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Gender Differences in Mental Well-Being: A Decomposition Analysis

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January 2008

Abstract: The General Health Questionnaire (GHQ) is frequently used as a measure of mental well-being. A consistent pattern across countries is that women report lower levels of mental well-being, as measured by the GHQ. This paper applies decomposition techniques to Irish data for 1994 and 2000 to examine the factors lying behind the gender differences in GHQ score. For 1994 most of the difference is accounted for by characteristics while in 2000 most of the difference arises from returns to characteristics. The issue of path dependence, or choice of reference group, is shown to be important, mostly arising from the differing effect of principal economic status on men and women.

Keywords: GHQ, decomposition, path dependence.

JEL Codes: I12, I31, I32.

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Gender Differences in Mental Well-Being: A Decomposition Analysis

1. Introduction

The General Health Questionnaire (GHQ) first introduced by Goldberg (1972) is one of the most commonly employed measures of mental health. The original development of the measure involved a 60 item version (GHQ-60) with the "best" 30, 20 and 12 of these items being identified for use when the respondent's time was at a premium (giving rise to the GHQ-30, GHQ-20 and GHQ-12 measures respectively). Items in the GHQ consist of a question asking whether the respondent has recently experienced a particular symptom or item of behaviour rated on a four-point scale. For example a respondent might be asked the question: have you recently been feeling reasonably happy, all things considered? The respondent then answers from one of the following four categories: more so than usual, same as usual, less than usual, or much less than usual.

The GHQ score can be used as a predictor of an individual being a psychiatric case. The score is highly correlated with standardised clinical interviews and in a review of six validity studies of the GHQ-12, Goldberg and Williams (1988) reported sensitivity rates (proportion of cases correctly identified) of between 71% and 91%, as well as specificity rates (proportions of normals correctly identified) of between 71% and 91%. The variance weighted mean of sensitivity and specificity rates were 89% and 80% respectively.

Two main scoring systems are then used to summarise the GHQ score. The first, the GHQ method, assigns a score of 0 if the individual answers in either of the first two categories or 1 if answering either of the latter two categories. The alternative scoring method is the Likert method where responses are given weights of 0,1,2, and 3. In this case, the "best" GHQ score in terms of mental well-being is a score of 0, while the worst is a score of 36. In some cases, the Likert ordering may be reversed, so that weights of 3, 2, 1, and 0 are given, in which case the best score is 36 and the worst is 0. This is the scoring system employed in the analysis here.

In terms of the choice between GHQ and Likert scoring systems, Banks et al (1980) suggest that the Likert method is to be preferred to the GHQ method in studies using parametric multivariate techniques, since its distribution more closely approximates the normal.

There is evidence to suggest that women exhibit higher rates of minor psychiatric morbidity and depression than men (Goldberg and Williams, 1988). Bebbington (1998) and Bebbington et al (1998) consider the possible factors lying behind the higher rates of depressive disorder for women. What they term “macrosocial” factors such as income, marital and employment status are clearly important but their effect differs across countries arguably because they reflect other underlying conditions. They note evidence that age appears to be important, with the female:male ratio of depressive disorder showing an “inverse U” relationship. The increase in the female excess around the time of puberty and the decline around the time of menopause is suggestive of a role for hormones. However, it is difficult to relate the changes in the female:male ratio to actual hormonal changes. Thus it is possible that the changes in the female:male ratio around the time of puberty and the menopause may reflect the fact that these are times of social and psychological transition, rather than any hormonal changes.

Weich et al (2001) investigated whether the higher presence of common mental disorders (as measured by the GHQ-12) amongst women compared to men could be accounted for by differences in the number of social roles (e.g. paid worker, carer, living with dependent children etc) played by men and women. They found no statistically significant effect, a result which is echoed by the papers of Emslie at al (1999, 2002) who also investigate the effect of social role and find no effect. An interesting contribution to this literature is by Gunnell et al (2002) who show that while women have higher rates of minor mental disorders, men have suicide rates which are about three times higher. This indicates either a higher long-term risk of suicide following a past episode of minor mental disorder among men or else gender differences in the validity of responses to mental health screening questionnaires.

Kuehner (2003) reviews the literature on gender differences in unipolar depression and finds that the gender difference shows no sign of narrowing over time. She concludes that more integrative models are needed which take into account psychological, psychosocial and macrosocial factors and their interactions and which also connect with physiological and endocrine responses.

This paper adopts a multivariate approach to investigate the factors lying behind gender differences in GHQ scores in Ireland for two years, 1994 and 2000. We choose two years in order to investigate whether the gender difference and the factors lying behind it have changed over time. We borrow techniques from the labour economics literature to decompose the difference in GHQ scores into that part attributable to differences in underlying characteristics (such as age, education, employment status etc) and that attributable to the "return" to these characteristics i.e. the impact of these characteristics on GHQ score. The remainder of the paper is as follows. In the next section we briefly explain the decomposition approach we take. In section 3 we discuss our data source and present results of the decomposition. Section 4 discusses the issue of "path dependence" or choice of reference group while section 5 presents concluding comments.

2. The Blinder-Oaxaca Decomposition

The decomposition approach we adopt is the well-known one from labour economics associated with Blinder and Oaxaca (Blinder, 1973, Oaxaca, 1973). This has become a standard technique for decomposition of "gaps" in outcomes such as wages between different population groups. Typically the population is partitioned into two groups on the basis of a variable which in principle should not affect the outcome in question. Thus wage gaps between groups which are partitioned on the basis of gender, race or religion may be decomposed into a part accounted for by differences in characteristics and a part accounted for by differences in the returns to characteristics. Blinder-Oaxaca (henceforth B-O) type decompositions have typically been carried out using linear regression models owing to the attractive property that such models fit "exactly" at the mean of the sample, but the approach has also been used for binary, ordered and count models (Madden, 2000, Demoussis and Giannakopolous, 2007, and Bauer et al, 2007 respectively). Although an ordered probit approach could be adopted with our data, for reasons we discuss below we adopt the linear regression approach in the main text of the paper.

