

AN EXPLORATORY FACTOR ANALYSIS OF THE GENERAL HEALTH QUESTIONNAIRE-12 AND A SUBSEQUENT ANALYSIS OF THE DETERMINANTS OF MENTAL HEALTH STATUS

1: Introduction

This paper provides an analysis of mental health in Ireland by investigating the underlying structure of the GHQ-12 in the Living in Ireland Survey (LIIS). This will uncover specific mental health dimensions in the questionnaire (Graetz, 1991; Darity and Goldsmith, 1996; Kalliath *et al* , 1994). The technique used to investigate this structure is an exploratory factor analysis technique. When it is not known how many factors will be needed to accurately explain the inter-relationships among a set of variables then exploratory factor analysis is recommended to be used (Pett *et al* , 2003; Pedhazur and Schmelkin, 1991; Tabachnick and Fidell, 2001). When implementing an exploratory factor analysis technique, it is important that no preconceived expectations are held by the researcher regarding the number of factors that may emerge from the data; instead the structure unfolds itself from the data (Pett *et al* , 2001). This paper also employs the three factors uncovered in the analysis as dependent variables and analyses the determinants of each of the three dependent variables using a fixed effects panel data regression technique and compares the results to the overall GHQ-12 results.

1.1: The General Health Questionnaire -12 (GHQ-12)

The GHQ was designed by Goldberg (1972) and is a measure used to identify psychiatric illness in a population (Wildman, 2003; Kalliath *et al* , 2004). Goldberg and Williams (1988) state that it is useful in distinguishing people who are suffering from a mental illness from those that are not. Several versions of the GHQ have been devised, from the GHQ-60, GHQ-30, GHQ-28 and GHQ-12 (Kalliath *et al* , 2004, Mai, Gaebel, Lopez-Ibor and Sartorius 2002). According to Mai *et al* (2002 p:200), the GHQ is defined as a “*pure state measure*” meaning that it assesses how an individual feels their current state differs from their usual state. Changes in the condition are emphasised not the absolute level of the health problem. In this respect, the items on the GHQ compare a person’s present state with what is normal for that person (Goldberg, 1978; McDowell, 2006). According to Goldberg (1972), the GHQ design identifies two main types of health problems. The first problem is

being unable to carry out normal functions and the second problem is the emergence of a new occurrence of a worrying nature.

The version of the GHQ that is used in the LIIS is the GHQ-12. The GHQ-12 is a short questionnaire containing twelve questions and is often used in large scale social surveys as it takes only a couple of minutes to complete and is as reliable and valid as other GHQs (Banks and Jackson, 1982; Winefield *et al* , 1989; Werneke, Goldberg, Yalcin and Uestuen, 2000). The shorter version of the GHQ has the advantage of being quicker to administer and still retains the psychometric properties of the longer GHQ versions (Shevlin and Anderson, 2005; Picardi, Abeni, and Pasquini, 2001). The twelve questions on the questionnaire all appear on the GHQ-60. According to McDowell (2006), the GHQ-12 has been compared with other scales to test its validity and correlates highly with measures of distress and measures of well being. The GHQ-12 is displayed in Table 1.

Table 1: The General Health Questionnaire-12.

| General Health Questionnaire-12 | | |
|---------------------------------|--|--|
| | The following twelve statements may possibly describe the way that you have been feeling over the last few weeks. For each statement I would like you to circle the number beneath the answer which best suits the way you have been feeling recently. HAVE YOU RECENTLY.... | |
| 1 | Been able to concentrate on whatever you are doing? | (0) More so than usual. (1) Same as usual. (2) Less than usual. (3) Much less than usual. |
| 2 | Lost much sleep over worry? | (0) Not at all. (1) No more than usual. (2) Rather more than usual. (3) Much more than usual |
| 3 | Felt that you were playing a useful part in things? | (0) More so than usual. (1) Same as usual. (2) Less than usual. (3) Much less than usual. |
| 4 | Felt capable of making decisions about things? | (0) More so than usual. (1) Same as usual. (2) Less than usual. (3) Much less than usual. |
| 5 | Felt constantly under strain? | (0) Not at all. (1) No more than usual. (2) Rather more than usual. (3) Much more than usual. |
| 6 | Felt that you could not overcome your difficulties? | (0) Not at all. (1) No more than usual. (2) Rather more than usual. (3) Much more than usual. |
| 7 | Been able to enjoy your normal day to day activities? | (0) More so than usual. (1) Same as usual. (2) Less than usual. (3) Much less than usual. |
| 8 | Been able to face up to your problems? | (0) More so than usual. (1) Same as usual. (2) Less than usual. (3) Much less than usual. |
| 9 | Been feeling unhappy or depressed? | (0) Not at all. (1) No more than usual. (2) Rather more than usual. (3) Much more than usual. |
| 10 | Been losing confidence in yourself? | (0) Not at all. (1) No more than usual. (2) Rather more than usual. (3) Much more than usual. |
| 11 | Been thinking of yourself as a worthless person? | (0) Not at all. (1) No more than usual. (2) Rather more than usual. (3) Much more than usual. |
| 12 | Been feeling reasonably happy, all things considered? | (0) More so than usual. (1) Same as usual. (2) Less than usual. (3) Much less than usual. |

Source: The Living in Ireland Survey: 1994-2001.

The GHQ-12 is often used as a unidimensional measure of psychological morbidity meaning that it is taken as a measure of general mental health (Hankins, 2008; Shevlin and Anderson, 2005; Tait, Hulse and Robertson, 2003; Wildman, 2003). When the GHQ-12 is used in this way it is not analysed into further constituent elements of a person's mental health such as depression, anxiety, stress or social dysfunction but instead analyses mental health as a whole concept, in other words, mental health is analysed as a one dimensional concept (Winefield *et al* , 1989; Banks and Jackson, 1982). Falissard (1999) states that unidimensionality is when a set of items measure one common item. Similarly, Hagtvet and Nasser (2004) also maintain that for a set of items to be unidimensional in structure they must have one or a single factor in common. However, studies show that variables constructed or combined in this manner can result in a substantial loss of information (Brenninkmeijer and VanYperen, 2008). Cheung (2002) states that it would be out of the ordinary if versions of the GHQ such as the GHQ-28; the GHQ-30 and the GHQ-60, were shown to be multidimensional in their construction, meaning that underlying mental health concepts are identified but that the GHQ-12 is shown to be uni-dimensional.

