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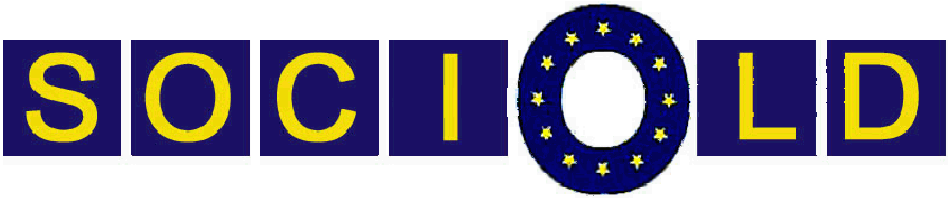

Unemployed, uneducated and sick: the effects of socioeconomic status on health duration in the European Union

By

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Unemployed, uneducated and sick: the effects of socioeconomic status on health duration in the European Union[♣]

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This paper employs a logistic model to measure the effect of socioeconomic and individual characteristics on the length of time an individual remains in good health. It employs an objective measure of physical health, the Physical and Mental Health Problems, Illnesses and Disabilities (PMID) measure in the ECHP dataset, for 13 European countries, for the years 1994-2002. The results show that socioeconomic status does affect the likelihood of individuals entering bad health. In particular, unemployment increases and education decreases the probability of a person ceasing to enjoy good health. Income effects, are however, somewhat weaker, being confined to a small number of countries and being mainly observed only for the highest income quartile. Interesting age and gender effects are also found.

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1. Introduction

Recent years have witnessed considerable interest in the relationship between socioeconomic status and health. Researchers have uncovered evidence of links between various facets of the socioeconomic status of individuals and their health. The evidence points to this being a positive relationship, the better off enjoying considerably better health than the underprivileged in society. One important socioeconomic determinant of health is unemployment, and this has been shown in the literature to have serious negative consequences on an individual's health. However, policy makers are increasingly concerned with the negative effects of long-term ill-health. This paper addresses this key issue head on by looking at the effect of unemployment on health *duration*. In addition, the cross European Union focus of the paper permits the identification of institutional factors unique to individual countries that have a bearing upon this relationship.

This sphere of investigation also throws up a host of methodological challenges which also provide some interest. For example, it is not clear *a priori* whether the effects of unemployment, such as the sense of alienation and low self esteem arising from being detached from the productive processes of society, or lack of access to affordable housing, adequate health care, and appropriate diet, *cause* poor health, or whether poor health is a factor that restricts the individual's opportunity to secure adequate long-term, secure employment. These endogeneity and selection issues are fully investigated in the paper, and shed new light on the transmission mechanisms between unemployment and health duration.

The paper considers the impact on an individual's health of a number of socioeconomic indicators, including employment status, income, and education, controlling for a variety of individual characteristics, such as age, gender and occupational status. The study employs an objective

measure of health, namely a measure of physical and mental health problems, illnesses and disabilities. The issue of endogeneity in the unemployment – health duration relationship is addressed in this study as the individual's socioeconomic status is recorded at the time his or her good health comes to an end, while the probability of exit from a spell of good health is estimated over the whole time that the individual is healthy. Thus, by design, lower health status cannot cause lower socioeconomic status. This methodology, namely to restrict the sample to those individuals who exhibit good health at the initial point of the survey, is often used in applied research in order to avoid endogeneity problems (Lynch *et al*, 1997; Buckley *et al*, 2004). Furthermore, an individual who is healthy for long periods may adopt a lifestyle that may be more detrimental towards health than otherwise which, in turn, may cause loss of health capital, thus adversely affecting the duration of health spell. If prospects of deteriorating health increase as the good health spell continues there is positive duration or state dependence (Heckman and Borjas (1990) and Lancaster (1979)). In addition, failure to account for effects of unobserved personal characteristics[4] which decrease (increase) the probabilities of exiting a spell of good health may also bias the results in favour of a negative (positive) duration dependence. The influence of socioeconomic and individual characteristics on the length of time an individual remains in good health is estimated using a logistic regression approach proposed by Jenkins (1995), which allows for covariates to vary across time, and is able to accommodate the issues described above.

The paper henceforth is organised as follows. In the next section an overview of the pertinent literature on the nature of the relationship between socio-economic status and health is presented. Section 3 details the statistical and econometric methodology employed and describes the

[4] This may include not only personal or family characteristics but also unobserved factors such as the duration of the good health spell prior to the entrance of the individual in the observation period.

data in the study. The results are discussed in section 4 and conclusions are offered in section 5.

2. The relationship between socioeconomic status and health: an overview of the literature

The effect of socioeconomic status on health has potentially far reaching policy implications. It is therefore not unsurprising that such an issue has received considerable interest in both academic and policy making circles and has generated a vast and rapidly increasing volume of literature. This section does not set out to provide a comprehensive review of that literature, but rather to provide an overview of the essence of the state of play at present. Mackenbach *et al* (1990) provided evidence that variation in mortality rates and health is not so much related to the level of medical provision but rather more to individuals' socio-economic circumstances. Hence, the impact of factors affecting the initial incidence of diseases and infections among the population appear to overshadow the impact of the direct effects of medical care.

