lower levels of psychological health and psychosocial health than otherwise similar employees.
- Household income is positively related to both psychological and psychosocial health, with individuals in households with an annual income of less than £5,200 reporting the lowest levels of well-being. This suggests non-material welfare benefits from poverty reduction policies.
- We find a non-linear relationship between psychological health and regional deprivation at the District Health Authority level. Psychological health is highest in areas of moderate deprivation and lowest at the extremes of the IMD distribution. However, we find little evidence of a relationship between psychosocial health and regional deprivation.
- Individual measures of psychological and psychosocial health are highly socially contingent at the household level amongst our sample, a hitherto neglected aspect of this literature.

Our findings provide considerable support for government policies that focus attention on reducing social deprivation, improving health care provision and promoting the values of community, family and inclusion in society. They also imply that economic policies targeted at reducing unemployment, especially where it is highly concentrated, and eliminating household poverty will, if successful, not only increase the material well-being and associated life outcomes of the affected individuals, but also dramatically improve their psychological and psychosocial health.

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Table 1: Mean Levels of Psychological and Psychosocial Health by Main Economic Characteristics

	Psychological (0-12)			Psychosocial (7-21)		
	All	Men	Women	All	Men	Women
All	10.38	10.62	10.05	19.64	19.52	19.78
Self-employed	10.81*	10.87	10.61*	19.73	19.66	19.97
Employee	10.67	10.89	10.33	19.82	19.70	20.00
Unemployed	9.94***	10.29***	9.50***	19.16***	19.02***	19.36***
Long-term sick	7.92***	8.15***	7.45***	18.57***	18.42***	18.85***
Non-participant	10.07***	10.47***	9.93***	19.46***	19.11***	19.57***
Unemployed in highest quartile employment deprivation area	10.20**	10.43	9.75	18.89	18.88	18.91*
Unemployed in lowest quartile employment deprivation area	9.35	9.67	9.16	19.31	18.58	19.72
< £5,200 per annum	9.17	9.39	9.06	18.59	18.00	18.92
£5,200 - £10,400	9.78***	9.83**	9.73***	19.07***	18.79***	19.32**
£10,400 - £20,800	10.40***	10.65***	10.06***	19.58***	19.41***	19.82***
£20,800 - £31,200	10.74***	10.88***	10.49***	19.93***	19.84***	20.09***
£31,200 - £41,600	10.70**	10.88***	10.36***	20.06***	19.95***	20.26***
> £41,600	10.62***	10.84***	10.25***	20.18***	20.10***	20.33***
Resides in highest quartile IMD DHA area	10.19***	10.46***	9.86*	19.46***	19.35***	19.59***
Resides in lowest quartile IMD DHA area	10.49	10.78	10.09	19.77	19.68	19.88

*Notes:*

1. Asterisks indicate (\*\*\*) =1% level, \*\* =5% level, \* =10% level) a statistically significant difference relative to the base groups: employee; unemployed in lowest quartile employment deprivation area; household income < £5,200 per year; resides in lowest quartile IMD (Index of Multiple Deprivation - DETR 2000) DHA (District Health Authority) area.

TABLE 2: Ordered Probit Household Random Effects Estimates of the Determinants of Psychological Health