1.2: Suitability of Factor Analysis on the GHQ-12 Variables

Before a factor analysis is applied to a set of variables, tests are carried out to ascertain if the analysis would be a suitable one. (Pett *et al* , 2003; Whynes *et al* , 1999; de Ruyter and Wetzels, 1998; Tan and Vogel, 2008). The tests of suitability are the Bartlett's Test of Sphericity which tests the null hypothesis that there is no relationship between the variables (Bartlett, 1950) as shown below in Equation 1. The Kaiser-Meyer-Olkin test which is a test of sampling adequacy (Kaiser, 1974; Phipps and Clark, 1993, Pett *et al* , 2003) is shown in Equation 2. Kaiser (1974, p35) suggests the following as a guideline; above 0.90 is "marvellous", in the 0.80s is "meritorious", in the 0.70s is "middling" and less than 0.60 is "mediocre, miserable or unacceptable". Phipps and Clark (1993) confirm that a result of above 0.70 is a sufficient result to apply a factor analysis but that over 0.80 is excellent. Cronbach's Alpha is shown in Equation 3. The value for Cronbach's Alpha should lie between 0 and 1. 0 or close to it indicates that there is very little or no correlation between the items and values close to and equalling 1 indicating that there is high to perfect correlation between the items on the scale, therefore the higher the value for Cronbach's Alpha, the greater reliability among the variables (Pett *et al* , 2003; Pedhazur and Schmelkin, 1991; Bland and Altman, 1997).

Bartlett's Test of Sphericity:

$$\chi^2 = - \left[(N-1) - \left(\frac{2k+5}{6} \right) \right] \log_e |R| \quad (1)$$

Where:

- χ^2 = the calculated chi-square value for Bartlett's test.
- N = sample size
- k = the number of items or variables in the matrix
- \log_e = natural logarithm
- |R| = determinant of the correlation matrix

Cronbach's Alpha:

$$\alpha = \frac{k}{k-1} \left(1 - \frac{\sum \sigma_i^2}{\sum \sigma_i^2 + 2\sum \sigma_{ij}} \right) \quad (2)$$

Where:

- α = coefficient alpha
- k = number of items in the scale
- $\sum \sigma_i^2$ = sum of the variance of the items

Kaiser Meyer Olkin:

$$KMO = \frac{\sum_{i \neq j} \sum r_{ij}^2}{\sum_{i \neq j} \sum r_{ij}^2 + \sum_{i \neq j} \sum a_{ij}^2} \quad (3)$$

Where:

- $\sum \sum$ = sum of all items in the matrix when Item i \neq Item j
- r_{ij} = Pearson correlation between items i and j
- a_{ij} = partial correlation coefficient between Items i and j

The results of these three tests can be seen in Table 2. The results of all the above tests indicate that it is possible that the GHQ-12 has underlying factors in its construction.

Table 2: Tests of Data Suitability for Factor Analysis

| Tests Applied to the Living in Ireland Data | Result | Outcome |
|---|----------|--|
| Bartlett's Test of Sphericity | 5787.206 | Reject H_0 of no intercorrelations between GHQ-12 items. <i>Proceed.</i> |
| Kaiser Meyer Olkin | 0.876 | "in the 0.80s is meritorious" <i>Proceed.</i> |
| Cronbach's Alpha | 0.88 | Factor Analysis Suitable as value is nearer to 1.00. <i>Proceed.</i> |

Source: Living in Ireland Survey 1994-2001

1.3: The Factor Analytic Approach Implemented

Several papers suggest the use of a common factor analysis method instead of Principal Components Analysis (PCA) due to the fact that PCA is a data reduction method and that its use should be restricted because the components are calculated using all the variance in the variables under investigation (Ford, MacCallum and Tait, 1986; Snook and Gorsuch, 1989; Bentler and Kano, 1990; Loehlin, 1992; Mulaik, 1986). PCA can result in the same number of factors as items (Kline, 1994; Tacq, 1997). The most widely used method of factor analysis is Principal Axis Factoring (PAF) (Tabachnick and Fidell, 2001) and is used in this study since the common variance is analysed, after the unique and error variance have been removed. A PAF solution which contains the same number of factors as a PCA solution is the better estimate of the correlations between the items due to the PCA solution including errors of measurement because the total variance is analysed (Nunnally and Bernstein, 1994). The aim in PAF is to extract the maximum variance from the variables concerned but also that the common parts of the original variables be represented by the factors in the analysis (Tacq, 1997)

1.4: Naming the Extracted Factors Following the Principal Axis Factoring Technique

Factors which have not been rotated are difficult to interpret and quite often do not provide meaningful clusters of items (Pett *et al* , 2003; Tabachnick and Fidell, 2001). In a health context, general health can be sub-divided into sections, physical and mental health which even though they are separate areas of health, they are correlated (Dixon *et al* , 1999; Harris and Barrowclough, 1998; Pett *et al* , 2003) as a person who rates their physical health positively also tends to positively rate their mental health also. This indicates that an oblique rotation should be implemented as the factors are likely to be correlated. A Promax oblique factor rotation to the power of 2 was carried out on the original factor loadings after the PAF and three factors were apparent in the GHQ-12 as appeared in the LIIS as can be seen from Table 3. Factor loadings greater than 0.30 are retained as recommended by Nunnally and Burnstein (1994).

