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Unemployment, mortality and the problem of health-related selection: Evidence from the Scottish Longitudinal Study

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Summary

Objectives: Associations between unemployment and mortality are often complicated by processes of health-related selection. Testing whether unemployment causes health deterioration is complicated because failing health may increase the probability of unemployment. In some previous studies of unemployment and mortality a 'wear-off' period, after employment status is observed, is used which ignores the first few years of mortality events. It is assumed that selection effects will wear-off during this period. In this study we aim to test the effectiveness of using wear-off periods.

Methods: Using data from the Scottish Longitudinal Study (SLS) we fitted logistic regression models for the odds of death in a given time period after the 1991 census for those aged 35 – 64 in 1991. We compared the odds ratios for the labour force participation groups as well as comparing the changes in risk associated with cumulatively increasing the length of wear-off prior to follow-up.

Results: We found no evidence of health-related selection into unemployment.

Conclusion: We suggest that the use of the five year wear-off period in many studies of mortality and unemployment may be an ineffective and unnecessary technique for mitigating the effects of health-related selection.

1 Introduction

The potential for unemployment to negatively affect an individual's health status has been the focus of much research in the last twenty years throughout the developed world (Bartley, Ferrie and Montgomery 2006). Associations between a spectrum of health outcomes and unemployment have been empirically borne out in the literature including; mental health (Nordenmark and Strandh 1999; Thomas, Benzeval and Stansfield 2005), substance use and teenage pregnancy (Fergusson, Horwood and Woodward 2001), suicidal behaviours (Blakely, Collings and Atkinson 2003) and limiting long-term illness (LLTI) (Bartley, Sacker and Clarke 2004). In addition to these outcomes much work has sought to investigate associations between unemployment and mortality (e.g. Morrell, Taylor, Quine, Kerr and Western 1999; Moser, Goldblatt, Fox and Jones 1987; Fox, Goldblatt and Adelstein 1982).

Whilst many of these studies report statistically strong associations between unemployment and poor health, establishing this as a causal relationship poses a great challenge as we are reliant on observational rather than experimental studies (Oswald, 2007). One problem stems from the possibility that health may be both an outcome of and a cause of unemployment (Bartley and Ferrie 2001; Bartley 1996). For example, it is possible that ill members of the population are selected into unemployment so any cross-sectional analysis could exaggerate the direct effect of unemployment on health or mortality. If such health selection takes place even strong relationships between unemployment and health cannot be regarded as causal. More generally, of course, there may be other (unobserved) factors that select people into unemployment that could potentially bias any claims that unemployment *per se* can increase the risk of subsequent poor health and death.

In attempting to overcome health and other selection issues longitudinal studies have used a number of techniques including controlling for baseline health (Martikainen, 1990; Montgomery *et al.,* 1999), studying whether the impact of unemployment differs at times of low and high overall society-level unemployment when selection effects might be expected to vary (Martikainen and Valkonen, 1996; Martikainen and Valkonen 1998; Martikainen, Maki and Jantti 2007) and studying the impact of unemployment experimentally when whole workforces are made or threatened with redundancy (Ferrie, Martikainen, Shipley, Marmot, Stansfield and Smith 2001; Steenland and Pinkerton, 2008).

Another common approach, based on the work of Fox *et al*., (1982), is to exclude deaths in the first few years of follow-up after economic status is observed. If the relative mortality risk is lowered when these deaths are excluded this suggests that health selection may have biased upwards the overall mortality risk. As Bartley (1994: 334-5) comments:

"in a cohort study, any group selected for physical illness should exhibit high mortality in the early years of follow up which returns towards the level of the rest of the cohort later on as those who are very ill die and the rest recover."

In the UK, despite a downward trend in unemployment rates (defined as those out of work who are actively seeking work), there has been a steady increase in those of working age who are permanently sick with some evidence suggesting that many of those who may previously have identified themselves as unemployed have been diverted to sickness related benefits (Beatty and Fothergill, 2005). This may be typical of those with a limiting long-term illness (Bartley and Owen, 1996). A consequence of this is that by the time of the 1991 census those classifying themselves as unemployed may be less likely to have been selected into unemployed because of poor health than may have been the case in the 1970s or 1980s when studies such as those by Fox *et al.* (1982) were conducted. The addition of a question on work related LLTI in the 1991 UK

census gives a further ability to control for health selection not available previous UK census-based studies.

In this study, we therefore exploit the Scottish Longitudinal Study (SLS) to explore possible health-related selection into unemployment using post-1991 mortality events linked to individuals whose employment status was recorded in the 1991 census. We assess the association of unemployment with mortality using various lengths of wear-off period and controlling for limiting illness, recorded in 1991.