Covariates	All			Men			Women		
	<i>b</i>	S.E.	ME	<i>b</i>	S.E.	ME	<i>b</i>	S.E.	ME
Age	-0.044	0.007***	-.017	-0.052	0.010***	-.020	-0.038	0.012***	-.015
Age squared / 100	0.067	0.009***	.026	0.075	0.012***	.029	0.063	0.015***	.024
Male	0.177	0.027***	.070	-	-	-	-	-	-
Black	0.105	0.097	.041	0.245	0.140*	.089	-0.099	0.144	-.037
South Asian	-0.098	0.083	-.038	-0.050	0.096	-.020	-0.165	0.146	-.062
Chinese	0.336	0.267	.129	0.203	0.357	.074	0.405	0.387	.158
Other	0.004	0.112	-.001	0.035	0.151	.011	-0.052	0.185	-.022
Degree or higher	-0.073	0.042*	-.030	-0.094	0.051*	-.033	-0.040	0.077	-.016
'A' level or equivalent	-0.132	0.046**	-.053	-0.151	0.058***	-.059	-0.094	0.078	-.040
Higher vocational	-0.053	0.045	-.022	-0.070	0.054	-.027	0.000	0.082	-.001
'O' level or equivalent	-0.045	0.040	-.018	-0.053	0.048	-.020	-0.024	0.060	-.010
CSE or equivalent	0.059	0.058	.020	0.057	0.072	.020	0.073	0.110	.022
Other qualification	0.049	0.070	.017	0.013	0.109	.005	0.072	0.099	.025
Married / Co-habiting	0.033	0.040	.011	-0.002	0.048	-.003	0.074	0.071	.027
Separated	-0.352	0.070***	-.138	-0.351	0.101***	-.134	-0.363	0.100***	-.143
Divorced	-0.149	0.051***	-.061	-0.171	0.071**	-.069	-0.124	0.078	-.049
Widowed	-0.180	0.087**	-.071	-0.274	0.148*	-.104	-0.106	0.124	-.042
Lone parent (living alone)	-0.036	0.061	-.016	0.099	0.200	.037	-0.061	0.081	-.028
Number of children (aged > 2)	0.051	0.016***	.020	0.023	0.019	.009	0.108	0.027***	.043
Number of infants (aged < 3)	-0.009	0.046	-.002	-0.011	0.057	-.002	0.030	0.075	.013
Acute illness in last 2 weeks (≤ 2 days)	-0.407	0.045***	-.160	-0.323	0.059***	-.125	-0.508	0.074***	-.200
Acute illness in last 2 weeks (≥ 3 days)	-0.764	0.046***	-.300	-0.664	0.067***	-.255	-0.922	0.087***	-.365
In-patient hospital stay in last year	-0.250	0.046***	-.101	-0.234	0.062***	-.092	-0.273	0.075***	-.110
Cancer	-0.180	0.102*	-.074	-0.237	0.155	-.092	-0.130	0.172	-.058
Heart Attack/Stroke	-0.179	0.075**	-.073	-0.244	0.089***	-.095	-0.071	0.143	-.034
Respiratory system	-0.182	0.043***	-.071	-0.180	0.055***	-.068	-0.188	0.075**	-.074
Stomach/colon/bowel/digestive system	-0.215	0.059***	-.086	-0.179	0.073**	-.072	-0.275	0.104***	-.107
Muscular/arthritis/rheumatism	-0.321	0.034***	-.127	-0.280	0.043***	-.108	-0.394	0.064***	-.158
Hypertension/high blood pressure	-0.179	0.075**	-.044	-0.011	0.082	-.005	-0.260	0.116**	-.102
Sight/hearing	-0.141	0.068**	-.054	-0.170	0.077**	-.064	-0.050	0.140	-.018
Migraine/epilepsy	-0.189	0.059***	-.072	-0.205	0.077***	-.078	-0.175	0.095*	-.066
Diabetes	-0.092	0.062	-.037	-0.067	0.082	-.023	-0.135	0.098	-.058
Other	-0.132	0.050***	-.053	-0.098	0.067	-.040	-0.161	0.078**	-.064

TABLE 2: (Continued)

Self-employed	0.021	0.043	.009	-0.009	0.046	-.002	0.124	0.095	.048
Unemployed * employment deprivation in DHA	0.029	0.011**	.011	0.025	0.014*	.006	0.031	0.018*	.012
Unemployed	-0.620	0.126***	-.241	-0.445	0.197**	-.165	-0.800	0.237***	-.317
Long-term sick	-0.642	0.057***	-.255	-0.651	0.076***	-.250	-0.608	0.050***	-.249
Non-participant	-0.139	0.038***	-.055	-0.179	0.064***	-.070	-0.153	0.056***	-.061
£5,200 - £10,400	0.107	0.056*	.042	0.020	0.080	.006	0.151	0.083*	.060
£10,400 - £20,800	0.148	0.056***	.056	0.110	0.078	.038	0.138	0.085*	.055
£20,800 - £31,200	0.231	0.061***	.088	0.162	0.083**	.058	0.288	0.098***	.113
£31,200 - £41,600	0.188	0.067***	.071	0.157	0.089*	.056	0.156	0.111	.058
> £41,600	0.166	0.067**	.063	0.130	0.088*	.054	0.114	0.107	.043
Income missing	0.202	0.061***	.078	0.163	0.082**	-.059	0.201	0.095**	.079
Rural	0.027	0.032	.013	-0.001	0.037	.001	0.064	0.053	.029
Urban	-0.032	0.038	-.012	-0.113	0.048**	-.044	0.110	0.062*	.039
IMD in DHA area	0.007	0.004*	.003	0.016	0.006***	.006	-0.002	0.002	-.002
IMD squared / 100	-0.015	0.008**	-.010	-0.028	0.010***	-.010	-	-	-
<b><i>I</i></b> (Intra-household correlation)	0.508	0.039***	-	0.252	0.200	-	0.771	0.111***	-
Constant	2.925	0.182***	-	3.082	0.262***	-	3.037	0.303***	-
<b><i>C</i></b> <sup>2</sup> test of exogeneity (degrees of freedom)		44.08 (35)			66.98 (32)			62.56 (33)	
Sample		11241			6437			4804	