Table 3: Rotated Factor Loadings of the GHQ-12 Using an Oblique Promax Rotation.

| | Factor 1 | Factor 2 | Factor 3 |
|------------------|----------|----------|----------|
| 1. Concentration | | | 0.47 |
| 2. Worry | 0.44 | | |
| 3. Useful part | | | 0.42 |
| 4. Decisions | | | 0.44 |
| 5. Strain | 0.47 | | |
| 6. Difficulties | 0.32 | | |
| 7. Activities | | 0.61 | |
| 8. Problems | | 0.53 | |
| 9. Depressed | 0.65 | | |
| 10. Confidence | 0.72 | | |
| 11. Worthless | 0.59 | | |
| 12. Happy | | 0.60 | |

Source: Living in Ireland Survey 1994-2001

Note: Promax² oblique rotation solution

The first factor extracted displays high factor loadings on item 2, of the GHQ-12, *worry* (0.44), item 5; *strain* (0.47), item 6; *difficulties* (0.32), item 9; *depressed* (0.65), item 10; *confidence* (0.72) and item 11; *worthless* (0.59). This indicates that these items can be grouped together to form one factor and also indicates that if a person scored high on one of these issues that they are likely to display a high score on another. In other words, a

person who claims that they are losing confidence in themselves could also be very likely to be feeling unhappy or depressed. Likewise, a person who has been thinking of themselves as a worthless person could also be likely to be feeling constantly under strain. Factor one will be named Psychological Distress. All the above items are all the negative items in the GHQ-12. This is the case in other studies on the GHQ-12 (Andrich and van Schoubroeck, 1989).

Factor 2 displays high factor loadings on item 7; *activities* (0.61), item 8; *problems* (0.53) and item 12; *happy* (0.60). This indicates that, as they are all grouped under Factor 2 in the results, that they can be grouped together to form a separate factor measuring one particular concept. In Factor 2, a person who is able to enjoy their normal day to day activities is also likely to feel reasonably happy, all things considered, and a person who is able to face up to their problems is also likely to enjoy their normal daily activities. Factor 2 can be named Ability to Cope. Kalliath *et al* (2004) found a similar but not identical factor in the analysis as also loading highly on to this factor was item 4; *make decisions*.

Lastly, Factor 3, exhibits high factor loadings on item 1; *concentration* (0.47), item 3; *useful part* (0.42) and item 4; *make decisions* (0.44). It should also be noted here that these three items (along with the items in Factor 2) form the positively worded items of the GHQ-12. With Factor 3, a person who is able to concentrate on whatever they are doing is also likely to play and useful part in things and feel capable of making decisions. In certain studies, these 6 items have formed one factor but here it has been divided into two separate factors (Andrich *et al* , 1989). This factor is named Ability to Focus.

When looking at the items on the GHQ-12 which have loaded on to the three separate factors, one can understand, without any prior knowledge of former studies how the items on each factor can be interrelated. For example, it would not make any intuitive sense if item 10; *confidence* and item 7; *activities* appeared under the same factor heading as a person who has been losing confidence in themselves is not likely to be able to enjoy normal day to day activities. Taking another example, it would be difficult to interpret a factor that displayed high factor loadings on item 11; *worthless* and item 3; *useful part* as it would indicate that a person who has been thinking of themselves as a worthless person feels that they are playing a useful part in things. Likewise a person who is feeling unhappy or depressed (item 9) is not likely to be a person who is feeling reasonably happy all things considered (item 12).

2: An Analysis of the Determinants of Mental Health:

As seen in the previous section, the GHQ-12 has three underlying factors, named here as Psychological Distress, Ability to Cope, and Ability to Focus. According to Toyabe *et al* (2006) using the factors of the GHQ-12 separately can offer practical advantage in the identification of psychological problems in certain groups of the population as opposed to using the GHQ-12 in its unidimensional format. The aim of this section of the paper is to investigate if this is the case. The determinants of the GHQ-12 will be presented and discussed, followed by the determinants of each one of the three new factors uncovered in the exploratory factor analysis. The explanatory variables came from a detailed review of the literature on the factors that affect mental health. The economic theory followed is that of Grossman (1972).

2.1: Fixed Effects Regression of the Determinants of Mental Health

A fixed effects panel data regression with robust option specified to account for possible heteroscedasticity in the idiosyncratic error term is implemented in this paper to analyse the determinants of mental health status in a representative sample of the Irish population. The results of the fixed effects regression are seen in Table 4. The results for males and females are presented separately and the results are available for the entire sample also. A fixed effects regression is used following the results of a Hausman test (Hausman, 1978). Mental health status is measured by the GHQ-12 which as seen in Table 1 is a collection of 12 questions. Each answer is given a score and the scores are summed to generate a scale from 0-36, increasing in poor mental health. This is known as a Likert scale (Likert, 1932).

Equivalised household income is statistically insignificant in determining an individual's level of mental health. However, subjective income affects mental health. While this is not a measure of absolute income, Wildman and Jones (2002) note that it is not only absolute income that can have an affect on mental health but other income measures such as relative income. This finding shows that subjective income should also be included in a model of mental health.

Social class status seems to affect the mental health of males but not females to a significant degree. In the literature, there are cases where socio-economic status has been

used as a proxy for income. The finding in this paper that males in a high professional social class category could be compared to that of Weich *et al* (2003) who found that those on higher incomes, such as those in a professional social class category, had a lower level of mental health than individuals on a moderate income level.

When using a fixed effects regression model no marital status variables have any statistical significance in determining the level of mental health of males. However the widowed variable, or becoming widowed variable, is highly statistically significant for females. Wildman (2003) found a similar result. Other studies reviewed looked only at the differences in mental health between married individuals and single individuals not taking into account being separated or widowed. Studies such as Gove (1972) investigated the difference in mental health between males and females after marriage. Simon (2002) finds that marriage is beneficial of mental health of males and females.

Job satisfaction, when controlling for those who have no employment, is linked to an improvement in mental health for males and females. Evans *et al* (2006) note that not only is there a link between health and job satisfaction but that it is linked more specifically to mental health. Fischer and Sousa Poza (2006) highlight that employees who are happy in their job are less depressed and also are less hampered in their day to day activities, again indicating the effect of job satisfaction on mental and physical health.

As far back as 100 years ago, studies were carried out on collective life and human interaction and it was found then that high levels of anxiety and low levels of well being were linked to scarcity of memberships of community organisations. That finding is still relevant today. This paper shows that being a member of a club and having an active social life are important determinants of good mental health both for males and females.