The standard B-O decomposition follows from an equation of the following type:

$$Y_i = X_i'\beta_i + \varepsilon_i$$

where Y_i refers to the outcome (in this case GHQ score) for individual i (who may be male or female, X_i is a vector of determinants of GHQ (e.g. age, education, marital status etc.), β_i is the associated parameter vector and ε_i is an error term following a normal distribution (0, σ_ε). The standard B-O decomposition then breaks down the difference between male and female GHQ in the following way:

$$\bar{Y}_m - \bar{Y}_f = (\bar{X}_m - \bar{X}_f)'\hat{\beta}_m + \bar{X}_f'(\hat{\beta}_m - \hat{\beta}_f)$$

where $\bar{Y}_m$ is the predicted mean GHQ for males, $\bar{X}_m'$ is the mean vector of variables for males which determine GHQ and $\hat{\beta}_m$ is the vector of estimated returns to the GHQ determinants for males (likewise for females with the "f" subscript).

The first term on the right hand side is that part of the gap (evaluated at the mean) which can be assigned to differences in characteristics, while the second term is that part of the gap assigned to differences in the returns to characteristics. In turn the contribution of each of the variables in the X vector to the overall difference in characteristics can be calculated (and likewise with respect to the returns to characteristics). The difference in GHQ scores arising from the difference in characteristics is sometimes known as the "explained" part while the difference arising from differences in the returns to characteristics may be labelled the "unexplained" part (when these decompositions are carried out for wage gaps the unexplained part is sometimes regarded as that portion of the gap arising from discrimination).[1]

The analysis above assumes that the dependent variable is cardinal, as would be the case for, say, wages. In this paper the dependent variable, the GHQ, is an ordered categorical variable, albeit with quite a high number of categories (from 0 to 36). Strictly speaking, the appropriate modelling technique in these circumstances is an ordered probit or ordered logit (for an account of these models, see Wooldridge,

[1] For a discussion of the differing meaning which economists and lawyers attach to the concept of discrimination, see Ashenfelter and Oaxaca (1987).

2002). While Blinder-Oaxaca type decompositions can be carried out with ordered response models, it is not possible to estimate the contribution of each individual variable to the explained and unexplained parts of the decomposition. This is because while the sign of the estimated coefficient in an ordered model will give the direction of the effect of an independent variable on the probability of *Y* taking on the lowest and highest categories (GHQ values of 0 and 36), the sign does not always determine the direction of the effect for intermediate outcomes. Thus for the main text of this paper we estimate and carry out the decomposition assuming that the GHQ is a cardinal variable and employ the linear specification above. In the appendix we estimate ordered probit models and carry out the basic decomposition for these models. The outcomes are qualitatively very similar to the results with the linear model, so we are confident that the cardinality/linearity assumption is exercising very little influence on the results of the paper.

Decompositions of the above type will be sensitive to whichever group's GHQ is assumed to be the norm (in the example above it is assumed that the male score is the norm). This is a standard path-dependence (or index number) issue and typically it has relatively little effect on the qualitative results obtained.[2] However, in this particular application path dependence is a more substantial issue for reasons which will be discussed in section 4. For the first set of results in this paper we select the GHQ structure of the higher-value group (i.e. the male GHQ structure) as the norm. We now give an account of our data and present results.

3. Data and Results

In this section we apply the approach outlined above to Irish data. The data comes from two waves of the Living in Ireland Survey (LII), 1994 and 2000. The LII survey is a nationally representative survey which forms the Irish part of the European Community Household Panel Survey. It has been used extensively in a variety of studies on (amongst other issues) poverty, deprivation and education. The LII survey is available on an annual basis for each year from 1994 to 2001. As 1994 was the initial year of the survey and in 2000 a booster sample was added to combat attrition,

[2] See Oaxaca and Ransom (1994) for a discussion of this issue.

we believe that the samples in these particular years are most representative of the national population.[3]

Our dependent variable is GHQ-12 which takes on values from 0 to 36, with a value of zero representing the greatest level of mental stress and a value of 36 representing the least. In figure1 we present a histogram of GHQ-12 for males and females while figure 2 presents histograms by gender (figures 3 and 4 present the histograms for 2000). The distribution shows greatest mass towards the right, indicating that most people report relatively low levels of mental stress. There is also some evidence of "bunching" around certain values e.g. 30 and 24. It is not easy to detect differences by gender simply by eye-balling the graphs, however there is some evidence of slightly greater mass towards the middle and left of the distribution for females, indicating higher levels of stress.

This difference in GHQ-12 values by gender are confirmed by table 1 which gives average values for males and females for 1994 and 2000 and shows that the excess of GHQ for males was of the order of 3.4% in 1994 and 2.8% in 2000. It is also worth noting that average values for both male and female increased over the period, indicating lower levels of mental stress in 2000 compared to 1994 (see Madden 2007). That the difference by gender is statistically significant is confirmed by the preliminary regression in table 2, which regresses GHQ-12 against a variety of variables using the pooled male and female sample. We observe that, controlling for other variables, being female tends to reduce the GHQ score by about one unit. The age-sex interaction term is positive and significant, indicating that the gap between male and female shrinks as people get older. The variables with the greatest impact upon GHQ are marital status, health and principal economic status (at work, unemployed etc). The decomposition analysis will permit us to investigate whether the impact of these variables differ by gender.

We should bear in mind that the results presented in table 2 do not constitute a structural model of the determination of GHQ. Instead we estimate a reduced form equation for GHQ which attempts to identify those factors affecting GHQ without

[3] For a more detailed discussion of the LII survey, see Nolan et al (2002) and Watson (2004).

specifying the pathway whereby this effect comes about. Thus the estimating equations (and consequent decompositions which we carry out) are very much in the spirit of Clark and Oswald (1994, 2002). We model GHQ as depending upon the following variables: age, income, marital status, education, health, principal economic status (which mainly reflects labour force status), and two social capital variables, membership of a club or society and religious attendance. For some covariates the direction of causality should be interpreted with caution. Thus not being a member of a club or society may act to lower GHQ score, but it is arguably just as likely that causality is in the other direction i.e. suffering from mental stress and having a low GHQ decreases the probability that one would join a club.

Note that many of the variables which enter the reduced form model for mental stress are categorical variables, such as education or marital status. Oaxaca and Ransom (1999) point out an identification problem which can arise with decompositions when one or more of the right-hand variables is categorical. The separate contributions of sets of dummy variables to the unexplained portion of the decomposition are not invariant to the choice of reference group for categorical variables (i.e. the omitted category). A solution to this issue is provided by Gardeazabal and Ugidos (2004) who point out that identification can be obtained via a normalisation restriction on the coefficients of each set of dummy variables. The restriction is that for a categorical variable X_j with G groups, the sum of the coefficients on the G groups must be zero i.e. $\sum_{g=1}^{G} \hat{\beta}_{gj} = 0$. Thus essentially, in the case of the categorical variable, rather than estimating the coefficient $\hat{\beta}_{gj}$ i.e. the coefficient for X_{gj} the gth group of categorical variable j, we estimate the coefficient on (X_{gj}-X_{1j}) where group 1 is the reference category.