The relationship between labour force status and physical health has been examined in detail by, among others, Martikainen and Valkonen (1996) and Ruhm (2000), while the relationship between labour force status and psychological health has been extensively studied by Clark and Oswald (1994), Gerlach and Stephan (1996), Theodossiou (1998) and Winkelmann and Winkelmann (1998). The distinction between direct and indirect effects of socioeconomic status on health has also been highlighted by Duleep (1986) and Gerdtham and Johannesson (2001).

On the specific effect of unemployment, Moser *et al* (1984), Dahl (1993), and Bartley (1994) showed that unemployment is detrimental to an individual's health, while Gerdtham *et al* (2003) identified unemployment

to be a health hazard in itself. Moreover, Rantakeisu *et al* (1999) found that the unemployed who suffered the greatest financial hardship and shaming experiences reported the worst health outcomes. Their lifestyles had deteriorated, their social life was reduced, their self-confidence had diminished and they enjoyed fewer leisure activities. Additionally, Moser *et al* (1986) showed that higher mortality rates were not only confined to unemployed men but also to their wives. Other studies have addressed the important consequences of increased risk of unemployment. Ferrie *et al* (1995) examined the effect of anticipating job loss on self-reported health status, finding that job insecurity has negative effects on individual health status for both genders, but particularly for men.

The duration of unemployment has also been identified in the literature as a negative factor influencing mental and psychological health. A survey is provided by Ervasti (2002), which also reveals the existence of a non-linear effect, where psychological distress reaches its peak at the start of the unemployment period and declines as the unemployment continues. Winefield *et al* (1990) confirmed this nonlinear hypothesis, showing that psychological distress among young people peaks at about 9 months of unemployment duration. Similar negative effects on self-reported health status are also highlighted by Grobe and Schwartz (2003), especially among unemployed men with one or more years of unemployment, who were found to exhibit a four times larger incidence of reporting poor or bad health status in comparison to permanently employed men. Moreover, employed men were found to spend less than half the amount of time in hospital than those unemployed, while unemployed women spent 1.7 times longer in hospital than employed women. Finally, they also found that death rates are not only higher among the unemployed, but increase as the duration of unemployment increases.

Strong evidence of the effect of gender on the relationship between employment status and health status has also been found. Theodossiou

(1998) showed that women are less sensitive to unemployment than men, while Grundy and Holt (2000) found that poor health and disability of older men increased with the proportion of their working life spent unemployed. Thus, for older men, employment status effects in their earlier lives were important in shaping their current health, whereas for older women family related factors were the most important determinants of their poor health and disability status.

The effect of other individual characteristics has also been an area of interest addressed by a large number of papers. Glass *et al* (1999) found that inactivity in old age can lead to rapid health deterioration. The effect of age on the socioeconomic status health relationship was investigated by Morrell *et al* (1999) and Grundy and Holt (2000).

3. Statistical and econometric methodology

The data used in this study are from the European Community Household Panel Survey (ECHP). The ECHP is a longitudinal panel survey covering fifteen European Union countries, with the first interviews being conducted in 1994. The first wave of the sample was only conducted in twelve of the countries and sampled approximately 150,000 individuals in 71,000 households.

The duration of a spell of good health for an individual is defined in this study as follows. Individuals in good health are identified when they enter the survey. Then the length of the good health is measured (in years). The spell of good health can end in one of three ways: the individual may enter a spell of bad health; leave the panel whilst still in good health; or remain in good health by the end of the panel (wave 8). In the latter two cases, the period of good health is considered to be a censored observation. Thus, individuals who are observed as having good health from the beginning of

the survey are recorded and are followed until the time that they report worsened health status. An individual who does not report deterioration of health by the end of the survey is considered to be a censored observation.

This paper employs the Physical and Mental Health Problems, Illnesses and Disabilities (PMID) measure of physical health, which is based on the responses to the questions "Do you have any chronic physical or mental health problem, illness or disability?" The definitions of the variables and their means may be found in Table 4 in Appendix 2.

The study employs the Jenkins (1995) logistic approach to estimating the effect of socioeconomic and individual characteristics on the length of time an individual remains in good health. This approach allows for covariates to vary across time. Each individual is observed at a number of points in time and their covariates and status recorded. The status is a binary variable, for example good health or poor health, employed or unemployed, in receipt of income support or not in receipt of income support. A dummy variable is used to indicate if the individual exits from that particular status at the end of the time period in question, taking the value "1" in the period in which the individual exits, and the value "0" otherwise (an individual who remains in that particular status, or who has a censored spell).

The duration distribution is modelled by the probability of a spell ending at each value of t (the hazard rate):

$$h_{it} = P(T_i = t \mid T_i \geq t ; X_{it})$$

where X_{it} is a vector of covariates which vary with time, and T_i is a discrete random variable representing the time at which a spell ends:

$$P(T_i = t) = h_{it}\prod_{k=1}^{t-1}(1-h_{ik}) = \frac{h_{it}}{1-h_{it}}\prod_{k=1}^{t}(1-h_{ik})$$

and

$$P(T_i > t) = \prod_{k=1}^{t}(1-h_{ik})$$

The likelihood for the whole sample is therefore:

$$L = \prod_{i=1}^{n}\left[\left[\left(\frac{h_{it}}{1-h_{it}}\right)\prod_{k=1}^{t}(1-h_{ik})\right]^{\delta_i}\left[\prod_{k=1}^{t}(1-h_{ik})\right]^{(1-\delta_i)}\right]$$