Notes:

1. ME is the marginal effect calculated at the sample mean values and setting  $\mathbf{e}_{ih} = 0$ .
2. \* significant at 10% level; \*\* significant at 5% level; \*\*\* significant at 1 % level.
3. Omitted categories: female, white, no qualifications, single, not a lone parent (living alone), no acute illness in last two weeks, no in-patient hospital stays in last year, no long-term physical illness, employee, household income less than £5,200 per annum, suburban.
4.  $|t|$  is the absolute  $t$ -statistic.
5. Eight constant thresholds were also estimated and a year dummy included.

TABLE 3: Ordered Probit Household Random Effects Estimates of the Determinants of Psychosocial Health

Covariates	All			Men			Women		
	<i>b</i>	S.E.	ME	<i>b</i>	S.E.	ME	<i>b</i>	S.E.	ME
Age	-0.033	0.007***	-.013	-0.033	0.010***	-.014	-0.034	0.126***	-.012
Age squared / 100	0.035	0.009***	.014	0.032	0.011***	.013	0.044	0.015***	.016
Male	-0.324	0.029***	-.126	-	-	-	-	-	-
Black	-0.223	0.096**	-.084	-0.273	0.127**	-.106	-0.203	0.151	-.073
South Asian	-0.842	0.081***	-.322	-0.789	0.097***	-.307	-0.933	0.154***	-.340
Chinese	-0.660	0.212***	-.257	-0.686	0.273**	-.254	-0.815	0.301***	-.319
Other	-0.466	0.100***	-.179	-0.393	0.123***	-.157	-0.603	0.182***	-.217
Degree or higher	0.439	0.047***	.172	0.474	0.059***	.188	0.445	0.087***	.166
'A' level or equivalent	0.293	0.048***	.113	0.266	0.059***	.103	0.399	0.087***	.151
Higher vocational	0.264	0.056***	.104	0.278	0.055***	.112	0.287	0.089***	.108
'O' level or equivalent	0.205	0.038***	.080	0.243	0.050***	.096	0.195	0.063***	.073
CSE or equivalent	0.160	0.061***	.062	0.254	0.073***	.104	0.026	0.114	.005
Other qualification	0.173	0.065***	.065	0.170	0.098*	.065	0.153	0.096	.054
Married / Co-habiting	0.354	0.041***	.136	0.382	0.051***	.151	0.278	0.074***	.100
Separated	0.112	0.072	.039	-0.083	0.108	-.041	0.252	0.108**	.091
Divorced	0.117	0.051**	.042	0.068	0.072	.025	0.129	0.079*	.042
Widowed	0.309	0.087***	.118	0.021	0.150	-.003	0.310	0.124**	.113
Lone parent (living alone)	-0.002	0.063	-.002	0.138	0.188	.059	-0.009	0.082	-.003
Number of children (aged > 2)	-0.030	0.017*	-.012	-0.028	0.019	-.011	-0.034	0.029	-.013
Number of infants (aged < 3)	-0.035	0.049	-.013	-0.029	0.060	-.006	-0.039	0.079	-.018
Acute illness in last 2 weeks (≤ 2 days)	-0.033	0.049	-.012	-0.024	0.065	-.009	-0.037	0.079	-.013
Acute illness in last 2 weeks (≥ 3 days)	-0.057	0.047	-.022	-0.093	0.062	-.037	-0.015	0.073	.003
In-patient hospital stay in last year	-0.083	0.049*	-.032	-0.089	0.065	-.036	-0.087	0.076	.029
Cancer	0.124	0.119	.052	0.249	0.169	.121	0.005	0.178	-.008
Heart Attack/Stroke	0.106	0.077	.041	0.130	0.091	.046	0.067	0.143	.035
Respiratory system	-0.054	0.044	-.021	0.005	0.056	.002	-0.148	0.075**	-.053
Stomach/colon/bowel/digestive system	-0.158	0.061***	-.060	-0.130	0.073*	-.053	-0.201	0.110*	-.068
Muscular/arthritis/rheumatism	-0.048	0.035	-.018	-0.005	0.043	-.001	-0.133	0.062*	-.052
Hypertension/high blood pressure	-0.069	0.067	-.030	-0.022	0.083	-.016	-0.155	0.118	-.057
Sight/hearing	-0.139	0.069**	-.056	-0.137	0.079*	-.056	-0.058	0.130	-.021
Migraine/epilepsy	-0.077	0.062	-.033	-0.053	0.083	-.029	-0.111	0.098	-.040
Diabetes	-0.131	0.063**	-.049	-0.088	0.081	-.034	-0.223	0.102**	-.081
Other	0.007	0.051	.001	0.018	0.068	.005	-0.015	0.084	-.010