Being in full time employment, for males, is statistically significant in determining the level of mental health. This result corresponds to results of previous studies in this area. Jahoda and Rush (1980) note that its better for peoples mental health to be working than be unemployed. Schaufeli (1997) states that being unemployed can lead to psychological distress. For females, living in an urban area is associated with a poorer level of mental

health. This could be linked to a study by Paykel *et al* (2000) who looked at urban-rural mental health in the UK. They did not use the GHQ-12 as a dependent mental health variable but instead used the Revised Clinical Interview Schedule (CIS-R) which is a structured interview that provides the researcher with prevalence's which cover a one week period. Paykel *et al* (2002) found that urban interviewees had higher rates than rural interviewees of CIS-R morbidity and also higher drug and alcohol dependence. However, the authors do acknowledge that the urban-rural differences in mental health could be associated with a more adverse urban social environment. Kovess-Masfety *et al* (2002) also found that living in an urban location was associated with a higher risk of mental health disorders, in particular, depression.

Also, statistically significant for females is the neighbour explanatory variable. A neighbourhood in better condition is an important determinant in mental health status. This finding is similar to a finding from Propper *et al* (2004) who use 10 waves of the BHPS and the GHQ-12 and find that there is a negative association between mental health and neighbourhoods that are more disadvantages. Given that the Likert scale for GHQ-12 is increasing in poor mental health this indicates that poor mental health is associated with disadvantaged neighbourhoods.

While there is not a lot of literature available on the effect of self assessed health on mental health, there have been several studies carried out on the level of physical activity and mental health such as those by Stephens (2004) who looked at physical activity and mental health in Canada and noted that higher levels of physical activity was shown to be linked with general wellbeing, lower levels of depression and a positive mood. He also notes that the relationship was stronger for females than for males. The findings from the fixed effects regression analysis of mental health indicate that self assessed health is a strong determinant in mental health status, with the relationship being a positive one. Good self assessed health is linked to positive mental health or lower Likert scale scores and poor self assessed health is linked to higher Likert scale scores. The self assessed health variables are all compared to those that have fair self assessed health.

Table 4: The Determinants of Mental Health Using the GHQ-12 as the Dependent Variable

| Variable Name | Full sample | | Males | | Females | |
|---------------|---------------|--------|---------------|--------|---------------|--------|
| | β Coef. | t | β Coef. | t | β Coef. | t |
| gender | | | | | | |
| inequivinc | -0.13 | -1.51 | -0.10 | -0.77 | -0.15 | -1.22 |
| betterincsit | -0.29 | -6.14 | -0.22 | -3.36 | -0.35 | -5.15 |
| worseincsit | 0.71 | 13.24 | 0.56 | 7.53 | 0.82 | 10.73 |
| medcard | 0.25 | 2.85 | 0.30 | 2.53 | 0.21 | 1.68 |
| lowprof | -0.16 | -1.19 | -0.34 | -2.06 | 0.15 | 0.67 |
| nonman | -0.15 | -1.12 | 0.01 | 0.05 | -0.21 | -1.04 |
| skillman | -0.43 | -2.81 | -0.54 | -3.22 | 0.24 | 0.62 |
| sskillman | -0.38 | -2.77 | -0.37 | -2.06 | -0.30 | -1.40 |
| uskillman | -0.53 | -3.37 | -0.68 | -3.55 | -0.27 | -1.03 |
| nevworked | 0.05 | 0.18 | 0.03 | 0.09 | 0.02 | 0.05 |
| age2534 | 0.25 | 1.72 | 0.26 | 1.33 | 0.28 | 1.34 |
| age3544 | -0.03 | -0.13 | 0.31 | 1.11 | -0.24 | -0.83 |
| age4554 | -0.14 | -0.56 | 0.28 | 0.82 | -0.42 | -1.18 |
| age5564 | -0.29 | -0.96 | 0.30 | 0.73 | -0.70 | -1.65 |
| ageover65 | -0.51 | -1.46 | -0.05 | -0.11 | -0.82 | -1.65 |
| married | -0.13 | -1.05 | 0.04 | 0.22 | -0.25 | -1.48 |
| sepdv | -0.79 | -1.38 | -1.68 | -1.91 | -0.24 | -0.31 |
| widowed | 1.41 | 6.25 | 0.76 | 1.74 | 1.49 | 5.36 |
| basiced | -0.04 | -0.55 | -0.13 | -1.21 | 0.03 | 0.27 |
| junior | 0.02 | 0.31 | -0.10 | -0.88 | 0.13 | 1.17 |
| plc | 0.12 | 1.12 | 0.15 | 0.92 | 0.11 | 0.75 |
| degree | -0.15 | -1.23 | -0.26 | -1.62 | -0.07 | -0.39 |
| jobsat | -0.07 | -11.63 | -0.06 | -8.99 | -0.08 | -8.08 |
| imputejobsat | 0.39 | 3.43 | 0.41 | 2.93 | 0.44 | 2.33 |
| ftwork | -0.20 | -2.25 | -0.30 | -2.42 | -0.14 | -1.08 |
| memclub | -0.18 | -3.35 | -0.22 | -2.88 | -0.14 | -1.81 |
| sociallife | -0.69 | -12.37 | -0.47 | -5.97 | -0.84 | -10.91 |
| healthins | -0.08 | -0.93 | -0.16 | -1.35 | -0.04 | -0.30 |
| urban | 0.32 | 2.62 | 0.23 | 1.35 | 0.39 | 2.23 |
| neighbour | -0.03 | -3.32 | 0.00 | -0.22 | -0.05 | -4.00 |
| regchurch | -0.08 | -1.00 | -0.07 | -0.65 | -0.09 | -0.80 |
| vgsah | -2.08 | -27.04 | -1.65 | -15.29 | -2.43 | -22.39 |
| gsah | -1.48 | -21.38 | -1.17 | -12.11 | -1.72 | -17.64 |
| bsah | 3.11 | 20.41 | 3.41 | 15.36 | 2.90 | 13.83 |
| vbsah | 5.27 | 17.21 | 4.75 | 11.11 | 5.66 | 13.01 |
| famsize | 0.04 | 0.78 | 0.09 | 1.43 | -0.01 | -0.17 |
| year1995 | -0.28 | -3.70 | -0.37 | -3.52 | -0.21 | -1.97 |
| year1996 | -0.09 | -1.17 | -0.21 | -1.89 | -0.01 | -0.12 |
| year1997 | -0.04 | -0.51 | -0.14 | -1.17 | 0.02 | 0.18 |
| year1998 | -0.20 | -2.67 | -0.11 | -1.03 | -0.28 | -2.64 |
| year1999 | -0.21 | -2.60 | -0.23 | -2.05 | -0.20 | -1.70 |
| year2000 | -0.11 | -1.23 | -0.08 | -0.66 | -0.14 | -1.10 |
| year2001 | -0.23 | -2.37 | -0.27 | -2.07 | -0.20 | -1.42 |
| Cons | 14.56 | 27.92 | 12.91 | 17.97 | 16.00 | 21.04 |

