BMJ open

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Journal:	*BMJ Open*
Manuscript ID:	bmjopen-2012-001342
Article Type:	Research
Date Submitted by the Author:	24-Apr-2012
Complete List of Authors:	Popham, Frank Bambra, Clare
Primary Subject Heading:	Public health
Secondary Subject Heading:	Sociology
Keywords:	employment, unemployment, time-series, self rated health, socio-economic

Are changes in employment status associated with changes in self-rated health? Findings from UK individual level repeat cross-sectional data from 1978 to 2004.

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Word count: 2903

Keywords: employment, unemployment, time-series, self rated health, socio-economic

Abstract

Objectives : To assess how trends in employment status are associated with changes in self rated health year-on-year from 1978 to 2004 as there have been major changes in employment patterns in advanced market democracies and employment is an important determinant of health.

Design: Pooled analysis of repeat cross-sectional surveys

Setting: UK

Participants: 138,932 men and 145,300 women of working age (25 to 59)

Outcome measure: Self rated general health

Results: Poor health increased amongst both men and women from 1978 to 2004 after accounting for socio-economic changes. However, controlling for the changes in employment status since 1978 attenuated strongly the increase in poor general health. For example, before adjustment the linear trend showed a 6.2 (5.7 to 6.7) and a 4.4 (3.9 to 5) percentage point increase in poor health over the period for men and women respectively but after adjustment this decreased to 1.1 (0.7 to 1.6) and 0.9 (0.3 to 1.4)

Conclusions: These results suggest that changes in employment status, particularly the increase in sickness or disability related economic inactivity, in the UK since the late 1970s are strongly associated with a negative trend in poor health. Why this is the case needs further exploration.

Trial registration: This observational study was not reregistered.

Article summary

Article focus

- There have been major changes in employment (particularly the growth of those out of work sick or disabled) since the 1970s in many OECD countries.
- Given that self rated health is associated strongly with employment status these trends in employment may be associated with trends in population health.

Key messages

- Accounting for increases in socio-economic factors associated with good health suggests that self rated health has worsened since 1978 for both working age men and women.
- Much of this worsening can be accounted for by controlling for changes in employment status over time.
- There seems to be an association between rising levels of detachment from the labour market for both men and women and negative trends in poor self rated health.

Strengths and limitations

- The study uses consistent individual level data from a long term survey covering a period of socio-economic change
- The reasons for the association are not clear and require further investigation

Introduction

Since the late 1970s, there have been substantial social, political and economic changes in the UK and in other advanced market democracies. On the one hand, average levels of education and material wealth have increased in the UK since the 1970s [1] and there have been improvements to overall mortality levels and life expectancy. On the other hand, there have been negative trends with increases in inequalities in wealth and health [1, 2]. Welfare provision has decreased [3] at the same time as there have been large reductions in male employment levels and a related rise in male and female (excluding keeping house) economic inactivity rates [4]. The rise of economic inactivity has been linked to the de-industrialisation experienced by the labour markets of advanced market democracies and the associated loss of full-time, permanent, well-paid and skilled industrial jobs [5].

Being out of work has consistently been associated with a heightened risk of mortality [6], mental ill-health and suicide [7, 8], unhappiness [9], poor general health [10] and limiting long term illness [11, 12]. This heightened risk of ill-health applies not just to those unemployed (out of work and actively seeking work) but also to those economically inactive (out of work and not actively seeking work) [9, 10, 13]. Indeed, previous work found that the distribution of economic inactivity was an important factor behind the social gradient in health and in regional differences in health inequalities [10, 14].

Whilst there has been a wealth of research into the association between unemployment and adverse health, there has been much less which examines the health effects of economic inactivity. Arguably, it is the latter which is of increasing importance in public health terms as whilst unemployment is generally cyclical – rising and falling in line with economic contraction and expansion – economic inactivity has increasingly become a structural labour market problem [4]. For example in the UK, according to the 1966 census 94.4% of non-student working age men were in employment and only 3% were economically inactive whilst in the 2001 census, the figures were 80.2% and 14.5% respectively [15]. This paper examines the association of changes in employment status of men and women with changes in the level of poor self-rated health in the UK during the period 1978 to 2004 using individual level data from a repeat cross-sectional survey.

Methods

The General Household Survey is a UK government repeat cross-sectional household survey that started in 1971 (with gaps in 1997 and 1999). It covers Britain rather than the whole of the UK (so excludes Northern Ireland). Its long running nature means that it is highly suitable for assessing trends over time. The UK's Office for National Statistics (ONS) has produced a consistent (in terms of making variables as comparable as possible over time) time-series of the surveys 1972 to 2004 and it is this individual level dataset - available from the UK Data Archive - that was used in this analysis [16]. Analysis was limited to men and women aged 25 to 59. The lower age limit was chosen to limit the likelihood of people still being in higher education. Although state retirement age in the UK for the study period was 65 for men and 60 for women, it is common practice to restrict analysis to age 59 and below to limit the number of people who have taken voluntary early retirement straight from paid employment.

The health outcome was self-rated general health, with respondents asked "Over the last 12 months, would you say your health has on the whole been: good; fairly good or not good?". For this analysis, it was recoded good and fairly good health (0) versus not good (1) and this latter category is referred to as poor health from now on. The question was first asked in 1977 but the introduction to the question was different in this year so 1978 is taken as the reference year. Employment status was coded as employed, unemployed (out of work but actively seeking work), and the following categories of economic inactivity: retired, in education, keeping house full-time, sick or disabled and other economically inactive. As the time series file only included a single category for economic inactivity we returned to the original annual survey files to compile the more nuanced categories. The retired and in education group were combined for the analysis as the in education group was very small but those in it displayed a similar risk of poor health to those retired.