TABLE 3: (Continued)

Self-employed	-0.016	0.043	-.004	0.018	0.047	.009	-0.071	0.099	-.024
Unemployed * employment deprivation in DHA	0.008	0.011	.003	0.016	0.014	.006	-0.014	0.018	-.005
Unemployed	-0.295	0.136**	-.087	-0.340	0.190*	-.096	-0.150	0.237	-.036
Long-term sick	-0.198	0.058***	-.078	-0.164	0.073**	-.064	-0.173	0.102*	-.062
Non-participant	-0.063	-0.041	-.026	-0.044	0.065	-.020	-0.072	0.060	-.028
£5,200 - £10,400	0.164	0.055***	.066	0.255	0.081***	.100	0.082	0.081	.035
£10,400 - £20,800	0.268	0.057***	.107	0.340	0.080***	.133	0.238	0.088***	.092
£20,800 - £31,200	0.413	0.064***	.158	0.491	0.086***	.189	0.353	0.103***	.131
£31,200 - £41,600	0.503	0.071***	.193	0.550	0.094***	.213	0.517	0.123***	.191
> £41,600	0.535	0.071***	.209	0.593	0.093***	.235	0.502	0.119***	.188
Income missing	0.274	0.062***	.108	0.343	0.085***	.138	0.243	0.096**	.090
Rural	0.055	0.033*	.020	0.033	0.039	.013	0.078	0.057	.028
Urban	-0.011	0.039	-.003	-0.023	0.048	-.005	0.003	0.064	-.001
IMD in DHA area	0.001	0.001	.001	0.002	0.002	.001	-0.013	0.008*	-.005
IMD squared / 100	-	-	-	-	-	-	0.021	0.010*	.010
<b><i>R</i></b> (Intra-household correlation)	0.601	0.040***	-	0.453	0.116***	-	0.773	0.123***	-
Constant	2.882	0.172***	-	2.408	0.239***	-	3.179	0.344***	-
<b><i>C</i></b> <sup>2</sup> test of exogeneity (degrees of freedom)		46.14 (35)			35.21 (32)			31.53 (33)	
Sample		11241			6437			4804	

Notes:

1. ME is the marginal effect calculated at the sample mean values and setting  $\mathbf{e}_{ih} = 0$ .
2. \* significant at 10% level; \*\* significant at 5% level; \*\*\* significant at 1 % level.
3. Omitted categories: female, white, no qualifications, single, not a lone parent (living alone), no acute illness in last two weeks, no in-patient hospital stays in last year, no long-term physical illness, employee, household income less than £5,200 per annum, suburban.
4.  $|t|$  is the absolute  $t$ -statistic.
5. Eight constant thresholds were also estimated and a year dummy included.