Regression Statistics

Full Sample

of Obs = 47346
R-sq: within = 0.0807
between = 0.2586.
overall = 0.2064
F(43,32685)= 66.73
Prob > chi2 = 0.0000
Rho = 0.523

Males

of Obs = 22208
R-sq: within = 0.0741
between = 0.2578.
overall = 0.1984
F(43,15078)= 28.06
Prob > chi2 = 0.0000
Rho = 0.525

Females

of Obs = 25138
R-sq: within = 0.0902
between = 0.2534
overall = 0.2088
F(43,17564)= 40.52
Prob > chi2 = 0.0000
Rho = 0.520

2.2: Psychological Distress Panel Data Analysis Regression Results:

Factor 1 is named Psychological Distress, and is a combination of items 2, 5, 6, 9, 10 and 11. These items relate to worry, feeling under strain, not being able to overcome difficulties, feeling depressed, losing self confidence and thinking of oneself as worthless. As there are six items on the scale, the Likert scale for Psychological Distress ranges from 0-18 as each item is scored from 0-3. On the Likert scale, 0 would be the least psychologically distressed and 18 would be the most psychologically distressed.

Table 5 displays the regression results for males, females and the entire sample together. The subjective income variables hold the same significance for psychological distress as they did for mental health. Again, and with a similar direction, psychological distress increases with an increase in social class status for males only.

Unlike mental health, psychological distress is worse for females over the age of 65 when compared with those between the age of 16 and 24. Another difference in the results can be seen in the marital status variable of being married. Psychological distress is lower for females that are married compared to females that are single. The relationship is the opposite direction for widows.

A third statistically significantly different result is in the education variable of degree. Males with a degree or higher degree have a lower level of psychological distress than those with a Leaving Certificate level of education only. While living in an urban environment had a negative effect on mental health for females the same cannot be said for the level of psychological distress. While the relationship is the same direction it is not the same strength.

Mental health, as analysed using the 12 elements of the GHQ-12, was partly determined by full time work for males; however this is not the case with psychological distress. While having a full time job decreases psychological distress the result is not statistically significant.

Table 5: The Determinants of Psychological Distress Using a Fixed Effects Estimation Model

| Variable Name | Full sample | | Males | | Females | |
|---------------|---------------|--------|---------------|--------|---------------|--------|
| | β Coef. | t | β Coef. | t | β Coef. | t |
| lnequivinc | -0.12 | -1.96 | -0.09 | -0.99 | -0.14 | -1.60 |
| betterincsit | -0.18 | -5.50 | -0.13 | -2.84 | -0.22 | -4.79 |
| worseincsit | 0.46 | 12.48 | 0.38 | 7.44 | 0.51 | 9.83 |
| medcard | 0.17 | 2.83 | 0.20 | 2.39 | 0.15 | 1.77 |
| lowprof | -0.09 | -0.98 | -0.22 | -1.97 | 0.13 | 0.86 |
| nonman | -0.08 | -0.91 | -0.05 | -0.42 | -0.05 | -0.37 |
| skillman | -0.35 | -3.34 | -0.46 | -4.02 | 0.14 | 0.53 |
| sskillman | -0.32 | -3.38 | -0.36 | -2.89 | -0.21 | -1.40 |
| uskillman | -0.40 | -3.70 | -0.51 | -3.83 | -0.22 | -1.25 |
| nevworked | -0.04 | -0.20 | -0.16 | -0.67 | 0.13 | 0.38 |
| age2534 | 0.04 | 0.42 | 0.03 | 0.21 | 0.08 | 0.54 |
| age3544 | -0.15 | -1.06 | 0.06 | 0.30 | -0.27 | -1.39 |
| age4554 | -0.20 | -1.18 | 0.12 | 0.50 | -0.42 | -1.72 |
| age5564 | -0.32 | -1.56 | 0.04 | 0.12 | -0.56 | -1.93 |
| ageover65 | -0.51 | -2.14 | -0.26 | -0.77 | -0.67 | -1.98 |
| married | -0.18 | -2.15 | -0.03 | -0.28 | -0.29 | -2.53 |
| sepdv | -0.43 | -1.11 | -0.74 | -1.21 | -0.23 | -0.46 |
| widowed | 0.79 | 5.08 | 0.44 | 1.46 | 0.82 | 4.35 |
| basiced | -0.01 | -0.12 | -0.11 | -1.44 | 0.08 | 0.98 |
| junior | 0.02 | 0.41 | -0.06 | -0.86 | 0.09 | 1.21 |
| plc | 0.03 | 0.46 | 0.04 | 0.34 | 0.03 | 0.36 |
| degree | -0.09 | -1.13 | -0.25 | -2.20 | 0.02 | 0.20 |
| jobsat | -0.05 | -11.67 | -0.04 | -8.90 | -0.06 | -8.18 |
| imputejobsat | 0.17 | 2.23 | 0.18 | 1.86 | 0.24 | 1.83 |
| ftwork | -0.12 | -1.97 | -0.13 | -1.49 | -0.13 | -1.48 |
| memclub | -0.10 | -2.77 | -0.12 | -2.32 | -0.08 | -1.54 |
| sociallife | -0.41 | -10.70 | -0.27 | -4.91 | -0.50 | -9.62 |
| healthins | -0.04 | -0.59 | -0.09 | -1.09 | 0.00 | -0.02 |
| urban | 0.19 | 2.22 | 0.14 | 1.22 | 0.22 | 1.85 |
| neighbour | -0.02 | -3.72 | 0.00 | -0.36 | -0.04 | -4.43 |
| regchurch | -0.08 | -1.43 | -0.05 | -0.60 | -0.12 | -1.47 |
| vgsah | -1.27 | -24.02 | -1.00 | -13.37 | -1.49 | -20.10 |
| gsah | -0.87 | -18.32 | -0.71 | -10.46 | -1.00 | -15.04 |
| bsah | 1.66 | 15.85 | 1.87 | 12.12 | 1.50 | 10.56 |
| vbsah | 2.79 | 13.31 | 2.50 | 8.46 | 3.01 | 10.18 |
| famsize | 0.04 | 1.16 | 0.06 | 1.27 | 0.02 | 0.45 |
| year1995 | -0.15 | -2.83 | -0.25 | -3.34 | -0.07 | -1.00 |
| year1996 | -0.04 | -0.71 | -0.15 | -1.94 | 0.04 | 0.49 |
| year1997 | 0.00 | 0.05 | -0.09 | -1.07 | 0.06 | 0.79 |
| year1998 | -0.12 | -2.40 | -0.04 | -0.62 | -0.19 | -2.66 |
| year1999 | -0.13 | -2.32 | -0.11 | -1.45 | -0.15 | -1.84 |
| year2000 | -0.05 | -0.88 | -0.02 | -0.28 | -0.08 | -0.95 |
| year2001 | -0.12 | -1.79 | -0.14 | -1.57 | -0.10 | -1.08 |
| Cons | 7.10 | 19.87 | 5.94 | 11.88 | 8.09 | 15.69 |