2 Methods

2.1 Data and outcome variables

The data were extracted from the SLS which links census records from 1991 and 2001 for a 5.3% of the Scottish population. In addition, corresponding vital events registry data, from which we will draw our mortality events, is also linked for this period and beyond up to 2003 (the last year for which mortality events had been recorded at the time of this study). Our analysis focused on the working ages 35 up to state pension age of 64. Table 1 details the outcome variables that were constructed. Within the data extract we produced 8 variables corresponding to different wear-off periods that we aimed to compare. The first of these variables involved 0 years of wear-off, and thus contained all mortality events that occurred within five years of the census (1991-1995). The second variable involved 1 year of wear-off and thus ignored all mortality events occurring one year after the census day but captured all mortality events in the subsequent 5 years (1992-1996). The third variable involved 2 years of wear-off and thus ignored all mortality events that occurred within 2 years of the census day, but captured mortality events in 1993-1997. The remaining variables were produced following the same procedure up to variable 8 which involved 7 years of wear-off and captured those deaths between 1998 and 2002. We decided to carry out five year follow up analyses to allow for the maximum length of wear periods which also allowed us to extend this period two years beyond the traditional 5 year period that is often used whilst still allowing a substantial follow-up catch period.

Table 1: Outcome variables

Wear-off period	Mortality events	Deaths
0 years	1991 – 1995	3,059
1 year (1991)	1992 – 1996	3,517
2 years (1991 – 1992)	1993 – 1997	3,760
3 years (1991 – 1993)	1994 – 1998	4,075
4 years (1991 – 1994)	1995 – 1999	4,284
5 years (1991 – 1995)	1996 – 2000	4,442
6 years (1991 – 1996)	1997 – 2001	3,966
7 years (1991 – 1997)	1998 - 2002	3,146

2.2 Analysis

As the outcome was binary (whether the individual died or not), binomial logistic regression models were used for each of the different length wear-off periods beginning with 0 years through to 7 years successively. Two sets of two models were produced; a first set without direct control for LLTI and a second including this direct control. Within each set a base model including only age, age squared and sex was produced followed by a more complex full model including additional explanatory variables drawn from the 1991 census. The explanatory variables were included on the basis of known

associations with mortality and included; age (1991), age squared (1991), sex, social class (1991), marital status (1991), educational attainment (1991), area deprivation quintile[1] (1991), ethnicity and finally, and most importantly, labour force participation. Odds ratios associated with the different categories of economic position were then graphed to see patterns of change with different lengths of wear-off period.

If selection into unemployment was an issue which could be properly addressed using a wear-off period, we would expect the odds of mortality to be higher in the initial period immediately after 1991 and lower in the later mortality periods, when we expect selection effects to have diminished (Fox *et al.* 1982, Bartley 1994).

Table 2: Descriptive results

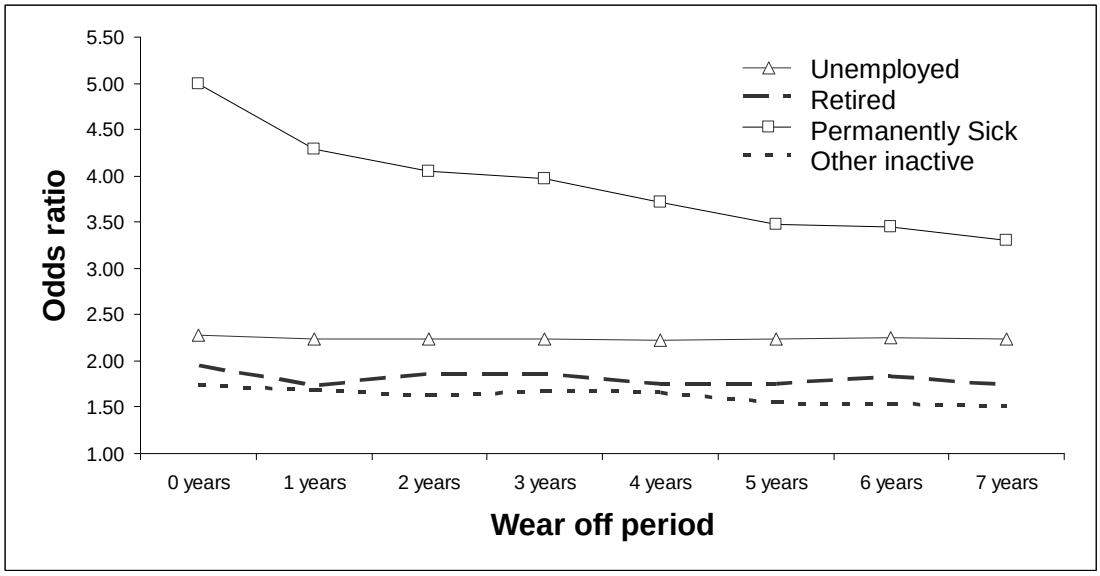
Variable	Frequency	%
Economic position		
In work	62,856	65.50
Unemployed	5,600	5.84
Retired	6,487	6.76
Permanently Sick	8,726	9.09
Other Inactive	12,294	12.81
Sex		
Male	46,747	48.71
Female	49,216	51.29
Social Class		
Professional occupations	3,218	3.35
Managerial and technical occupations	22,331	23.27
Skilled non-manual occupations	15,961	16.63
Skilled manual occupations	17,179	17.90
Partly skilled occupations	12,599	13.13
Unskilled occupations	7,413	7.72
Armed forces	259	0.27
No job in last ten years/not stated	17,003	17.72
Marital Status		
Single	8,639	9.00
Married (first marriage)	68,395	71.27
Remarried	7,350	7.66
Divorced	7,095	7.39
Widowed	4,484	4.67
Carstairs quintiles by CATT's		
One	19,116	19.94
Two	24,442	25.50
Three	20,187	21.06
Four	17,030	17.77
Five	15,087	15.74
Ethnicity		
White	95,115	99.12
Non-white	848	0.88
Limiting long-term illness		
Has a health problem	14,885	15.51
Does not have a health problem	81,078	84.49