The log-likelihood is therefore

$$l = \log L = \sum_{i=1}^{n}\delta_i \log\left(\frac{h_{it}}{(1-h_{it})}\right) + \sum_{i=1}^{n}\sum_{k}^{t}\log(1-h_{ik})$$

where δ_i is a dummy variable indicating if an individual has exited from good health, $\delta_i = 0$ indicates an individual remains in good health and $\delta_i = 1$ indicates an individual loses their good health. This has the same form as the standard log-likelihood function for regressing a binary variable where the unit of analysis is the day, month or year of a time spell. An expression for the hazard rate is also required. Hazards do not have to be proportional and so a non-proportional hazard model is the logistic:

$$h_{it} = \frac{1}{1+\exp(-\theta(t)+\beta' X_{it})}$$

$$= \log\left(\frac{h_{it}}{1-h_{it}}\right)$$

$$= \theta(t)+\beta' X_{it}$$

The logistic model is very similar to the log-log employed in most empirical applications. The logistic converges to a proportional hazard model as the hazard rate tends to zero, and in most applications the hazard rate will be sufficiently small.

In the regressions, the dependent variable is the dummy variable indicating if a spell of good health has been observed to end. The covariates are mostly dummy variables indicating occupation, level of education, marital status, level of income and other similar factors. Unobserved heterogeneity can be dealt with by generalising the model:

$$\log\left[\frac{h_{it}}{1-h_{it}}\right] = \theta(t) + \beta' X_{it} + \varepsilon_i$$

where ε_i is an unobserved individual specific error term which is not correlated with the covariates and has zero mean. To estimate this model, it is assumed that the ε_i follow some parametric distribution and integrate them out of the likelihood. There is a potential problem that while the ε_i may be iid in the whole population, when the data is restricted to individuals with a particular status, for example in good health, then this assumption may no longer hold. Tractable estimation can be used in this case, and while it is not possible to write the likelihood as a standard function, it is still possible to estimate the modified likelihood assuming that the ε_i are normally distributed.

4. The socioeconomic effects on health duration in the European Union: evidence from the ECHP

The overview of the literature reviewed in section 2 identified the socioeconomic determinants of health duration of greatest interest to be unemployment, education and income, which are dealt with in turn in the following three sections[5]. In each section the results from the whole sample are discussed first, and then the results from the sample disaggregated first by age and then gender. With respect to age, the sample is disaggregated into two groups, namely the young (those aged 20-45) who are in the early stages of their careers and are at their most productive and the older workforce (those aged over 45) who are approaching retirement and whose health is of great importance for labour force participation and retirement policies in the European Union. Furthermore, in view of the lifestyles and physiological differences between the genders, it is of considerable interest to social policy makers whether the socioeconomic effects of unemployment, education and income differ between males and females, when considering the design of social policy across member states.

4.1 The effects of unemployment on good health duration

Unemployed individuals are significantly more likely to lose their good health or have significantly shorter spells of good health. It can be seen from Table 1 that, for the whole sample, unemployment has a strong and significant effect on the period which one enjoys good health in most countries, in line with the recent literature. The odds of an unemployed individual facing a decline in health vary from 1.2 in France and Italy, to 2.0 in Greece and Austria, compared to those who are not unemployed. Only in the Netherlands and in Finland is there no significant effect.

[5] A list of all the variables included, together with their definitions and means, may be found in Table 4. The full set of results is available from the authors upon request.

These results complement the findings of Moser et al (1984), Dahl (1993) and Bartley (1994) on the negative effects of unemployment on health; the findings of Gerdtham et al (2003) and Rantakeisu et al (1999) on the negative effect on health of various bad experiences associated with unemployment; the results of Ferrie et al (1995) on the adverse effect of the risk of unemployment on health; and the results from Ervasti (2002), Winefield et al (1990) and Grobe and Schwartz (2003) on the negative effect of unemployment duration on health.

If the sample is now disaggregated by age, it can be seen from Table 1 that the unemployment effect is more significant for the younger age group in the majority of countries, with unemployment increasing the probability of an individual losing their good health. Again, only in the Netherlands and Finland is no significant effect found. The unemployment effect on the older age group is weaker by comparison. Only in Germany, the UK, Greece, Spain, Portugal and Austria are significant effects found for the older age group. As with the whole sample, young Greeks suffer the greatest odds of health decline if they are unemployed (they are 2.2 times as likely to enter a spell of bad health compared to those who are not unemployed) and young Germans the least negative effect (being only 1.2 times as likely to enter a spell of bad health compared to those who are not unemployed). The results in this paper therefore seem to echo the arguments made by Ervasti (2002) that older individuals embody a certain degree of experience that puts them in a better position to cope with unemployment. Moreover, for older workers, labour force participation decisions are greatly affected by health deterioration, and individuals who experience unemployment at the top end of this age bracket may decide to retire early or drop out of the labour market, and this may mask the unemployment effect for this older age group. This lends further weight to the importance of policies aimed at reducing health risks for this age group.

Though difficult to make *a priori* predictions as to possible gender effects of unemployment, it may be conjectured that the effect of unemployment would be greater for males, since firstly, males tend to be the household's main breadwinner, and secondly, males also appear to lack an alternative sense of purpose in comparison with females (such as domestic commitments, child-rearing, etc.). The results from this study confirm that this is indeed the case. For example, in Greece, an unemployed male is 2.6 times as likely to enter a spell of bad health compared to a male who is not unemployed, whereas an unemployed female is only 1.6 times as likely to enter a spell of bad health compared to a female who is not unemployed. The odds ratios vary from 1.3 (Germany) to 2.6 (Greece) for males, and from 1.1 (Germany) to 2.4 (Austria) for females. Only in the Netherlands and Finland are there no discernible gender effects, and only in France and Austria is the unemployment effect greater for females than males.