Regression Statistics

Full Sample

of Obs = 47817
R-sq within = 0.0624
Between = 0.1953
Overall = 0.1579
F(43,33112) = 51.25
Prob>F = 0.0000
Rho = 0.545

Males

of Obs = 22404
R-sq within = 0.0558
Between = 0.1940
Overall = 0.1481
F(43,15253) = 20.95
Prob>F = 0.0000
Rho = 0.543

Females

of Obs = 25413
R-sq within = 0.0717
Between = 0.1898
Overall = 0.1605
F(43,17816) = 32.00
Prob>F = 0.0000
Rho = 0.544

Source: Living in Ireland Survey 1994-2001

2.3: Ability to Cope Panel Data Analysis Regression Results

Factor 2, Ability to Cope, is constructed by merging the items on the GHQ-12 which loaded highly on to a second factor. These items are 7, 8 and 12: being able to enjoy normal day to day activities, being able to face up to ones problems and feeling reasonably happy all things considered.

The Likert scale goes from 0-9 as there are three variables included. The scale is decreasing in ability to cope meaning that positive values indicate a poorer ability to cope and negative values indicate an increased ability to cope. The regression results are found in Table 6.

As before the results are discussed in terms of a comparison with the mental health results as measured by the GHQ-12 seen in Table 4. Highly statistically significant in determining ability to cope is subjective income. Individuals whose income situation has improved have an improved ability to cope and the opposite is true also. While having a medical card, for males, was a determinant of poor mental health, in that is income related, it does not seem to have a significant effect on ability to cope. Fewer social class indicators have an effect on ability to cope whereas they did determine poor mental health levels.

Males and females between 25 and 34 have a poorer ability to cope than individuals between the ages of 16 and 24. This result is statistically significant for both genders. Another difference between the mental health determinants and ability to cope determinants is that being separated or divorced males have a higher or better ability to cope than males who are single. As is the case with all the results so far, regardless of econometric method, being a widow is associated with higher levels of inability to cope. As with the psychological distress results, ability to cope is not affected by being in full time employment in the same way as mental health was determined by full time employment.

Females living in an urban environment do not seem to have a poor ability to cope. It affects mental health in a negative capacity but does not have the same negative impact on ability to cope. Statistical significance of self assessed health variables are as they were previously. Table 6 is overleaf.

Table 6: The Determinants of Ability to Cope Using a Fixed Effects Estimation Model