[1] Deprivation was calculated using the Carstairs index calculated for 10,000 or so 'Consistent Areas Through Time' (CATTs); see Exeter *et al.* (2005) for further details.

3 Results

Figures 1-4 present the results from the analysis.[2] In all of the above graphs, and in line with previous studies, being out of work for whatever reason is associated with an increased risk of death relative to those in work. In the basic model in Figure 1 the unemployed are around 2.5 times more likely to die relative to those in work. Importantly, however, this relationship is remarkably stable irrespective of the duration of wear-off that is used. However, for the permanently sick in Figure 1, we see a much more marked selection pattern, with higher relative mortality risk in the earlier periods shortly after the census followed by a steady decline with increased duration of wear-off.

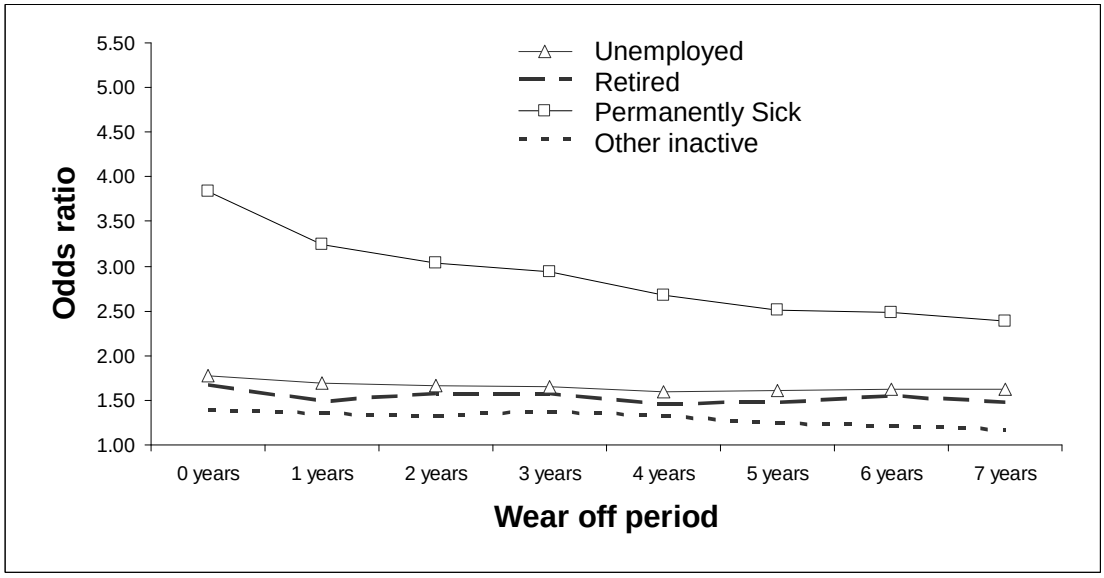
Figure 1: Basic models, controlling only for age, age^2 and sex



The addition of the social class, marital status, educational attainment, area deprivation and ethnicity variables (Figure 2) attenuated the relationship slightly but the relative relationships remained unchanged for unemployment and permanent sickness.