Figure 1: The Distribution of Psychological Health by Gender

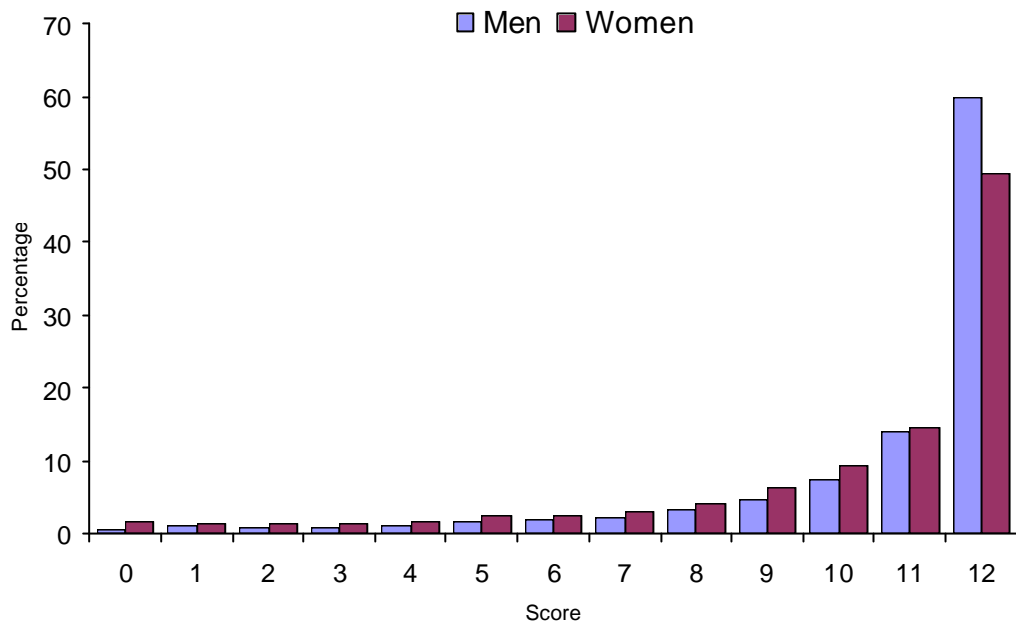


Figure 2: The Distribution of Psychosocial Health by Gender

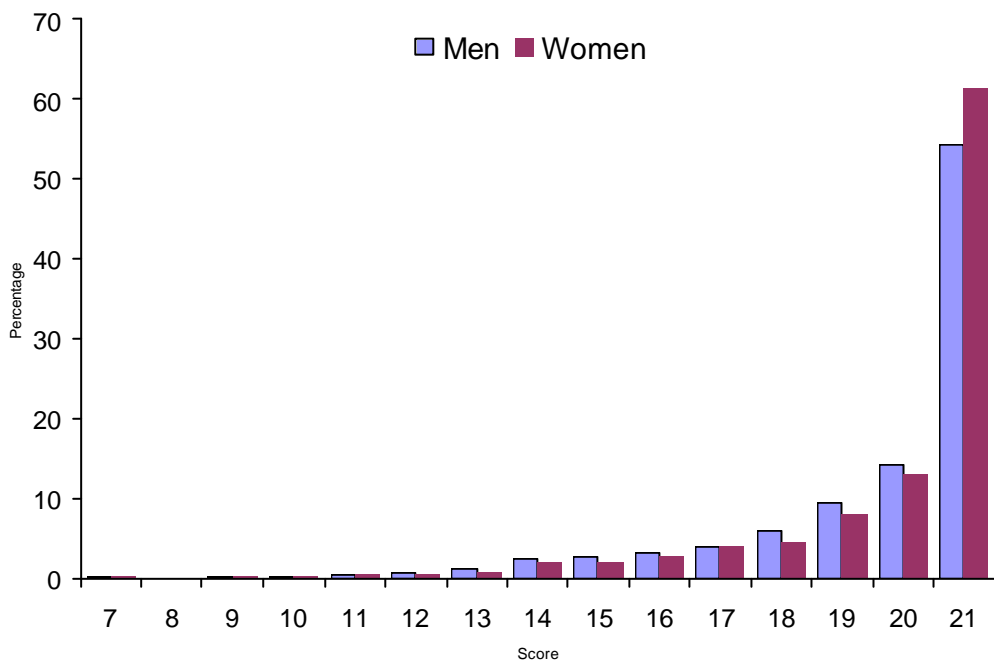
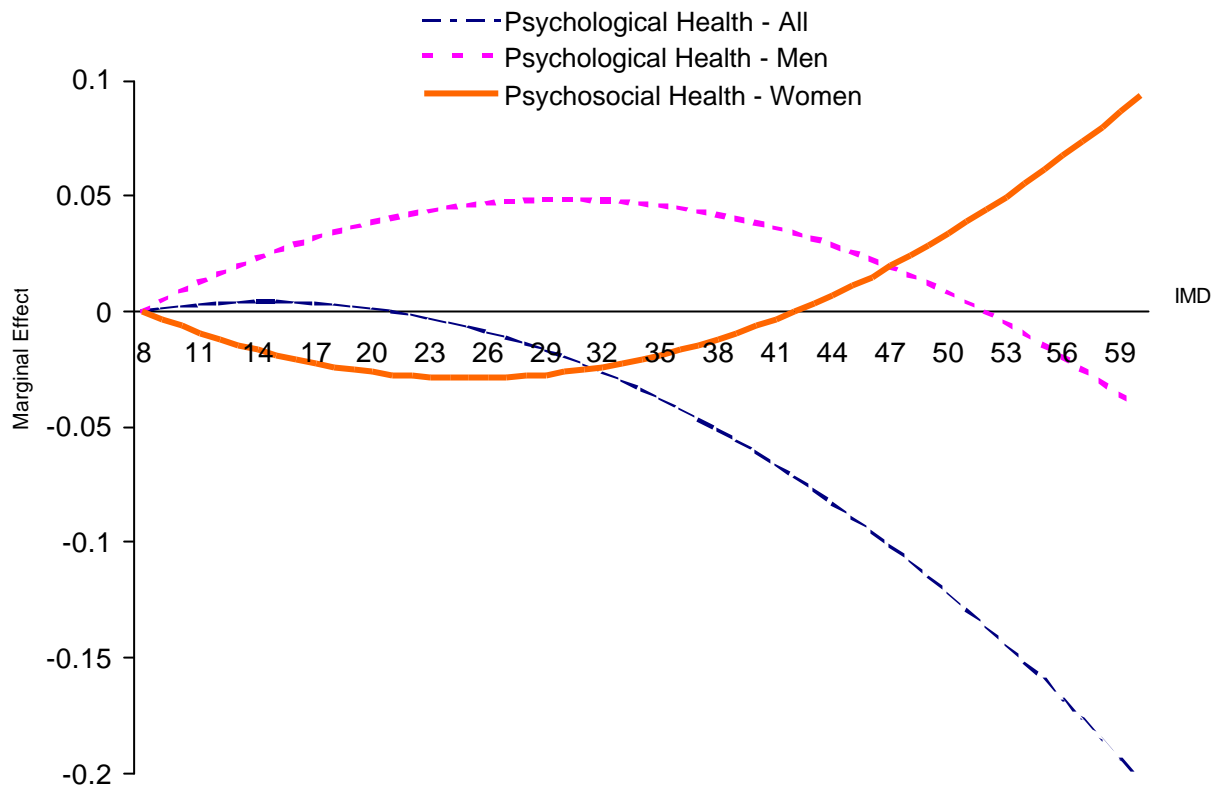