4.2 The effects of education on good health duration

The established literature suggests that there is a beneficial effect of education on good health. Studies include Muller (2002) and Sturm and Gresenz (2002) who identified education as being closely related to health, Muller (2002) who showed education to be a powerful predictor of mortality, Duncan *et al* (2002) who demonstrated that better educated individuals tend to adopt healthier lifestyles, and Fuchs (2004) who postulated that education increases the ability to take control of behaviour and make decisions over a longer time horizon. In line with this literature, education in this study is also shown to have a strong and significant effect on the length of a spell of good health, as shown in Table 2. Education has a strong and significant effect on the period which one enjoys good health in most countries, in line with the recent literature. The odds of an individual with second level education suffering a decline in health varies between 69% (Portugal) and 91% (Germany) compared to a person with only a basic level of education. Moreover, the odds of an

individual with third level education suffering a decline in health varies between 42% (Portugal) and 85% (Denmark) compared to a person endowed with only first level of education. Only in Belgium and Austria is there no significant effect of either second or third level education, and only in the Netherlands, France and Finland is there no significant effect of second level education. These results are therefore picking up the beneficial effect of education on the duration of good health.

The education effects on good health duration when the sample is disaggregated by age are also presented in Table 2. It can be seen that the effect of education for the young is very similar to that found for the whole sample[6]. The only noticeable difference is that there is no longer an education effect for young Danes for both levels of education, and no effect of second level education for young Germans. However, for the older workforce, although the effect of second-level education is similar to that for the whole sample, the effect of third-level education is weaker for the older workforce compared to the results for the whole sample, with the UK and Italy joining Belgium and Austria in having no discernable effects of third-level education. This may be due to the fact that the level of education is likely to be more of a significant factor for younger individuals. Although the older age group will have the benefit of experience to help them obtain a job, for younger individuals with little or no experience it is their qualifications that are more likely to determine their occupation. Individuals with lower levels of education tend to be found in more physically demanding work which could have an effect on their health. Conversely however, those with higher levels of education

[6] In the Netherlands, after wave 3, there are a large number of individuals classed as having less than second level education, which puts them in the lowest education category. This results in education increasing the probability of losing good health. For this reason, the results for the Netherlands will be placed to one side. Thus, we have replaced the level of education in waves 4-8 with the level of education in wave 3, so as to achieve consistency with other countries in the ECHP. The effect of education will remain underestimated as there is no scope for individuals increasing their education level in waves 4-8.

are often cited as being in occupations with more stressful work so this may also have a bearing on the results.

Compared with the whole sample, the beneficial effects of second level education on health duration tend to be stronger for females and weaker for males. For example in Ireland, for the whole sample, those with second level education were 25% less likely to enter a spell of bad health than those with only first level education. When the sample is disaggregated by gender, however, this figure falls to 20% for males and rises to 30% for females. Of those countries with significant effects, only Portugal bucks this trend. Interestingly, the education effect for males loses significance in Denmark (for both second and third levels) and Germany (second level) compared to the whole sample. The picture for third level education is, however, less clear cut. In some countries the beneficial effects of third level education fall for males (Ireland and Greece) and rise for females (Ireland, Greece and Spain), but has the opposite effect in other countries. For example, in the UK as a whole, an individual with third level education is 16% less likely to enter a spell of bad health compared with someone with only the first level of education, whereas this figure rises to 19% for males but falls to 13% for females.

4.3 The effects of income on good health duration

The last of the main effect for consideration is income, the results for which are detailed in Table 3. When compared to the strong effect of unemployment status and level of education, the effects of income are less impressive. All the significant results point to higher income individuals being less likely to enter a spell of bad health, with most of the significant results being concentrated in the highest income quartile group. For example, a person in the highest income quartile is between 13% (Italy) and 41% (Portugal) less likely to enter a spell of bad health compared to a person in the lowest income quartile. Only in Portugal, Belgium and

France do effects exist for all income quartiles, while for Austria, Italy, and Netherlands, effects only exist for the highest income quartile. In Denmark, the UK, Ireland, Greece and Finland, there are no significant for any income quartile. These results therefore appear to show that the detrimental effects of income on health are less important compared with the effects of unemployment or education, which casts into doubt studies which highlight the dominant effect of income or wealth on health, *inter alia*, Goldman *et al* (1995), Ecob and Davey Smith (1999), Duncan *et al* (2002), Attanasio and Hoynes (2000), Blakely *et al* (2002), Grundy and Holt (2000), Ruhm (2000), van Rossum *et al* (2000), Crossley and Kennedy (2002), Meer *et al* (2003) and Wagstaff *et al* (2001).

It is *a priori* less certain how or if the effect of income will change between age groups. Younger individuals, for example, may have less financial commitments and be less affected by lower income. Focussing on the top income quartile, there is little evidence of this being the case. Compared with the whole sample, the income effect is stronger for the older workforce in all countries where a significant effect was found, whereas for the younger workforce it is stronger in Germany and Belgium, and weaker in France, the Netherlands and Portugal. For example, in France as a whole, having a high income reduced one's chance of entering bad health by 30%. For the young this figure worsens to only 25%, whereas for the older workforce it improves to 36%.