Before carrying out the decomposition by gender, we first present the characteristics of the population (in terms of the variables in table 2) by gender and year. In terms of differences in characteristics by gender, we note that females tend to be in families with slightly lower income and also have higher rates of widowhood, reflecting lower life expectancy for males. The educational profile is different, with more women listing the Leaving Cert as their highest level of education while a slightly higher fraction of males have third level education. The greatest difference in characteristics is to be observed in terms of principal economic status. A significantly higher fraction of males are in the labour force (either unemployed or working, the default category) while there is a correspondingly higher fraction of females on home duties. Males are more likely to be a member of a club or association, while women are more likely to attend religious services. In terms of changes over time, the sample in 2000 was older (despite the addition of the booster sample) but probably the biggest change in terms of characteristics is the reduction in the fraction of men unemployed and in the fraction of women on home duties. There is also a lower fraction of both genders reporting health problems and also lower religious attendance.

Table 4 presents regression results for males and females for 1994 and 2000. In terms of differences in the coefficients, we note that the magnitude of the effect of marital status differs by gender – being married or single has a positive effect for both males and females, but the magnitude is greater for females and it is also greater in 1994 compared to 2000. The same can be said of the *negative* effect of separation/divorce. The positive effect of education on GHQ appears to be greater for females, as does the negative effect of health problems. In 1994, being unemployed has a negative effect for both males and females, and by 2000 the negative effect for males has diminished, while it has disappeared for females. The effect of being on home duties is strongly negative for males in 1994 and approaching conventional significance levels (perhaps reflecting disguised unemployment) but by 2000 this effect has disappeared. The slightly stronger positive effect of club membership on GHQ for males (in 1994 at least) compared to females and the slightly stronger effect of religion for females compared to males mirrors the differences in characteristics and suggests that both club membership/religion and GHQ are being simultaneously determined and reinforces the earlier comments regarding direction of causation.

We now turn to the decompositions. As shown in table 5, for 1994, the gap in average GHQ by gender was approximately 0.85. The explained gap taking account of characteristics alone and using the vector of male returns, β_m, as the "norm" is

1.81 or 213% of the actual gap. Thus if females had the same returns to characteristics as males, then their average GHQ gap with regard to males would be more than twice as great as it actually is. The unexplained gap in 1994 is correspondingly about –0.96, or –113% i.e. if females had the same characteristics as males then they would have a GHQ score approximately one unit higher than males. The decomposition for 2000 shows an explained gap of about 0.08 (11%) and an unexplained gap of about 0.65 (89%). Thus the principal part of the difference in GHQ scores in 1994 was accounted for by characteristics, while in 2000 it was accounted for by returns to characteristics. This arises principally from the change in the return to "home duties". This variable had a negative effect on GHQ in 1994 and then a positive effect in 2000. A possible explanation is that in 1994 many males on home duties were actually "disguised unemployed" and were on home duties involuntarily, with a consequent negative effect on GHQ. By 2000, with virtually full employment, a much higher proportion of those males on home duties were in that category voluntarily.

Table 5 also gives the decomposition when females are the reference group and for both 1994 and 2000 the breakdown between characteristics and the return to characteristics is much more even. In both cases they each account for about 50% of the gap. This shows the importance of path dependence which we return to in more detail in section 4.

Table 6 then shows the breakdown of the explained and unexplained gaps by variable. In terms of the explained difference in 1994, the bulk of the difference is accounted for by principal economic status, in particular the higher proportion of men at work and the lower proportion of men on home duties. It is possible that home duties also represented disguised unemployment for some women. In terms of the unexplained gap (remember this portion alone suggests a GHQ premium for women), the greatest proportion is accounted for by the higher return to being on home duties, being married, income and attending religious services.

The decomposition for 2000 is quite different. First of all, both the explained and unexplained gaps work in the same direction i.e. males have higher GHQ not just because of a more favourable set of characteristics but also because they get a "better" return from those characteristics. In terms of the decomposition of the explained gap, the greatest contribution comes once again from principal economic status, with a higher proportion working and retired. This is offset to some degree by the lower proportion on home duties (note that the difference in this characteristic is weighted by the male return, which is positive in 2000, an issue we return to below). In terms of the unexplained gap, the biggest fraction is accounted for by the difference in the constant which can be regarded as simply reflecting differences in unobservables. This is offset to some degree by the more preferable returns to age, income and religious attendance received by females.

4. Path Dependence in Decomposition Models

As pointed out above, the results obtained from a B-O decomposition can be sensitive to the choice of reference group (i.e. whether β_m or β_f is regarded as the reference vector of returns to characteristics). It has generally been the practice in B-O studies of wage discrimination to take the higher wage group as the reference group. In this case the unexplained portion of the raw wage gap is interpreted as discrimination against the lower wage group. If the lower wage group is taken as the reference group then the unexplained portion of the wage gap is interpreted as favouritism towards the higher wage group (see Oaxaca and Ransom, 1994).

Another approach to the path dependence issue is to regard neither group as being the reference group but to instead assume there is an underlying non-discriminatory model (whose vector of returns can be denoted as β^*), thus permitting both favouritism and discrimination to exist. In this case the decomposition is:

$$\bar{Y}_m - \bar{Y}_f = \bar{X}'_f(\beta^* - \hat{\beta}_f) + \bar{X}'_m(\beta_m - \beta^*) + (\bar{X}_m - \bar{X}_f)'\beta^*$$

where the first two terms on the right hand side of the equation represent the unexplained portion of the gap (“discrimination” and “favouritism” respectively) while the third term represents the explained portion.