| Variable Name | Full sample | | Males | | Females | |
|---------------|---------------|--------|---------------|--------|---------------|--------|
| | β Coef. | t | β Coef. | t | β Coef. | t |
| lnequivinc | 0.01 | 0.52 | 0.01 | 0.35 | 0.01 | 0.38 |
| betterincsit | -0.06 | -4.62 | -0.05 | -3.05 | -0.06 | -3.38 |
| worseincsit | 0.13 | 9.44 | 0.09 | 4.41 | 0.17 | 8.47 |
| medcard | 0.04 | 1.60 | 0.03 | 1.02 | 0.04 | 1.24 |
| lowprof | -0.01 | -0.30 | -0.02 | -0.58 | 0.02 | 0.34 |
| nonman | -0.04 | -1.05 | 0.04 | 0.95 | -0.11 | -1.91 |
| skillman | -0.03 | -0.69 | -0.03 | -0.71 | 0.11 | 1.08 |
| sskillman | -0.03 | -0.75 | -0.01 | -0.30 | -0.04 | -0.66 |
| uskillman | -0.08 | -1.83 | -0.10 | -2.06 | -0.03 | -0.40 |
| nevworked | 0.02 | 0.21 | 0.08 | 0.91 | -0.10 | -0.78 |
| age2534 | 0.11 | 2.74 | 0.11 | 2.14 | 0.11 | 2.00 |
| age3544 | 0.06 | 1.05 | 0.14 | 1.83 | 0.01 | 0.07 |
| age4554 | 0.03 | 0.43 | 0.06 | 0.69 | 0.01 | 0.11 |
| age5564 | 0.00 | 0.04 | 0.13 | 1.17 | -0.09 | -0.78 |
| ageover65 | -0.03 | -0.31 | 0.12 | 0.96 | -0.15 | -1.11 |
| married | 0.02 | 0.55 | 0.03 | 0.61 | 0.01 | 0.23 |
| sepdv | -0.05 | -0.35 | -0.60 | -2.53 | 0.25 | 1.22 |
| widowed | 0.29 | 4.81 | 0.14 | 1.20 | 0.30 | 4.07 |
| basiced | -0.03 | -1.43 | -0.03 | -1.11 | -0.03 | -0.88 |
| junior | 0.00 | 0.12 | -0.02 | -0.87 | 0.03 | 0.97 |
| plc | 0.03 | 1.12 | 0.07 | 1.59 | 0.01 | 0.23 |
| degree | -0.05 | -1.56 | -0.02 | -0.57 | -0.08 | -1.63 |
| jobsat | -0.01 | -7.81 | -0.01 | -5.63 | -0.02 | -5.86 |
| imputejobsat | 0.10 | 3.29 | 0.10 | 2.79 | 0.09 | 1.81 |
| ftwork | 0.00 | 0.20 | -0.05 | -1.39 | 0.04 | 1.28 |
| memclub | -0.04 | -2.95 | -0.06 | -2.81 | -0.03 | -1.39 |
| sociallife | -0.18 | -12.19 | -0.14 | -6.84 | -0.21 | -10.10 |
| healthins | -0.03 | -1.23 | -0.01 | -0.47 | -0.05 | -1.41 |
| urban | 0.06 | 1.90 | 0.05 | 1.05 | 0.07 | 1.58 |
| neighbour | 0.00 | -1.69 | 0.00 | -0.73 | 0.00 | -1.52 |
| regchurch | -0.01 | -0.39 | -0.04 | -1.45 | 0.02 | 0.79 |
| vgsah | -0.43 | -21.06 | -0.36 | -12.57 | -0.49 | -16.91 |
| gsah | -0.32 | -17.22 | -0.25 | -9.77 | -0.37 | -14.30 |
| bsah | 0.76 | 18.76 | 0.80 | 13.68 | 0.73 | 13.10 |
| vbsah | 1.20 | 14.78 | 1.20 | 10.65 | 1.19 | 10.35 |
| famsize | 0.00 | 0.18 | 0.02 | 1.09 | -0.01 | -0.66 |
| year1995 | -0.07 | -3.64 | -0.09 | -3.27 | -0.06 | -1.99 |
| year1996 | -0.02 | -0.82 | -0.05 | -1.70 | 0.01 | 0.33 |
| year1997 | -0.02 | -0.72 | -0.04 | -1.25 | 0.00 | 0.15 |
| year1998 | -0.02 | -1.01 | -0.03 | -1.24 | -0.01 | -0.23 |
| year1999 | -0.04 | -1.69 | -0.08 | -2.82 | 0.00 | 0.16 |
| year2000 | -0.02 | -0.77 | -0.03 | -1.09 | 0.00 | -0.07 |
| year2001 | -0.05 | -1.93 | -0.10 | -2.84 | -0.01 | -0.16 |
| Cons | 3.76 | 27.04 | 3.56 | 18.64 | 3.97 | 19.57 |

Regression Statistics

Full Sample

of Obs = 48147
R-sq within = 0.0515
Between = 0.2025
Overall = 0.1479
F(43,33411) = 42.17
Prob>F = 0.0000
Rho = 0.453

Males

of Obs = 22552
R-sq within = 0.0499
Between = 0.1863
Overall = 0.1389
F(43,15253) = 20.95
Prob>F = 0.0000
Rho = 0.4705

Females

of Obs = 25595
R-sq within = 0.0568
Between = 0.2079
Overall = 0.1515
F(43,17978) = 25.17
Prob>F = 0.0000
Rho = 0.442

Source: Living in Ireland Survey 1994-2001

2.4: Ability to Focus: Panel Data Analysis Regression Results

Factor 3, Ability to Focus, is generated from items 1, 3 and 4 on the GHQ-12 which are ability to concentrate, playing a useful part in things, and capable of making decisions. The dependent variable, Ability to Focus is a Likert scale continuous variable with a possible score of 0-9 decreasing in Focus as the Likert score increases.

The results for the determinants of ability to focus can be seen on Table 7. The differences between the determinants of ability to focus and mental health are not immense however some differences are worth noting. Only the lower professional social class category is significant. This indicates that males in this social class category have a better ability to focus than males in the higher social class category. Males between the ages of 25 and 34 are not as able to cope as younger males. While this was statistically significant for females and ability to focus it is only significant for males in this case.

An important determinant of mental health was being a member of a club or organisation however it is not statistically significant when analysing the determinants of ability to focus. The significance of all other variables remains the same.

Table 7: The Determinants of Ability to Focus Using a Fixed Effects Estimation Model