The income effect also varies by gender. Again, focussing on the top income quartile, where most of the significant effects are observed, it is clear that the beneficial effect of higher income is higher for females and lower for males than for the whole sample. To take France again as an example, remember that having an income level in the top quartile reduced an individual's chance of entering bad health by 30%. For males this deteriorates to 28%, whereas for females this improves to 31%.

5. Conclusions.

This paper employed the Jenkins approach to measure the effect of socioeconomic and individual characteristics on the length of time an individual remains in good health, using an objective measure of physical health, the Physical and Mental Health Problems, Illnesses and Disabilities (PMID) measure in the ECHP dataset, for 13 European countries, for the years 1994-2002. The results show that socioeconomic status does affect the likelihood of individuals entering bad health. In particular, unemployment increases and education decreases the probability of a person ceasing to enjoy good health. Income effects, are however, somewhat weaker, being confined to a small number of countries and being mainly observed only for the highest income quartile. Interesting age and gender effects are also found. Unemployment effects are greatest for the younger workforce and for males, whereas second-level education effects are greater for females and weaker for males.

References

Bartley, Mel., 1994 "Unemployment and ill health: understanding the relationship", Journal Epidemiology and Community Health, 48: 333 – 337

Blaxter, Mildred, 1990 "Health and Lifestyles", London: Tavistock/Routledge Winkelmann, Lilianna, & Winkelmann, Rainer, [1998] "Why are the unemployed so unhappy? Evidence from panel data.", Economica, 65(257): 1 – 15

Buckley, N.J., Denton, F.T., Robb, A.L. and Spencer, B.G. (2004) 'The transition from good to poor health: an econometric study of the older population' Journal of Health Economics (forthcoming)

Clark, A. E., & Oswald, A. J., 1994. Unhappiness and unemployment. The Economic Journal, 104(424): 648-659.

Cox, David R. and D. Oakes, 1984 "Analysis of Survival Data", pp 1-31, Chapman and Hall, London,

Dahl, Espen, 1993 "Social Inequality in Health - the role of the healthy worker effect", Soc Sci Med, 36: 1077 – 1086

Duleep, H.O. 1986 "Measuring the effect of income and adult mortality using longitudinal administrative data" Journal of Human Resources, vol. 21.

Ervasti, H., 2002. Unemployment, well-being and job-search: A comparison of Denmark and Finland.http://www.socsci.auc.dk/cost/unemployment/Malta2002/HeikkiErvasti.pdf

Ferrie, J.E., Shipley, M.S., Marmot, M., Stansfeld, S.., Davey-Smith, G. (1995). "Health effects of anticipation of job change and non-employment: longitudinal data from the Whitehall II study", British Medical Journal, 311: 1264-1269.

Flatau, P., Galea, J., & Petridis, R., 2000. Mental health and well being in unemployment. The Australian Economic Review, 33(2): 161-181.

Gerdtham, U-G and Johannesson, M. 2001 "The relationship between happiness, health and socioeconomic factors: results based on Swedish microdata" Journal of Socioeconomics, vol. 30, pp. 553-57.

Gerdtham, U.-G. & Johannesson, M., 2003. A note on the effect of unemployment on mortality. Journal of Health Economics, 22: 505-518.

Gerlach, K. and Gesine, S. 1996, "A paper on unhappiness and unemployment in Germany" Economics Letters vol. 52, no. 3, pp. 325-30.

Glass, Roberta, Ichiro Kawachi & Bruce P. Kennedy, 1999 "Social Capital and Self-Rated Health: A Contextual Analysis", American Journal of Public Health, 89(8): 1187 - 1193

Grobe, T. G., & Schwartz, F. W., 2003. Unemployment and health status. Part of the Federal Health Reporting, Booklet 13, Robert Koch Institute (in German).

Grundy, E., & Holt, G., 2000. Adult life experiences and health in early old age in Great Britain. Social Science & Medicine, 51: 1061-1074.
Jenkins, S., 1995, 'Easy Estimation Methods for Discrete-Time Duration Models' Oxford Bulletin of Economics and Statistics Volume 57, Number 1
Katz, S., A.B. Ford, R.W. Moskowitz, B.A. Jackson, and M.W. Jaffe (1963) "Studies of illness in the aged: the index of the ADL – a standard measure of biological and psychosocial function", Journal of the American Medical Association, vol. 185, pp. 914-919.
Lancaster, T. 1999 "Econometric methods for the duration of unemployment" Econometrica vol. 47, no. 4, pp. 939-956.
Leino-Arjas, P., Liira, J., Mutanen, P., Malmivaara, A., & Matikainen, E., 1999. Predictors and consequences of unemployment among construction workers: prospective cohort study. British Medical Journal, 319: 600–605.
Lynch, J.W., Kaplan, G.A. and Shema, S.J. (1997) '*Cumulative impact of sustained economic hardship on physical, cognitive, psychological and social functioning*' The New England Journal of Medicine, 337, 1889-1895.
Mackenbach, J. P., M. H. Bouvier-Colle, and E. Jougla, 1990 "Avoidable Mortality and Health Services: A Review of Aggregate Studies.", Epidemiology and Community Health, 44: 106 – 111
Martinkainen, P.T. and Valkonen, T. 1996 "Excess mortality of unemployed men and women during a period of rapidly increasing unemployment" The Lancet vol. 348, pp. 909-12.
Morrell, S., Taylor, R., Quine, S., Kerr, C., & Western, J., 1999. A case-control study of employment status and mortality in a cohort of Australian youth. Social Science & Medicine, vol. 49, pp.383-92.
Moser, K., Fox, J., & Jones, D., 1984 "Unemployment and Mortality: Further Evidence from the OPCS Longitudinal Study", The Lancet: 365 – 367
Moser, K.A., J. Fox and D.R. Jones, 1986, "Unemployment and Mortality in the OPCS Longitudinal Study" In Class and Health: Research and Longitudinal Data, ed. R.G. Wilkinson, London: Tavistock.
Muller, Andreas, 2002 "Education, income inequality, and mortality: a multiple regression analysis" British Medical Journal, Volume 324,
Rantakeisu, Ulla, Starrin, Bengt & Hagquist, Curt, 1999 "Financial Hardship and Shame: A Tentative Model to Understand the Social and Health Effects of Unemployment", British Journal of Social Work, 29: 877-901
Ruhm, C. 2000 "Are recessions good for your health?" Quarterly Journal of Economics vol. 115, no. 2, pp. 617-50.
Sturm, Roland and Carole Roan Gresenz 2002 "Relations of income inequality and family income to chronic medical conditions and mental health disorders: national survey", British Medical Journal, Volume 324