In the case we are dealing with here the distinction between discrimination and favouritism seems less plausible. There is no model of the determination of GHQ corresponding to a model of the labour market. Nor do we have employers who can confer favouritism or discrimination. Yet the issue of path dependence remains, and in some sense may be even more relevant. Typically in an investigation of wage discrimination the issue revolves around differences in the magnitude of returns to characteristics. Thus the return to higher education may be greater for the higher wage group, but it will typically be positive for both groups. This is not always the case when decomposing differences in GHQ. For example, in the regressions by gender in table 4 we note that the *sign* of the return to certain characteristics (3^{rd} level education and home duties) differs by gender (though in the case of home duties none of the coefficients are significantly different from zero).

In this case it thus seems less useful to think in terms of some “true” underlying non-discriminatory pattern of returns, and so the approach of Fournier (2005) seems more appropriate. He maintains that path dependence should not be seen as a limitation of a decomposition approach but instead as a valuable source of information concerning the underlying process.

Table 6 replicates table 5 except that this time the reference group is females, while in table 7 we present the *difference* between the proportional contributions of the variables depending upon choice of reference group. In interpreting table 7 bear in mind that a positive value indicates that this variable is assigned a larger proportion of the explained (or unexplained) gap when males are the reference group. For the explained gap in 1994, some of the differences are quite small in absolute amounts. The exceptions are being single, the various categories of labour force status, being a club member and attending religious services. The case of home duties reflects the point above that in 1994 it has a negative effect on GHQ for males, but a positive effect for females. In 2000 the sign changes for both genders, though in both years the absolute value of the coefficient is considerably smaller for women. For the case of the unexplained gap, the differences tend to be larger in absolute size. The largest absolute differences arises in the cases of age, income, being married, working, being on home duties and religious attendance. In the case of age, when males are the reference group this acts to reduce the gap, whereas when females are the reference group it provides a positive contribution to the gap.

Absolute differences in the case of characteristics are in general higher in 2000 than in 1994. In terms of the explained gap, the largest absolute differences are found in the categories of working, being on home duties and being retired. In the case of home duties, when males are the reference group home duties acts to reduce the gap. In this case, the difference in this particular characteristic between men and women is being weighted by the male return, which is positive. However, when females are the reference group it is weighted by the negative, female, return. For the case of working, while in both cases its contribution to the gap is the same direction, the magnitude in the case where males are the reference group is much larger. In the case of returns in 2000, by far the largest differences are observed with age and income. For age, regardless of the choice of reference group it acts to reduce the gap. However the proportionate reduction is more than twice as great when females are the reference group. A similar phenomenon is observed in the case of income.

The extra information regarding the decompositions provided by tables 6 and 7 can seem somewhat confusing and care must be taken in interpreting the results. The key issue here is the different role which different factors can play in terms of their effect on male and female GHQ. For any variable for which there is a relatively large difference in characteristics then the choice of reference return, $\hat{\beta}_{jm}$ or $\hat{\beta}_{jf}$ can be critical. This is why the variables referring to principal economic status (working, unemployed, home duties etc) tend to be those where choice of reference group is important, as typically the difference in characteristic is quite large, but the magnitude (and sometimes even the direction) of the return to the characteristic can differ quite substantially between men and women. Since the return effectively determines the weight assigned to the difference in characteristic the proportion of the gap accounted for by these variables is affected by path dependence. Hence, in terms of explained differences, home duties are important when viewed from the male perspective, but relatively unimportant when viewed from the female perspective. The case of principal economic status is further complicated by the fact that for one of its categories, home duties, the sign of the return changes over time. This may reflect a change in composition between those voluntarily and involuntarily on home duties. This may relate back to the work of Emslie et al (1999, 2000) who conjectured that the greater number of social roles held by women may give rise to greater mental stress. What this paper has shown is that social roles (if we view principal economic status as a proxy for social role) may be an important factor in explaining the difference in mental stress between men and women. However, rather than the number of social roles being the key factor, it is perhaps the different impact of certain social roles on the different genders which may be most relevant.

5. **Conclusions**

This paper has addressed the issue of the higher level of mental stress (as measured by GHQ score) of women compared to men using the well-known Blinder-Oaxaca decomposition method. The analysis is applied to Irish data for two different years, 1994 and 2000. The analysis for 1994 suggests that the raw gap is completely accounted for (in fact over accounted for in that it explains more than 100% of the gap) by differences in characteristics, with the greatest individual contributions coming from differences in principal economic status. The analysis for 2000 assigns a proportionally smaller role to characteristics (only about 11% of the raw gap) with principal economic status continuing to play an important role, and an increased contribution (compared to 1994) from marital status and health. In terms of the contribution of individual factors to the unexplained portion, the crucial variables in 1994 are principal economic status, marital status and income. In 2000 the most important contributions are from differences in unobserved factors (as reflected in the constant) and also age and income.

The issue of path dependence, or choice of reference group is also seen to be particularly important. This arises both in terms of the decomposition of the raw gap into explained and unexplained portions, and the contribution of individual variables to these portions. When females are chosen as the reference group then for both years both characteristics and the return to characteristics account for approximately equal parts of the gap. In terms of the contribution of individual factors, the issue of path dependence takes on particular importance when there is a variable with a large difference in characteristics between men and women, principal economic status being perhaps the best example of this.

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Figure 1: GHQ-12 (1994)