Figure 3: Deprivation and Psychological and Psychosocial Health



## Appendix 1

TABLE A1: District Health Authority Deprivation Measures

District Health Authority Area (DHA)	Employment Deprivation Index	Index of Multiple Deprivation	Sample Size (in DHA)
Avon	8.96	19.48	207
Barking & Havering	11.33	25.22	78
Barnet	8.36	16.63	65
Barnsley	20.75	42.53	50
Bedfordshire	8.22	19.76	149
Berkshire	5.28	12.27	188
Bexley & Greenwich	12.22	27.35	71
Birmingham	17.89	41.59	193
Bradford	14.75	39.26	121
Brent & Harrow	11.88	25.57	64
Bromley	7.46	12.64	63
Buckinghamshire	5.49	13.14	153
Bury & Rochdale	15.04	33.08	85
Calderdale & Kirklees	12.08	29.39	135
Cambridgeshire	7.13	16.08	129
Camden & Islington	19.33	40.80	70
Cornwall & Isles of Scilly	13.82	28.35	124
County Durham	17.74	35.38	161
Coventry	14.65	33.57	79
Croydon	9.53	21.04	50
Doncaster	18.76	38.97	80
Dorset	8.85	18.21	170
Dudley	10.99	24.58	64
Ealing, Hammersmith & Hounslow	11.88	27.58	115
East & North Hertfordshire	6.10	12.80	137
East Kent	11.42	24.85	116
East Lancashire	14.87	36.27	126
East London & The City	23.39	57.71	113
East Riding	14.31	30.13	149
East Surrey	4.60	7.91	80
East Sussex, Brighton & Hove	11.06	23.18	139
Enfield & Haringey	15.17	33.86	90
Gateshead & South Tyneside	20.51	40.96	98
Gloucestershire	7.67	15.90	99
Herefordshire	8.38	19.94	36
Hillingdon	7.55	18.30	58
Isle of Wight	14.93	29.34	33
Kensington Chelsea & Westminster	11.08	22.76	50
Kingston & Richmond	5.71	8.53	65
Lambeth, Southwark & Lewisham	17.89	39.74	165
Leeds	11.97	25.78	156
Leicestershire	9.28	21.31	277
Lincolnshire	10.65	22.89	134
Liverpool	28.26	58.05	125
Manchester	24.58	55.92	65
Merton, Sutton & Wandsworth	9.06	19.33	119
Morecambe Bay	13.29	25.30	93
Newcastle & North Tyneside	18.65	37.51	128
Norfolk	10.47	23.17	170

TABLE A1 (continued)