Theodossiou, I., 1998. The effects of low-pay and unemployment on psychological well-being: A logistic regression approach. Journal of Health Economics, 17(1): 85-104.
Winkelmann, L. and R Winkelmann (1998) "Why are the unemployed so unhappy? Evidence from panel data." Economica, vol. 65, no. 257, pp. 1-15.
Winefield, A. H., & Tiggemann, M., 1990. Length of unemployment and psychological distress: Longitudinal and cross-sectional data. Social Science & Medicine, 31(4): 461-465.
Jenkins, S., 1995, 'Easy Estimation Methods for Discrete-Time Duration Models' Oxford Bulletin of Economics and Statistics

Appendices

Appendix 1

Table 1 The effect of unemployment on health

Sample	Whole Sample		Individuals aged 20-45		Individuals aged 46-65		Males		Females	
Country	Odds Ratio	Z-value	Odds Ratio	Z-value	Odds Ratio	Z-value	Odds Ratio	Z-value	Odds Ratio	Z-value
Germany	1.250***	3.05	1.217**	2.08	1.309**	2.31	1.329***	2.76	1.180*	1.64
Denmark	1.388**	2.34	1.534***	2.59	1.088	0.32	2.031***	3.56	1.069	0.35
Netherlands	1.184	1.55	1.181	1.29	1.143	0.65	1.464	1.56	1.132	1.01
Belgium	1.426***	2.58	1.361*	1.85	1.460	1.51	1.686**	2.51	1.359*	1.69
France	1.247**	2.33	1.300**	2.37	1.120	0.62	1.062	0.38	1.396***	2.76
UK	1.458***	3.54	1.431***	2.89	1.459*	1.88	1.593***	3.57	1.332	1.59
Ireland	1.593***	3.50	1.690***	3.35	1.282	0.98	1.499***	2.60	1.632*	1.92
Italy	1.225*	1.76	1.403**	2.49	0.989	-0.04	1.500***	2.72	0.952	-0.27
Greece	2.025***	5.54	2.155***	4.85	1.850***	2.74	2.600***	5.90	1.577**	2.35
Spain	1.340***	4.04	1.370***	3.62	1.301**	1.96	1.423***	3.69	1.303**	2.31
Portugal	1.540***	3.70	1.482***	2.60	1.608**	2.50	2.187***	4.77	1.199	1.12
Austria	2.058***	4.25	1.675**	2.21	2.709***	3.81	1.781**	2.50	2.396***	3.57
Finland	1.049	0.45	1.132	0.92	0.905	-0.58	1.146	0.91	0.962	-0.26

Table 2 The effect of education on health

Sample	Whole Sample		Whole Sample		Individuals aged 20-45		Individuals aged 20-45		Individuals aged 46-65		Individuals aged 46-65	
Education	Second Level		Third Level		Second Level		Third Level		Second Level		Third Level	
Country	Odds Ratio	Z-value	Odds Ratio	Z-value	Odds Ratio	Z-value	Odds Ratio	Z-value	Odds Ratio	Z-value	Odds Ratio	Z-value
Germany	0.914*	-1.93	0.775***	-4.14	0.967	-0.57	0.812***	-2.63	0.839**	-2.25	0.757***	-2.86
Denmark	0.814**	-2.23	0.846*	-1.68	0.995	-0.04	0.973	-0.21	0.622***	-3.21	0.747*	-1.87
Netherlands	0.922	-1.32	0.762***	-3.20	0.960	-0.52	0.792**	-2.23	0.857	-1.53	0.721**	-2.19
Belgium	0.938	-0.70	0.915	-0.86	0.912	-0.83	0.762**	-2.16	0.908	-0.62	1.199	1.08
France	0.982	-0.32	0.708***	-4.71	0.886	-1.61	0.697***	-3.85	1.115	1.25	0.674***	-3.26
UK	0.808***	-3.49	0.839***	-3.53	0.836**	-2.51	0.837***	-3.01	0.734***	-2.66	0.876	-1.48
Ireland	0.748***	-3.64	0.546***	-4.93	0.742***	-2.93	0.467***	-4.75	0.745**	-2.29	0.696*	-1.92
Italy	0.797***	-3.65	0.679***	-3.21	0.801***	-2.71	0.600***	-3.40	0.794**	-2.39	0.791	-1.25
Greece	0.767***	-3.38	0.689***	-3.64	0.818*	-1.90	0.781*	-1.86	0.765**	-2.23	0.619***	-2.88
Spain	0.698***	-5.50	0.713***	-5.13	0.718***	-4.36	0.716***	-4.24	0.660***	-3.05	0.706***	-2.72
Portugal	0.691***	-3.73	0.429***	-5.53	0.759**	-2.48	0.412***	-4.32	0.399***	-3.56	0.443***	-3.35
Austria	0.899	-1.24	0.792	-1.43	0.865	-1.18	0.846	-0.81	0.984	-0.13	0.757	-1.09
Finland	0.935	-0.91	0.740***	-3.60	0.909	-0.90	0.717***	-2.79	0.975	-0.23	0.740**	-2.50