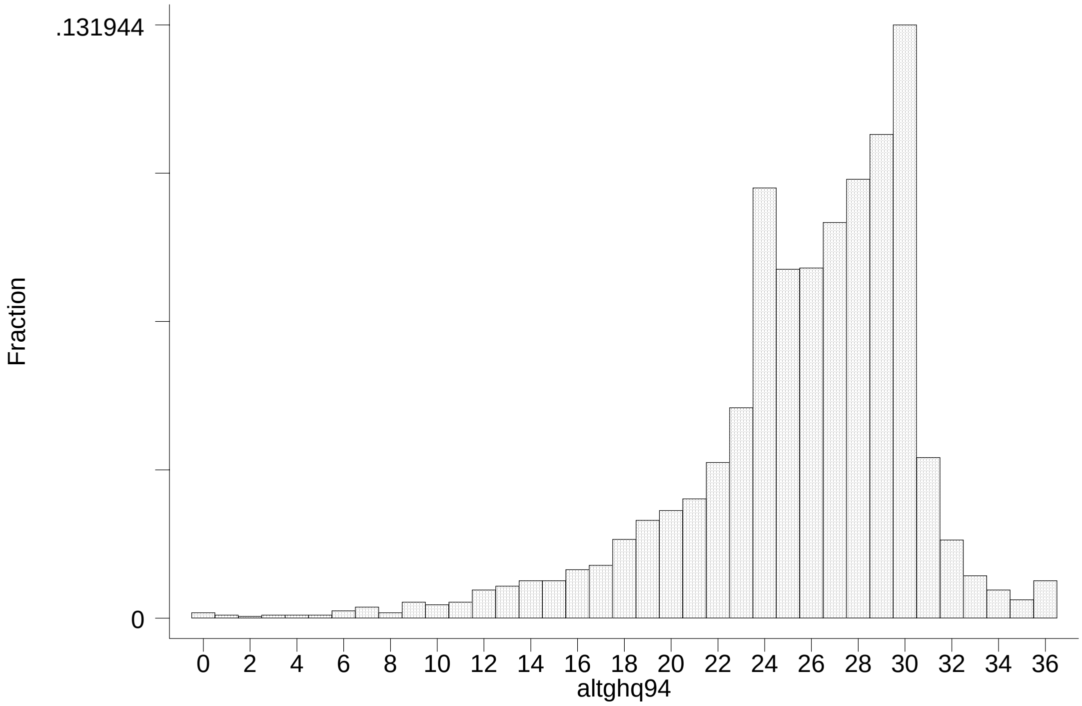

Figure 2: GHQ-12 (1994) by Gender (male=0, female=1)

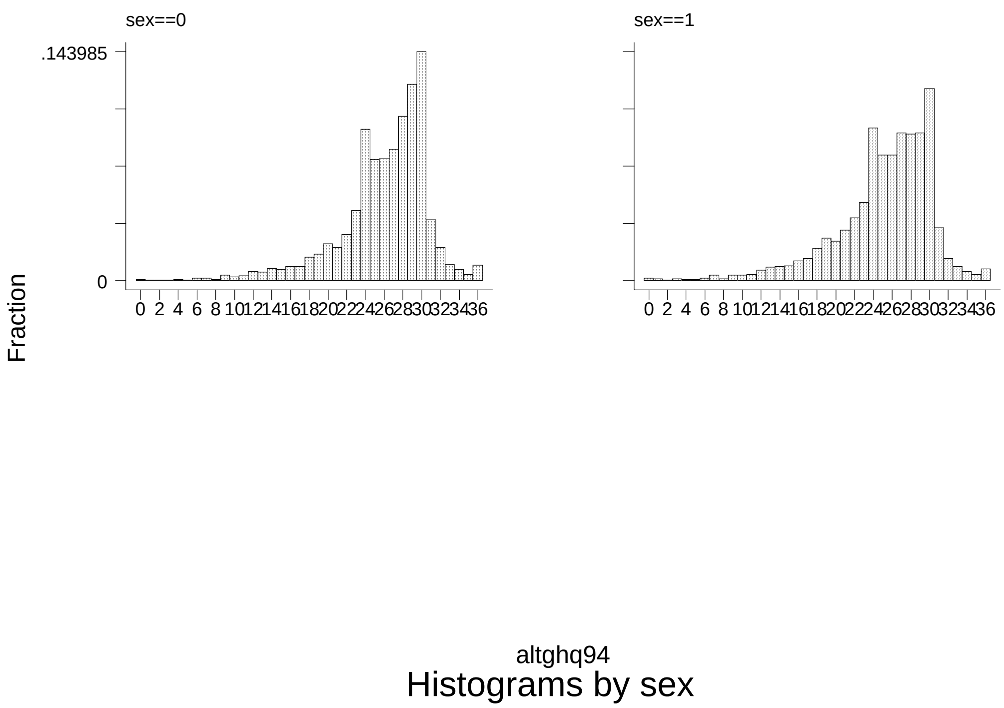

Table 1: GHQ by Gender, 1994 and 2000

	Male	Female	% Difference
1994 (n=8731)	26.04	25.19	3.4
2000 (n=6612)	26.54	25.81	2.8

Table 2: OLS Regression of GHQ, 1994 and 2000

Variable	1994 (n=8721)	2000 (n=6608)
Age	-0.093	-0.046
	*(0.021)****	*(0.021)***
Age^2	0.001	0.000
	*(0.000)****	*(0.000)*
Sex	-1.046	-0.946
	*(0.274)****	*(0.283)****
Age*Sex	0.015	0.014
	*(0.006)***	*(0.006)***
Income (log)	0.370	0.227
	*(0.089)****	*(0.085)****
Married	0.703	0.386
	*(0.125)****	*(0.115)****
Separated/Divorced	-1.405	-0.497
	*(0.282)****	*(0.236)***
Widowed	-0.657	-0.490
	*(0.201)****	*(0.190)****
Inter Cert	0.054	-0.056
	(0.092)	*(0.091)*
Leaving Cert	0.229	0.256
	*(0.089)****	*(0.087)****
3rd Level	0.028	0.037
	(0.117)	*(0.105)*
Bad Health Problem	-6.357	-6.369
	*(0.297)****	*(0.315)****
Mild Health Problem	-2.865	-2.401
	*(0.154)****	*(0.170)****
In Education	0.561	-0.102
	*(0.203)****	*(0.213)*
Unemployed	-1.542	-0.413
	*(0.181)****	*(0.249)**
Retired	0.990	0.965
	*(0.209)****	*(0.196)****
Home Duties	0.239	0.019
	(0.156)	*(0.153)*
Other	-1.232	-1.245
	*(0.334)****	*(0.300)****
Club Membership	0.683	0.598
	*(0.107)****	*(0.106)****
Religious	0.792	0.444
	*(0.132)****	*(0.123)****
Constant	23.951	25.356
	*(0.705)****	*(0.732)****

Standard Errors in brackets. Default category is male, single, with no formal educational qualifications, no health problem and working. *, ** and *** indicate significant at 1%, 5% and 10% respectively.