| Variable Name | Full sample | | Males | | Females | |
|---------------|---------------|--------|---------------|-------|---------------|--------|
| | β Coef. | t | β Coef. | t | β Coef. | t |
| lnequivinc | -0.01 | -0.66 | -0.02 | -0.60 | -0.01 | -0.29 |
| betterincsit | -0.06 | -4.71 | -0.04 | -2.40 | -0.07 | -4.10 |
| worseincsit | 0.10 | 7.41 | 0.06 | 3.27 | 0.13 | 6.81 |
| medcard | 0.04 | 1.85 | 0.07 | 2.10 | 0.02 | 0.59 |
| lowprof | -0.07 | -2.07 | -0.10 | -2.47 | 0.00 | -0.04 |
| nonman | -0.06 | -1.70 | -0.03 | -0.58 | -0.06 | -1.27 |
| skillman | -0.04 | -1.08 | -0.05 | -1.09 | 0.05 | 0.52 |
| sskillman | -0.03 | -0.82 | 0.00 | -0.08 | -0.03 | -0.53 |
| uskillman | -0.06 | -1.44 | -0.09 | -1.76 | 0.00 | 0.07 |
| nevworked | 0.04 | 0.58 | 0.06 | 0.65 | -0.01 | -0.06 |
| age2534 | 0.10 | 2.66 | 0.13 | 2.56 | 0.08 | 1.45 |
| age3544 | 0.04 | 0.88 | 0.11 | 1.57 | 0.00 | -0.02 |
| age4554 | 0.02 | 0.29 | 0.08 | 0.88 | -0.02 | -0.24 |
| age5564 | 0.01 | 0.15 | 0.12 | 1.06 | -0.06 | -0.56 |
| ageover65 | 0.01 | 0.08 | 0.07 | 0.54 | -0.03 | -0.23 |
| married | 0.02 | 0.62 | 0.02 | 0.40 | 0.02 | 0.47 |
| sepdv | -0.09 | -0.63 | -0.36 | -1.54 | 0.06 | 0.34 |
| widowed | 0.34 | 5.92 | 0.16 | 1.37 | 0.38 | 5.55 |
| basiced | -0.02 | -1.03 | -0.02 | -0.63 | -0.02 | -0.80 |
| junior | 0.00 | -0.03 | -0.02 | -0.53 | 0.01 | 0.45 |
| plc | 0.04 | 1.66 | 0.02 | 0.41 | 0.06 | 1.79 |
| degree | -0.01 | -0.35 | -0.01 | -0.29 | -0.01 | -0.27 |
| jobsat | -0.01 | -6.46 | -0.01 | -5.51 | -0.01 | -3.83 |
| imputejobsat | 0.11 | 3.72 | 0.10 | 2.64 | 0.13 | 2.83 |
| ftwork | -0.08 | -3.74 | -0.14 | -4.14 | -0.04 | -1.37 |
| memclub | -0.04 | -2.58 | -0.04 | -1.91 | -0.03 | -1.62 |
| sociallife | -0.10 | -7.15 | -0.06 | -2.96 | -0.13 | -6.82 |
| healthins | -0.02 | -1.10 | -0.05 | -1.46 | -0.01 | -0.33 |
| urban | 0.07 | 2.20 | 0.02 | 0.51 | 0.10 | 2.41 |
| neighbour | 0.00 | -1.18 | 0.00 | 0.73 | -0.01 | -2.12 |
| regchurch | -0.01 | -0.53 | -0.02 | -0.62 | -0.01 | -0.18 |
| vgsah | -0.37 | -18.89 | -0.28 | -9.82 | -0.44 | -16.41 |
| gsah | -0.28 | -16.15 | -0.21 | -8.41 | -0.34 | -14.01 |
| bsah | 0.67 | 17.37 | 0.70 | 12.08 | 0.64 | 12.49 |
| vbsah | 1.23 | 15.95 | 1.14 | 10.26 | 1.29 | 12.09 |
| famsize | 0.01 | 0.71 | 0.02 | 1.16 | 0.00 | -0.04 |
| year1995 | -0.06 | -3.38 | -0.07 | -2.34 | -0.07 | -2.52 |
| year1996 | -0.03 | -1.58 | -0.02 | -0.79 | -0.04 | -1.57 |
| year1997 | -0.03 | -1.50 | -0.02 | -0.80 | -0.04 | -1.41 |
| year1998 | -0.05 | -2.85 | -0.03 | -1.20 | -0.07 | -2.80 |
| year1999 | -0.05 | -2.39 | -0.05 | -1.61 | -0.05 | -1.87 |
| year2000 | -0.04 | -1.74 | -0.03 | -0.83 | -0.05 | -1.71 |
| year2001 | -0.05 | -2.19 | -0.03 | -0.72 | -0.08 | -2.39 |
| Cons | 3.69 | 27.99 | 3.53 | 18.72 | 3.80 | 20.30 |

Regression Statistics

Full Sample

of Obs = 48097
R-sq within = 0.0469
Between = 0.2078
Overall = 0.1549
F(43,33371) = 38.18
Prob>F = 0.0000
Rho = 0.478

Males

of Obs = 22542
R-sq within = 0.0410
Between = 0.2063
Overall = 0.1484
F(43,15379) = 15.30
Prob>F = 0.0000
Rho = 0.4877

Females

of Obs = 25555
R-sq within = 0.0550
Between = 0.2100
Overall = 0.1613
F(43,17949) = 24.30
Prob>F = 0.0000
Rho = 0.471

Source: Living in Ireland Survey 1994-2001

3: Conclusions

This paper presented the results of an empirical factor analysis on the GHQ-12 as measured in the LIIS. Before an exploratory factor analysis technique could be applied to the data, a number of tests were run to ascertain the suitability of the data to the techniques to be applied. These were the Bartlett's test of sphericity, the Kaiser-Meyer-Olkin test and Cronbach's Alpha. The results of 5787.206, 0.876 and 0.88 respectively indicated that factor analysis techniques could be applied to the LIIS. Following a visual investigation of the correlation matrix, a PAF technique was applied to the LIIS. This is a commonly used technique in the area factor analysis (Tabachnick and Fidell, 2001).

Following the initial factor extraction using PAF, the factors revealed in the GHQ-12 were then rotated. An oblique Promax rotation was implemented on the original factor loadings and three main factors were extracted. These factors were named Psychological Distress, Ability to Cope and Ability to Focus. Other papers have found two or three factors which have been named anxiety and social dysfunction (Kilic *et al* , 1997), dysphoria and social dysfunction (Politi *et al* , 1994) psychological distress, social dysfunction, social role (Doi and Minowa, 2003) and anxiety, social dysfunction and loss of confidence (Graetz 1991).

Dependent variables were then generated in accordance with the items that loaded on to each factor. Each factor was then analysed separately from the GHQ-12 measure and the results given. The results from each of these three regression analyses were then compared with the regression results of the determinants of mental health. In general, similar independent variables are consistently statistically significant for all three factors and the general GHQ-12 mental health measure. In all three cases a fixed effects regression was used and the determinants of Psychological Distress, Ability to Cope and Ability to Focus were uncovered. These determinants were then compared to the determinants of mental health as measured by the GHQ-12.

The main differences between the determinants were that older females were more likely to be psychologically distressed but that living in an urban environment did not affect either psychological distress or ability to cope in the same way that it affected female mental health. Also full time work was a statistically significant explanatory variable for neither psychological distress nor ability to cope. Being a member of a club or organisation improves ability to focus but not in a large capacity.

Overall, it can be seen that while there are certain differences between the coefficients of mental health status and the coefficients of the determinants of psychological distress, ability to cope and ability to focus, the main factors such as job satisfaction, self assessed health and subjective income situation remain similar. While Toyabe *et al* (2006) state that using factors separately to the overall measure can aid in the identification of psychological problems in certain groups of the population in this case the identification of mental health differences is relatively small.

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