Sample	Males		Males		Females		Females	
Education	Second Level		Third Level		Second Level		Third Level	
Country	Odds Ratio	Z-value	Odds Ratio	Z-value	Odds Ratio	Z-value	Odds Ratio	Z-value
Germany	0.942	-0.84	0.728***	-3.69	0.886**	-2.01	0.844**	-1.96
Denmark	0.881	-0.98	0.910	-0.65	0.766**	-2.13	0.799	-1.61
Netherlands	0.850*	-1.72	0.723***	-2.66	0.965	-0.45	0.766**	-2.25
Belgium	0.942	-0.45	0.776*	-1.76	0.933	-0.54	1.061	0.40
France	0.987	-0.17	0.670***	-3.94	0.983	-0.21	0.759***	-2.74
UK	0.832**	-2.08	0.807***	-2.96	0.782***	-2.94	0.867**	-2.11
Ireland	0.802*	-1.92	0.692**	-2.34	0.693***	-3.39	0.424***	-4.66
Italy	0.823**	-2.30	0.591***	-3.25	0.769***	-2.98	0.779	-1.55
Greece	0.780**	-2.36	0.765**	-1.99	0.764**	-2.37	0.618***	-2.97
Spain	0.731***	-3.59	0.697***	-4.10	0.639***	-4.60	0.708***	-3.57
Portugal	0.614***	-3.31	0.389***	-3.60	0.784*	-1.84	0.458***	-4.04
Austria	0.799*	-1.73	0.617**	-2.00	0.963	-0.34	1.001	0.00
Finland	0.825*	-1.92	0.667***	-3.42	1.067	0.59	0.817*	-1.70

Table 3 The effect of income on health

Sample	Whole sample		Whole sample		Whole sample	
Income	Income Group 2		Income Group 3		Income Group 4	
Country	Odds Ratio	Z-value	Odds Ratio	Z-value	Odds Ratio	Z-value
Germany	0.965	-0.65	0.915	-1.57	0.792***	-3.97
Denmark	0.960	-0.37	0.951	-0.45	0.863	-1.27
Netherlands	0.949	-0.67	0.950	-0.68	0.820**	-2.46
Belgium	0.800*	-1.95	0.812*	-1.86	0.826*	-1.66
France	0.884*	-1.72	0.808***	-2.96	0.700***	-4.51
UK	0.970	-0.45	0.968	-0.50	0.901	-1.58
Ireland	1.043	0.43	0.885	-1.16	0.860	-1.37
Italy	1.022	0.28	1.007	0.08	0.865*	-1.70
Greece	1.037	0.42	1.101	1.07	0.934	-0.72
Spain	0.952	-0.76	0.885*	-1.84	0.951	-0.73
Portugal	0.778***	-3.28	0.728***	-4.11	0.592***	-6.36
Austria	0.854	-1.48	0.914	-0.83	0.798**	-2.07
Finland	1.035	0.39	1.100	1.12	0.947	-0.60

	Individuals aged 20-45		Individuals aged 20-45		Individuals aged 20-45		Individuals aged 46-65		Individuals aged 46-65		Individuals aged 46-65	
Income	Income Group 2		Income Group 3		Income Group 4		Income Group 2		Income Group 3		Income Group 4	
Country	Odds Ratio	Z-value	Odds Ratio	Z-value	Odds Ratio	Z-value	Odds Ratio	Z-value	Odds Ratio	Z-value	Odds Ratio	Z-value
Germany	0.979	-0.33	0.945	-0.84	0.780***	-3.45	0.942	-0.59	0.842*	-1.74	0.771***	-2.61
Denmark	0.908	-0.74	0.846	-1.25	0.736**	-2.12	1.113	0.49	1.186	0.77	1.071	0.31
Netherlands	0.968	-0.36	0.934	-0.72	0.831*	-1.86	0.897	-0.73	0.939	-0.45	0.760*	-1.92
Belgium	0.743**	-2.07	0.846	-1.21	0.782*	-1.66	0.963	-0.20	0.780	-1.22	0.933	-0.36
France	0.849*	-1.81	0.831**	-1.99	0.757**	-2.54	0.942	-0.51	0.761**	-2.40	0.640***	-3.89
UK	1.004	0.05	0.977	-0.31	0.856**	-1.99	0.868	-1.07	0.917	-0.69	0.916	-0.71
Ireland	1.034	0.26	0.769*	-1.84	0.818	-1.34	1.064	0.40	1.045	0.29	0.891	-0.70
Italy	1.043	0.37	1.135	1.08	1.160	1.23	0.988	-0.12	0.893	-1.10	0.664***	-3.71
Greece	0.955	-0.37	1.085	0.63	1.057	0.40	1.097	0.81	1.087	0.70	0.822	-1.52
Spain	1.041	0.48	0.918	-0.98	1.058	0.63	0.820**	-2.02	0.808**	-2.21	0.789**	-2.29
Portugal	0.785**	-2.35	0.736***	-2.88	0.650***	-3.80	0.744***	-2.74	0.683***	-3.57	0.528***	-5.58
Austria	0.760*	-1.94	0.988	-0.08	0.837	-1.20	0.914	-0.56	0.757*	-1.77	0.669**	-2.54
Finland	1.054	0.51	1.106	0.97	0.979	-0.18	0.975	-0.16	1.044	0.29	0.864	-1.00