Table 3: Population Characteristics By Age and Gender

Variable	1994		2000	
	Male (N=4174)	Female (N=4547)	Male (N=3057)	Female (N=3551)
Age	42.916	43.115	45.337	45.677
Income (log)	5.738	5.707	6.149	6.090
Single	0.377	0.290	0.372	0.276
Married	0.585	0.596	0.582	0.587
Sep/Divorced	0.011	0.026	0.019	0.036
Widowed	0.028	0.088	0.028	0.101
No Quals	0.37	0.343	0.320	0.290
Inter Cert	0.246	0.212	0.240	0.220
Leaving Cert	0.247	0.325	0.264	0.323
3rd Level	0.137	0.12	0.176	0.167
Bad Health	0.034	0.032	0.034	0.025
Mild Health	0.129	0.138	0.106	0.116
Working	0.639	0.325	0.674	0.419
In Education	0.076	0.072	0.064	0.07
Unemployed	0.111	0.038	0.043	0.022
Retired	0.147	0.034	0.182	0.049
Home Duties	0.002	0.519	0.005	0.422
Other	0.025	0.011	0.031	0.016
Club Member	0.519	0.341	0.51	0.369
Religious	0.783	0.849	0.727	0.779

Table 4: OLS Regression of GHQ by Gender, 1994 and 2000

Variable	1994		2000	
	Male	Female	Male	Female
Age	-0.058	-0.117	-0.067	-0.015
	*(0.029)***	*(0.031)****	*(0.028)***	*(0.031)*
Age^2	0.001	0.001	0.001	0.000
	*(0.000)**	*(0.000)****	*(0.000)**	*(0.000)*
Income (log)	0.342	0.409	0.161	0.271
	*(0.123)****	*(0.128)****	*(0.118)*	*(0.123)***
Married	0.205	0.921	0.195	0.432
	(0.213)	*(0.164)****	*(0.185)*	*(0.155)****
Sep/Divorced	-0.379	-1.671	-0.058	-0.724
	(0.509)	*(0.350)****	*(0.392)*	*(0.306)***
Widowed	-0.901	-0.548	-0.459	-0.420
	*(0.365)***	*(0.252)***	*(0.345)*	*(0.242)**
Inter Cert	0.040	0.060	0.029	-0.152
	(0.124)	*(0.137)*	*(0.122)*	*(0.135)*
Leaving Cert	0.167	0.250	0.348	0.178
	(0.128)	*(0.124)***	*(0.123)****	*(0.122)*
3rd Level	-0.162	0.272	-0.205	0.280
	(0.154)	*(0.177)*	*(0.139)*	*(0.158)**
Bad Health	-5.729	-6.810	-6.313	-6.415
	*(0.415)****	*(0.424)****	*(0.400)****	*(0.489)****
Mild Health	-2.634	-3.018	-2.301	-2.458
	*(0.218)****	*(0.218)****	*(0.240)****	*(0.239)****
In Education	1.357	0.108	0.112	-0.374
	*(0.363)****	*(0.310)*	*(0.324)*	*(0.316)*
Unemployed	-1.294	-1.248	-0.883	0.062
	*(0.319)****	*(0.348)****	*(0.328)****	*(0.428)*
Retired	1.548	0.924	0.800	0.842
	*(0.351)****	*(0.390)***	*(0.286)****	*(0.345)***
Home Duties	-1.850	0.079	0.677	-0.066
	(1.216)	*(0.205)*	*(0.779)*	*(0.194)*
Other	-1.386	-0.467	-1.500	-1.101
	*(0.461)****	*(0.599)*	*(0.391)****	*(0.503)***
Club Member	0.831	0.535	0.527	0.647
	*(0.145)****	*(0.157)****	*(0.143)****	*(0.155)****
Religious	0.554	1.065	0.115	0.763
	*(0.170)****	*(0.205)****	*(0.160)*	*(0.185)****
Constant	23.292	23.468	26.620	23.613
	*(1.027)****	*(0.974)****	*(1.021)****	*(1.024)****

Standard errors in brackets. Default category is single, with no formal educational qualifications, no health problem and working. *, ** and *** indicate significant at 1%, 5% and 10% respectively.

Table 5: Explained and Unexplained GHQ Gap by Gender 1994-2000

	1994		**2000**	
Raw Gap (Male GHQ-Female GHQ)	0.85		0.73	
Males as Reference Group	**Explained**	**Unexplained**	**Explained**	**Unexplained**
	1.81 (213.2%)	-0.96 (-113.2%)	0.08 (10.9%)	0.65 (89.1%)
Females as Reference Group	0.36 (42.3%)	0.49 (57.7%)	0.41 (56.2%)	0.32 (43.8%)

Table 6: Proportional Contribution of Variables to GHQ Gap by Gender, 1994-2000 (males as reference group)

Variable	1994		2000	
	Prop of Explained Difference	Prop of Unexplained Difference	Prop of Explained Difference	Prop of Unexplained Difference
Age	0.005	-0.831	0.220	-2.109
Income (log)	0.006	0.401	0.118	-1.025
Single	0.052	0.067	0.385	-0.166
Married	-0.001	0.443	-0.012	-0.214
Sep/Divorced	0.003	-0.035	0.013	0.037
Widowed	0.03	0.032	0.42	-0.006
No Quals	-0.001	-0.191	-0.065	0.059
Inter Cert	0.001	0.004	0.007	0.061
Leaving Cert	-0.007	0.028	-0.259	0.084
3rd Level	-0.001	0.054	-0.024	-0.124
Bad Health	-0.004	-0.036	-0.753	0.004
Mild Health	0.013	-0.055	0.281	0.028
Working	0.28	-0.344	2.532	0.1
In Education	0.003	-0.093	-0.008	0.053
Unemployed	-0.052	0.002	-0.224	-0.032
Retired	0.096	-0.022	1.332	-0.003
Home Duties	0.526	1.038	-3.539	0.483
Other	-0.011	0.01	-0.283	-0.01
Club Member	0.082	-0.104	0.935	-0.068
Religious	-0.02	0.45	-0.076	-0.776
Other Unexplained		0.182		4.623

Table 6: Proportional Contribution of Variables to GHQ Gap by Gender, 1994-2000 (females as reference group)

Variable	1994		2000	
	Prop of Explained Difference	Prop of Unexplained Difference	Prop of Explained Difference	Prop of Unexplained Difference
Age	0.042	1.623	0.010	-4.269
Income (log)	0.035	-0.794	0.038	-2.117
Single	0.312	-0.171	0.165	-0.456
Married	-0.028	-0.856	-0.005	-0.433
Sep/Divorced	0.071	0.028	0.03	0.04
Widowed	0.092	-0.02	0.074	-0.003
No Quals	-0.043	0.405	-0.022	0.134
Inter Cert	0.006	-0.01	-0.007	0.137
Leaving Cert	-0.054	-0.042	-0.026	0.141
3rd Level	0.013	-0.122	0.006	-0.268
Bad Health	-0.023	0.074	-0.148	0.011
Mild Health	0.075	0.101	0.058	0.052
Working	0.523	1.33	0.394	0.33
In Education	0.001	0.194	0.005	0.099
Unemployed	-0.249	-0.01	0.003	-0.126
Retired	0.288	0.188	0.272	-0.024
Home Duties	-0.112	-0.008	0.067	0.012
Other	-0.018	-0.047	-0.04	-0.039
Club Member	0.264	0.313	0.222	-0.193
Religious	-0.193	-0.818	-0.097	-1.479
Other Unexplained		-0.359		9.453