District Health Authority Area (DHA)	Employment Deprivation Index	Index of Multiple Deprivation	Sample Size (in DHA)
North & East Devon	10.42	21.44	109
North & Mid Hampshire	4.61	9.93	119
North Cheshire	14.70	29.98	89
North Cumbria	13.23	25.91	95
North Derbyshire	12.68	26.09	102
North Essex	8.24	17.76	208
North Nottinghamshire	15.19	33.08	99
North Staffordshire	13.56	31.27	115
North West Lancashire	13.69	29.60	103
North Yorkshire	8.35	15.81	149
Northamptonshire	7.83	17.51	102
Northumberland	14.49	27.85	79
Nottingham	12.91	29.04	171
Oxfordshire	4.99	11.88	155
Portsmouth & S E Hampshire	8.61	19.04	112
Redbridge & Waltham Forest	12.21	27.66	78
Rotherham	16.71	37.79	63
Salford & Trafford	14.57	31.17	104
Sandwell	15.79	42.70	54
Sefton	18.22	32.75	80
Sheffield	15.80	34.00	114
Shropshire	9.32	21.91	123
Solihull	9.01	17.52	33
Somerset	8.77	18.91	117
South & West Devon	13.51	27.22	154
South Cheshire	9.51	17.86	151
South Derbyshire	10.95	24.50	128
South Essex	9.60	21.32	187
South Humber	14.15	29.00	71
South Lancashire	11.38	21.80	52
South Staffordshire	8.60	18.48	148
Southampton & S W Hampshire	8.38	18.31	88
St Helens & Knowsley	24.01	47.77	80
Stockport	10.05	19.50	79
Suffolk	8.60	18.39	124
Sunderland	21.35	42.58	76
Tees	20.33	40.50	116
Wakefield Health Care	15.92	34.37	96
Walsall	14.79	38.72	42
Warwickshire	7.51	16.85	125
West Hertfordshire	5.47	10.86	135
West Kent	8.13	17.32	184
West Pennine	14.57	35.89	170
West Surrey	4.25	8.29	170
West Sussex	6.22	13.80	166
Wigan & Bolton	15.90	33.63	131
Wiltshire	6.38	14.29	143
Wirral	19.63	36.17	79
Wolverhampton	16.61	40.15	69
Worcestershire	7.53	17.30	125

TABLE A2: Sample Characteristics

Covariates	All		Men		Women		Value Range	
	Mean	S.E.	Mean	S.E.	Mean	S.E.	Min	Max
Age	41.381	0.120	42.01	0.150	40.53	0.191	16	64
Male	0.571	0.005	-	-	-	-	-	-
White	0.942	0.002	0.942	0.003	0.942	0.003	0	1
Black	0.017	0.001	0.015	0.002	0.019	0.002	0	1
South Asian	0.026	0.002	0.029	0.002	0.022	0.002	0	1
Chinese	0.003	0.001	0.003	0.001	0.004	0.001	0	1
Other	0.012	0.001	0.015	0.001	0.014	0.001	0	1
Degree or higher	0.164	0.003	0.187	0.005	0.133	0.005	0	1
'A' level or equivalent	0.121	0.003	0.124	0.004	0.116	0.005	0	1
Higher vocational	0.128	0.003	0.156	0.005	0.091	0.004	0	1
'O' level or equivalent	0.256	0.004	0.229	0.005	0.292	0.007	0	1
CSE or equivalent	0.054	0.002	0.061	0.003	0.045	0.003	0	1
Other qualification	0.040	0.002	0.024	0.002	0.061	0.003	0	1
No qualifications	0.237	0.004	0.219	0.005	0.262	0.006	0	1
Single	0.237	0.004	0.219	0.005	0.237	0.006	0	1
Married / Co-habiting	0.611	0.005	0.681	0.006	0.517	0.007	0	1
Separated	0.037	0.002	0.025	0.002	0.054	0.003	0	1
Divorced	0.096	0.002	0.066	0.003	0.144	0.005	0	1
Widowed	0.026	0.002	0.009	0.001	0.047	0.003	0	1
Lone parent (living alone)	0.059	0.002	0.006	0.001	0.130	0.005	0	1
Number of children (aged > 2)	0.630	0.009	0.060	0.012	0.617	0.014	0	6
Number of infants (aged < 3)	0.082	0.003	0.080	0.004	0.086	0.004	0	2
Acute illness in last 2 weeks ( $\leq 2$ days)	0.080	0.003	0.071	0.003	0.091	0.004	0	1
Acute illness in last 2 weeks ( $\geq 3$ days)	0.083	0.003	0.072	0.003	0.097	0.004	0	1
In-patient hospital stay in last year	0.073	0.002	0.062	0.003	0.086	0.004	0	1
Cancer	0.011	0.001	0.008	0.001	0.014	0.002	0	1
Heart Attack/Stroke	0.003	0.002	0.034	0.002	0.023	0.002	0	1
Respiratory system	0.088	0.003	0.088	0.004	0.088	0.004	0	1
Stomach/colon/bowel/digestive system	0.041	0.002	0.047	0.003	0.036	0.003	0	1
Muscular/arthritis/rheumatism	0.167	0.004	0.173	0.005	0.160	0.005	0	1
Hypertension/high blood pressure	0.036	0.002	0.036	0.002	0.035	0.003	0	1
Sight/hearing	0.033	0.002	0.040	0.002	0.024	0.002	0	1
Migraine/epilepsy	0.041	0.002	0.035	0.002	0.050	0.003	0	1
Diabetes	0.041	0.002	0.038	0.002	0.045	0.003	0	1
Other	0.071	0.002	0.067	0.002	0.076	0.004	0	1
Self-employed	0.101	0.003	0.137	0.004	0.053	0.003	0	1
Employee	0.618	0.005	0.666	0.006	0.554	0.007	0	1
Unemployed	0.049	0.002	0.048	0.003	0.049	0.003	0	1
Long-term sick	0.063	0.002	0.073	0.003	0.049	0.003	0	1
Non-participant	0.170	0.004	0.076	0.003	0.295	0.007	0	1
<£5,200 per annum	0.076	0.003	0.049	0.003	0.112	0.005	0	1
£5,200 - £10,400	0.122	0.003	0.099	0.004	0.154	0.005	0	1
£10,400 - £20,800	0.241	0.004	0.244	0.005	0.237	0.006	0	1
£20,800 - £31,200	0.190	0.004	0.213	0.005	0.160	0.005	0	1
£31,200 - £41,600	0.108	0.003	0.123	0.004	0.088	0.004	0	1
> £41,600	0.138	0.003	0.152	0.004	0.119	0.005	0	1
Income missing	0.126	0.003	0.121	0.004	0.132	0.005	0	1
Rural	0.237	0.004	0.244	0.005	0.228	0.006	0	1
Suburban	0.616	0.005	0.616	0.006	0.616	0.007	0	1
Urban	0.147	0.003	0.140	0.004	0.156	0.005	0	1
IMD in DHA area	25.466	0.100	25.36	0.132	25.61	0.152	7.91	58.05
Sample	11241		6437		4804			