[2] Please note that all ratios are significant ($p < .05$) except for the ratio for period seven for the other inactive group in the LLTI controlled complex models.

Figure 2: Complex models, controlling for age, age2, sex and additional explanatory variables, but not controlling for LLTI



Controlling for LLTI attenuates the relationship for the unemployed but the relative pattern remains the same, with the mortality risk for the unemployed unchanged by the duration of wear-off (Figure 3). Interestingly, the selection shape for the permanently sick that is apparent in Figures 1 and 2 disappears with the addition of LLTI as a control variable. This has the effect of removing the excess risk of death for the permanently sick to the point that it matches quite closely the risk magnitude of the unemployed, a relationship that is fairly constant across all of the different wear-off periods. This broad relationship holds when we control for LLTI as well as the other explanatory variables (Figure 4).

Figure 3: Basic models , controlling for age, age^2, sex and LLTI

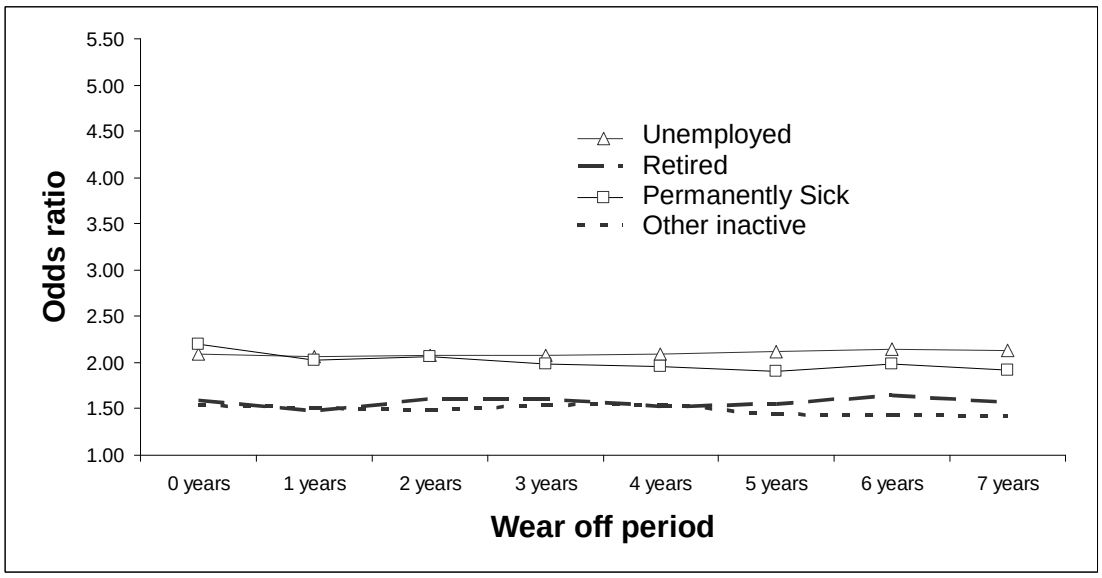
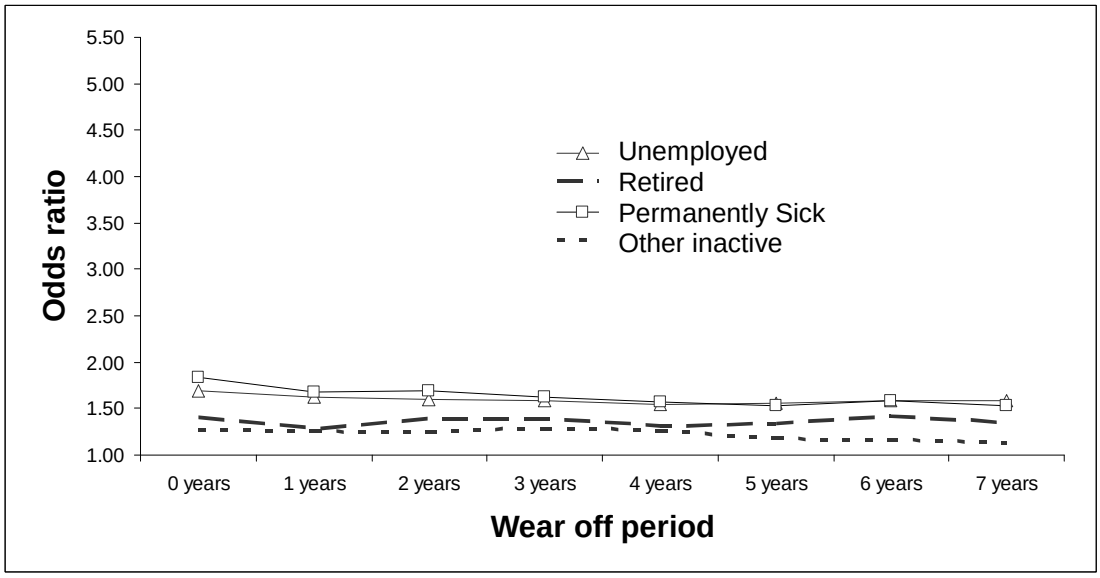