Table 7: Difference Between Proportional Contribution of Variables to GHQ Gap, 1994-2000

Variable	1994		2000	
	Difference in Prop of Explained Difference	Difference in Prop of Unexplained Difference	Difference in Prop of Explained Difference	Difference in Prop of Unexplained Difference
Age	-0.038	-2.454	0.211	2.160
Income (log)	-0.029	1.195	0.08	1.091
Single	-0.261	0.238	0.22	0.29
Married	0.027	1.299	-0.007	0.22
Sep/Divorced	-0.068	-0.063	-0.018	-0.003
Widowed	-0.062	0.052	0.345	-0.003
No Quals	0.043	-0.596	-0.043	-0.074
Inter Cert	-0.005	0.014	0.015	-0.076
Leaving Cert	0.046	0.07	-0.233	-0.056
3rd Level	-0.014	0.176	-0.03	0.144
Bad Health	0.019	-0.11	-0.605	-0.007
Mild Health	-0.062	-0.156	0.223	-0.024
Working	-0.243	-1.674	2.138	-0.23
In Education	0.002	-0.287	-0.014	-0.046
Unemployed	0.198	0.012	-0.227	0.094
Retired	-0.192	-0.21	1.061	0.021
Home Duties	0.639	1.046	-3.606	0.471
Other	0.007	0.057	-0.243	0.029
Club Member	-0.182	-0.418	0.713	0.125
Religious	0.173	1.268	0.021	0.703
Other Unexplained	0	0.542	0	-4.83

Appendix: Decomposition Using Ordered Probit

An individual's GHQ score is an ordered categorical variable. Thus it may be appropriate to model GHQ using an ordered probit/logit approach. When using such an approach the straightforward Blinder-Oaxaca decomposition outlined in the main text is no longer applicable, as the conditional expectation $E(Y|X)$ is no longer equal to $\overline{X}\hat{\beta}$. For the general case of a non-linear decomposition we have the decomposition for the outcome for individual i, Y_i given by

$$\Delta_m^{NL} = [E_{\beta_m}(Y_{im}|X_{im}) - E_{\beta_m}(Y_{if}|X_{if})] + [E_{\beta_m}(Y_{if}|X_{if}) - E_{\beta_f}(Y_{if}|X_{if})]$$

where $E_{\beta_m}(Y_{im}|X_{im})$ is the conditional expectation of male outcomes and $E_{\beta_m}(Y_{if}|X_{if})$ is the conditional expectation of female outcomes evaluated with the male parameter vector, β_m. Alternatively, using females as the reference group the decomposition is

$$\Delta_f^{NL} = [E_{\beta_f}(Y_{im}|X_{im}) - E_{\beta_f}(Y_{if}|X_{if})] + [E_{\beta_m}(Y_{im}|X_{im}) - E_{\beta_f}(Y_{im}|X_{im})].$$

In both cases the first term on the right hand side provides that portion of the difference in conditional expectation arising from differences in characteristics, X_m, X_f and the second term refers to the difference arising from the "returns" to those characteristics, β_m, β_f. Thus to apply this decomposition it is necessary to obtain the sample counterparts $S(\hat{\beta}_m X_{im})$ and $S(\hat{\beta}_f X_{im})$ of the conditional expectations, $E_{\beta_g}(Y_{ig}|X_{ig})$ and $E_{\beta_h}(Y_{ig}|X_{ig})$ where $(g,h)=(m,f)$ and $m \neq f$. We now apply this decomposition to the case of an ordered model.

An ordered model is based upon a latent regression of the form $Y_{im}^* = X_{im}\beta_m + \varepsilon_{im}$ where Y_{im}^* is unobserved (we give the example here in terms of male outcomes). Instead we observe

$$\begin{aligned} Y_{im} &= 0 \text{ if } Y_{im}^* \leq 0 \\ &= 1 \text{ if } 0 \leq Y_{im}^* \leq \mu_1 \\ &= 2 \text{ if } \mu_1 \leq Y_{im}^* \leq \mu_2 \\ &\dots \\ &= \text{J if } \mu_{J-1} \leq Y_{im}^*. \end{aligned}$$

where the μ_i , the "cut-off points", are parameters to be estimated along with the vector β_m. The conditional expectation of Y_{im} evaluated at the parameter vector β_m is:

$$E_{\beta_m}(Y_{im}|X_{im}) = F(\mu_1 - X_{im}\beta_m) - F(-X_{im}\beta_m)$$
$$+ 2[F(\mu_2 - X_{im}\beta_m) - F(\mu_1 - X_{im}\beta_m)]$$
$$+ \ldots$$
$$+ J[1 - F(\mu_{J-1} - X_{im}\beta_m)].$$

If we assume that the error term, ε_{im}, is distributed normally we obtain the ordered probit model and F refers to the cumulative standard normal distribution (if we assume it is distributed logistically we obtain the ordered logit model and F refers to the cumulative logistic distribution).

Given estimation of the parameter vector β_{im}, the sample counterparts of the components of the decomposition (assuming males to be the reference group) are calculated as follows:

$$S(\hat{\beta}_m X_{im}) = N^{-1}\sum_{i=1}^{N}\Big\{[F(\hat{\mu}_1 - X_{im}\hat{\beta}_m) - F(-X_{im}\hat{\beta}_m)]$$
$$+ 2[F(\hat{\mu}_2 - X_{im}\hat{\beta}_m) - F(\hat{\mu}_1 - X_{im}\hat{\beta}_m)]$$
$$+ \ldots$$
$$+ J[1 - F(\hat{\mu}_{J-1} - X_{im}\hat{\beta}_{im})]\Big\}.$$

The sample counterpart of $E_{\beta_m}(Y_{if}|X_{if})$, $S(\hat{\beta}_m X_{if})$ is obtained by replacing X_{im} by X_{if} in the above equation.