Notes:

1. SE is the standard error, Min is the minimum value and Max is the maximum value of the mean.

## Appendix 2 – The Relevant Health Survey of England Questions (Booklet for Adults)

### *The General Health Questionnaire 12 Score Questions*

**Instruction:** We should like to know how your health has been in general over the past few weeks. Please answer ALL questions (indicating) which (choice of answer given in brackets below each question) you think most applies to you.

#### **HAVE YOU RECENTLY:**

1. been able to concentrate on whatever you're doing?  
(better than usual; same as usual; less than usual; much less than usual)
2. lost much sleep over worry?  
(not at all; no more than usual; rather more than usual; much more than usual)
3. felt that you are playing a useful part in things?  
(more so than usual; same as usual; less so than usual; much less than usual)
4. felt capable of making decisions about things?  
(more so than usual; same as usual; less so than usual; much less than usual)
5. felt constantly under strain?  
(not at all; no more than usual; rather more than usual; much more than usual)
6. felt you couldn't overcome your difficulties?  
(not at all; no more than usual; rather more than usual; much more than usual)
7. been able to enjoy your normal day-to-day activities?  
(more so than usual; same as usual; less so than usual; much less than usual)
8. been able to face up to your problems?  
(more so than usual; same as usual; less so than usual; much less than usual)
9. been feeling unhappy and depressed?  
(not at all; no more than usual; rather more than usual; much more than usual)
10. been losing confidence in yourself?  
(not at all; no more than usual; rather more than usual; much more than usual)
11. been thinking of yourself as a worthless person?  
(not at all; no more than usual; rather more than usual; much more than usual)
12. being feeling reasonably happy; all things considered?  
(more so than usual; same as usual; less so than usual; much less than usual)

## Appendix 2 – continued

### *The Perceived Social Support Score Questions*

**Instruction:** We would now like you to think about your family and friends. By family we mean those who live with you as well as those elsewhere. Here are some comments people have made about their family and friends. We would like you to say how far each statement is true for you. Please answer ALL questions (indicating) which (choice of answer given in brackets below each question) you think most applies to you.

13. There are people I know – amongst my family or friends – who do things to make me feel happy. (not true; partly true; certainly true)
14. There are people I know – amongst my family or friends – who make me feel loved. (not true; partly true; certainly true)
15. There are people I know – amongst my family or friends – who can be relied upon no matter what happens. (not true; partly true; certainly true)
16. There are people I know – amongst my family or friends – who will see that I am taken care of if I needed to be. (not true; partly true; certainly true)
17. There are people I know – amongst my family or friends – who accept me just as I am. (not true; partly true; certainly true)
18. There are people I know – amongst my family or friends – who make me feel an important part of their lives. (not true; partly true; certainly true)
19. There are people I know – amongst my family or friends – who give me support and encouragement. (not true; partly true; certainly true)

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