Figure 4: Complex models, controlling for age, age^2, sex, additional explanatory variables, and LLTI



4 Discussion

In line with almost all work completed previously in this field, being unemployed is related to significantly higher odds of death relative to being employed in all of our models. This relationship is apparent both generally and after adjusting for individual socio-economic circumstances.

However as described above, drawing causal conclusions about this relationship has been complicated by the potential for ill health to influence employment status. Thus, the strong associations between unemployment and ill health may reflect selection of the unhealthy into unemployment rather than a causal effect of unemployment on health *per se*. In linked longitudinal data sets such as the LS a popular technique in prospective studies has been to allow these potential selection effects to wear-off by ignoring all mortality events that occurred within five years of the census-based definition of economic status. As Fox *et al.* (1982) suggest, this period allows for non-steady state unemployed individuals to either recover and return to the labour force or die.

We therefore explored whether it was possible to detect a change in the odds of death of the unemployed relative to the employed depending upon the length of wear-off. We were interested in both the effectiveness of this technique as well as potentially illustrating the effect and magnitude of these selection effects. Assuming that this wear-off period approach is appropriate, the evidence presented above suggests that the process of selection into unemployment of sick individuals is non-existent. If strong selection effects were present, we might expect the unemployed group to experience higher likelihoods of death initially with this figure declining steadily over time until reaching a steady state around the five year wear-off period. Indeed we might expect the distribution, at a lower magnitude, to match more closely the pattern exhibited by the permanently sick category in which we see a steady decline in the likelihood of death as those suffering acute illness either die or recover. This was not the case. Furthermore, direct control for LLTI had the effect of drastically reducing the apparent effects of selection in the permanently sick and we might argue that this control for baseline health may have isolated the effect of health-related selection out of work on health. However, it is important to note that nearly all individuals who are registered permanently sick in the census are also coded as having a LLTI which may complicate this conclusion.

Our results seem to accord with some suggestions made in the literature previously, although there seem to have been few rigorous tests of this effect. Thus, Moser *et al.* (1984) used a "wear-off" period following the 1971 England and Wales census suggested that the overall mortality risk associated with unemployment was little changed by excluding deaths in the initial years. And Bartley's (1994: 335) review of unemployment and mortality studies, mainly conducted using 1971 and 1981 census data, concludes that "this [wear-off] pattern is seen in men who are 'permanently sick' but not in the unemployed."

These results, and particularly the apparent lack of any selection processes among the out of work, leave two possible explanations. First, our sample of individuals (aged 35 – 64) may include a majority of steady-state economic status experiences. For example, it is plausible that a significant majority of our group of unemployed have been unemployed for at least five years (prior to 1991) thus removing the potential for them to be selected into unemployment through ill health in this period. As we saw, the unemployed maintained constant higher odds ratios relative to the employed group. This explanation was suggested as a possible reason accounting for the lack of apparent selection effects found in the work of Fox *et al*. (1982). However, it seems highly improbable that a majority of the unemployed group would have been in this steady state of unemployment for the requisite length of time to mask the effects of selection.

A second explanation could be simply that the role or magnitude of any selection effects for employment status and health are minimal in this sample. The odds ratios for the unemployed, whilst being significantly higher relative to the employed, remained mostly constant suggesting that unemployed individuals are dying at the same rates regardless of the wear-off period after the census. In the literature to date, a five year period has been widely adopted as it is deemed an appropriate timescale a) for unemployment to have had an impact on a person's health if one were to exist, b) to allow for those individuals who became unemployed due to poor health to die or recover and return to good health and therefore c) to begin to rule out the possibility of reverse causality between unemployment and poor health. Our results perhaps suggest that the role of health in determining unemployment could be minimal in the first place. If our unemployed group had contained a significant number of recently unemployed individuals due to ill health, we would expect to see the patterns described by Fox and colleagues of an early peak in odds ratios followed by gradual decline.

In conclusion this study has found little evidence of a selection effect operating on the unemployed group. The use of a wear-off period following measurement of employment status may be an unnecessary and ineffective method for mitigating the effects of selection. Furthermore, we suggest that controlling for LLTI may go some way to isolating the effect of unemployment on health.

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