The sample counterparts are then used to obtain the parts of the decomposition:

$$\hat{\Delta} = [S(\hat{\beta}_m X_{im}) - S(\hat{\beta}_m X_{if})] + [S(\hat{\beta}_m X_{if}) - S(\hat{\beta}_f X_{if})].$$

The case where females are the reference group is the mirror image of above.

Table A1 gives the results for the ordered probit models for the pooled sample of men and women for 1994 and 2000. As in the case of the linear regression, the gender coefficients are statistically significant. Notwithstanding the difficulty in interpreting the estimated coefficients in an ordered as opposed to a linear model, it is noteworthy that estimated coefficients for each independent variable have the same sign in both models.

The same can also be said for the estimated models by gender in table A2. While not every coefficient takes the same sign as its counterpart in the linear regressions in table 4, the vast majority do, and in those cases where the sign is different, the coefficient is typically not statistically significant.

Finally, table A3 presents the decomposition by characteristics and returns to characteristics. The results are qualitatively very similar to table 3 and offer reassurance that the use of the linear model in the main text does not alter the substantive results of this paper to any meaningful extent.

Table A1: Ordered Probit Regression of GHQ, 1994 and 2000

Variable	1994 (n=8721)	2000 (n=6608)
Age	-0.024	-0.019
	*(0.005)****	*(0.005)****
Age^2	0.000	0.000
	*(0.000)****	*(0.000)****
Sex	-0.253	-0.217
	*(0.060)****	*(0.071)****
Age*Sex	0.004	0.003
	*(0.001)****	*(0.002)***
Income (log)	0.078	0.065
	*(0.019)****	*(0.021)****
Married	0.121	0.052
	*(0.027)****	*(0.029)**
Separated/Divorced	-0.237	-0.070
	*(0.062)****	*(0.059)*
Widowed	-0.157	-0.112
	*(0.044)****	*(0.047)***
Inter Cert	0.011	-0.017
	(0.020)	*(0.023)*
Leaving Cert	0.050	0.061
	*(0.019)****	*(0.022)****
3rd Level	0.005	0.012
	(0.026)	*(0.026)*
Bad Health Problem	-1.128	-1.262
	*(0.066)****	*(0.080)****
Mild Health Problem	-0.579	-0.543
	*(0.034)****	*(0.043)****
In Education	0.097	-0.080
	*(0.045)***	*(0.053)*
Unemployed	-0.344	-0.142
	*(0.040)****	*(0.062)***
Retired	0.229	0.228
	*(0.046)****	*(0.049)****
Home Duties	0.043	0.024
	(0.034)	*(0.038)*
Other	-0.221	-0.238
	*(0.073)****	*(0.075)****
Club Membership	0.167	0.151
	*(0.023)****	*(0.026)****
Religious	0.170	0.084
	*(0.029)****	*(0.031)****

Standard errors in brackets. Default category is male, single, with no formal educational qualifications, no health problem and working. *, ** and *** indicate significant at 1%, 5% and 10% respectively.

Table A2: Ordered Probit Regression of GHQ by Gender, 1994 and 2000

Variable	1994		2000	
	Male	**Female**	**Male**	**Female**
Age	-0.016	-0.027	-0.025	-0.010
	*(0.007)***	*(0.007)****	*(0.008)****	*(0.007)*
Age^2	0.000	0.000	0.000	0.000
	*(0.000)***	*(0.000)****	*(0.000)****	*(0.000)*
Income (log)	0.085	0.075	0.059	0.065
	*(0.029)****	*(0.027)****	*(0.032)**	*(0.029)***
Married	0.030	0.163	0.001	0.066
	(0.049)	*(0.034)****	*(0.050)*	*(0.036)**
Sep/Divorced	-0.068	-0.277	0.022	-0.119
	(0.118)	*(0.073)****	*(0.106)*	*(0.072)**
Widowed	-0.203	-0.136	-0.091	-0.095
	*(0.084)***	*(0.053)****	*(0.093)*	*(0.057)**
Inter Cert	0.007	0.012	-0.005	-0.032
	(0.029)	*(0.029)*	*(0.033)*	*(0.032)*
Leaving Cert	0.051	0.044	0.093	0.035
	*(0.030)**	*(0.026)**	*(0.033)****	*(0.029)*
3rd Level	-0.047	0.065	-0.049	0.065
	(0.036)	*(0.037)**	*(0.038)*	*(0.037)**
Bad Health	-1.076	-1.166	-1.353	-1.197
	*(0.097)****	*(0.090)****	*(0.111)****	*(0.116)****
Mild Health	-0.563	-0.589	-0.574	-0.518
	*(0.051)****	*(0.046)****	*(0.066)****	*(0.056)****
In Education	0.234	0.039	-0.044	-0.116
	*(0.084)****	*(0.065)*	*(0.088)*	*(0.074)*
Unemployed	-0.302	-0.269	-0.265	-0.008
	*(0.074)****	*(0.073)****	*(0.089)****	*(0.100)*
Retired	0.385	0.155	0.203	0.172
	*(0.081)****	*(0.082)**	*(0.078)****	*(0.081)***
Home Duties	-0.405	0.011	0.169	0.006
	(0.281)	*(0.043)*	*(0.212)*	*(0.045)*
Other	-0.233	-0.071	-0.273	-0.241
	*(0.107)***	*(0.126)*	*(0.106)***	*(0.118)***
Club Member	0.210	0.126	0.144	0.157
	*(0.034)****	*(0.033)****	*(0.039)****	*(0.036)****
Religious	0.121	0.225	0.018	0.144
	*(0.039)****	*(0.043)****	*(0.043)*	*(0.043)****

Standard errors in brackets. Default category is single, with no formal educational qualifications, no health problem and working. *, ** and *** indicate significant at 1%, 5% and 10% respectively.

Table A3: Explained and Unexplained GHQ Gap by Gender 1994-2000

	1994		**2000**	
Raw Gap (Male GHQ-Female GHQ)	0.87		0.73	
Males as Reference Group	**Explained**	**Unexplained**	**Explained**	**Unexplained**
	1.73 (197.2%)	-0.85 (-97.2%)	0.01 (13.5%)	0.63 (86.5%)
Females as Reference Group	0.35 (40.0%)	0.52 (60.0%)	0.38 (52.3%)	0.35 (47.7%)