Income	Males Income Group 2		Males Income Group 3		Males Income Group 4		Females Income Group 2		Females Income Group 3		Females Income Group 4	
Country	Odds Ratio	Z-value	Odds Ratio	Z-value	Odds Ratio	Z-value	Odds Ratio	Z-value	Odds Ratio	Z-value	Odds Ratio	Z-value
Germany	0.935	-0.89	0.956	-0.58	0.808***	-2.63	0.994	-0.08	0.876*	-1.77	0.781***	-3.14
Denmark	0.909	-0.60	0.928	-0.48	0.739*	-1.84	1.022	0.14	0.978	-0.14	1.008	0.05
Netherlands	0.948	-0.45	1.031	0.26	0.899	-0.90	0.966	-0.35	0.914	-0.89	0.805**	-1.99
Belgium	0.807	-1.30	0.781	-1.51	0.997	-0.02	0.807	-1.44	0.856	-1.03	0.708**	-2.12
France	0.866	-1.44	0.848*	-1.67	0.717***	-3.12	0.892	-1.19	0.753***	-2.83	0.668***	-3.73
UK	0.970	-0.31	1.057	0.58	0.921	-0.84	0.972	-0.33	0.897	-1.24	0.901	-1.18
Ireland	0.908	-0.69	0.698**	-2.46	0.690**	-2.46	1.160	1.14	1.068	0.48	1.038	0.26
Italy	0.986	-0.13	1.004	0.04	0.921	-0.73	1.060	0.58	0.998	-0.02	0.802*	-1.91
Greece	1.066	0.53	1.161	1.21	0.988	-0.09	1.023	0.20	1.048	0.41	0.860	-1.15
Spain	0.921	-0.90	0.833**	-1.98	0.926	-0.82	0.989	-0.13	0.950	-0.58	0.974	-0.27
Portugal	0.801**	-2.06	0.729***	-2.93	0.539***	-5.31	0.758***	-2.87	0.730***	-3.25	0.630***	-4.32
Austria	0.919	-0.57	0.971	-0.19	0.859	-0.98	0.806	-1.52	0.859	-1.06	0.751*	-1.88
Finland	1.121	0.93	1.114	0.89	1.091	0.70	0.962	-0.32	1.087	0.71	0.825	-1.46

Appendix 2

Table 4 Definition of variables

Variable Name	Description	Mean
pidnew	Unique number to identify each individual	-
wave	Wave number	-
country	Country number	-
hid	Household identifier	-
age	Age in years	40.422
Sex	0="male", 1="female"	0.509
marital_status	1="married", 2="separated", 3="divorced", 4="widowed", 5="never married"	-
live_together	If not married do they live together 0="no", 1="yes"	0.164
live_as_couple	0="no", 1="yes"	0.660
emp_status_long	Employment status classed as one of 12 groups	4.190
emp_status_short	Employment status classed as one of 3 groups	1.761
Age_sq	Age in years "squared"	1896.472
Education	Individual's highest level of education	-
Second_ed	Highest level of education is second level 0="no", 1="yes"	0.348
Third_ed	Highest level of education is third level 0="no", 1="yes"	0.186
Self_emp	Individual is self-employed 0="no", 1="yes"	0.096
Unemp	Individual is unemployed 0="no", 1="yes"	0.063
Educate_training	Individual is in full-time education or training 0="no", 1="yes"	0.110
Retired	Individual is retired 0="no", 1="yes"	0.099
Out_of_labour_market	Individual is out of the labour market i.e full-time housework, childcare, etc. 0="no", 1="yes"	0.160
Separated	Individual is either divorced or separated 0="no", 1="yes"	0.030
Widowed	Individual is widowed 0="no", 1="yes"	0.039
Single	Individual has never been married 0="no", 1="yes"	0.273
Equiv_income	Household equivalised income	1146280
Inc_gp2	Household equivalised income is the 2nd lowest quartile 0="no", 1="yes"	0.242
Inc_gp3	Household equivalised income is in the 2nd highest quartile 0="no", 1="yes"	0.254
Inc_gp4	Household equivalised income is in the highest quartile 0="no", 1="yes"	0.267
pmid_spell	Running spell of good pmid health in years	3.121
exit_pmid	Variable indicating if PMID spell has ended 0="no", 1="yes"	0.059