Single year of age was used in the analysis. Three measures of socio-economic position were used with categories made consistent over time by the ONS, whether the person had a university level degree or not, whether they lived in owned outright housing, owned with mortgage housing, private rented housing or social (state or housing association) rented housing and finally, whether they lived in a household with car access. Across all years, a total of 10% of men and 4% of women in the sample had missing data for one or more of the variables. Using multiple imputation based on all variables already described plus country of residence

(England, Wales, Scotland), for men and women separately, five imputed datasets with no missing data were created for each year separately and pooled and analysed together. The results using the imputed datasets were very similar to those from the original dataset (analysed excluding cases with any missing data) and the use of either does not change the conclusions of the study. The results from the multiple imputation analyses are presented here and the main results from the original complete case analysis are shown in the supplemental file. The total sample sizes across all years were 138,932 men and 145,300 women. Table 1 includes the individual year sample sizes and response rates.

The prevalence of poor health amongst individual respondents in all other years (1979-2004) was compared to 1978 using a logistic regression model containing year dummy variables with standard errors accounting for the household clustering in the survey (although this was minimal as men and women in the same household were analysed separately). The initial model (model A) controlled for age as well as socio-economic change in education, housing tenure and car access as these are variables associated with better general health [17]. Model B then controlled additionally for employment status to assess its impact on the annual differences. To test the impact of allowing the effect of variables to change over time model A and model B were refitted with interaction effects included between year and all the other variables. Non-response weights are included in the time series General Household Survey file from 2000 onwards (when weights were introduced) and these have been applied in all analysis (weights are scaled to have a mean of 1 in each year) with each individual in the years prior to 2000 being weighted equally (at 1). As odds ratios across different logistic models are not directly comparable [18] we also present the results as adjusted prevalence differences (that are comparable across models [18]) by using the post estimation "margins" command in Stata. This also shows difference on an absolute scale. Stata 11.2 was used for the analysis.

Results

Table 1 shows that for men the rate of poor health was low in 1978 (in 1982 was it lowest) and then increased to 10.7% in 2004 a rise of 3.2 percentage points over the period while the rate of poor health was lowest for women in 1984 having declined slightly from 1978, although in the 1990s the rate rose and was just over 1 percentage point higher at the end of period compared to the start. There was clear socio-economic change

over the period with declines in social rented housing and increases in owner occupation, household car access and degree attainment (see Supplemental Figure 1).

Table 1 Response rates, sample sizes and percentage in poor health for men and women by year.

Year	Response rate* (%)	Number of men	% of men in poor health	Number of women	% of men in poor health
1978	82	6845	7.5	7072	11.5
1979	83	6626	8.1	6823	11.3
1980	82	6704	8.8	6904	12.3
1981	84	6953	7.8	7117	11.4
1982	84	5817	6.9	5983	10.3
1983	82	5607	7.5	5811	11.5
1984	81	5420	7.6	5583	9.6
1985	82	5617	7.3	5747	10.5
1986	84	5703	7.5	5873	10.3
1987	85	5804	7.4	5966	10.7
1988	85	5586	8	5769	10.4
1989	84	5700	7.3	5851	10
1990	81	5276	7.9	5475	11.1
1991	84	5586	7.7	5806	10.4
1992	83	5548	8.1	5881	10
1993	82	5381	8.1	5660	10.9
1994	80	5394	9.5	5658	11.3
1995	80	5400	10.3	5770	11.5
1996	76	5104	7.9	5400	11.5
1998	72	4666	11.1	5049	12.4
2000	67	4393	10	4728	12.2
2001	72	4892	10.2	5267	12.1
2002	69	4650	11.1	5040	12.1
2003	70	5560	10	5971	12.5
2004	69	4700	10.7	5096	12.8

*Response rates are from http://www.esds.ac.uk/doc/5640/mrdoc/pdf/5640ghs05appendixb.pdf (page 10)

Taking these socio-economic changes into account showed greater increases in poor health over time from 1978 (model A table 2 and figures 1 and 2 for men and women respectively). Increases in poor health for men were greater than for women. To summarise the apparent linear trend in poor health we refitted model A with year as a continuous variable and this suggested that for men over the period poor health had increased by 6.2 (5.7 to 6.7) percentage points after accounting for socio-economic change and for women by 4.4 (3.9 to 5) percentage points (see figures 1 and 2). Figure 3 illustrates the changes in non-employment over time with male unemployment (left panel) being cyclical, peaking in the mid 1980s and the early 1990s recession then falling away and being over taken by those sick or disabled in the late 1990s with this group now being the largest. Other forms of economic inactivity for males showed some increases but remained relatively small groups although those retired or in education had increased to be about 2.5% of the working age male population.

Table 2 Logistic regression results for men and women

	Men (Model A) ORs (95% CIs)	Men (Model B) ORs (95% CIs)	Women (Model A) ORs (95% CIs)	Women (Model B) ORs (95% CIs)
Age	1.05 (1.05 to 1.05)	1.04 (1.04 to 1.04)	1.03 (1.03 to 1.04)	1.03 (1.02 to 1.03)
Year				
1978	1	1	1	1
1979	1.09 (0.96 to 1.25)	1.04 (0.91 to 1.2)	0.98 (0.88 to 1.1)	0.98 (0.87 to 1.09)
1980	1.24 (1.09 to 1.41)	1.14 (0.99 to 1.31)	1.1 (0.99 to 1.23)	1.12 (1 to 1.24)
1981	1.09 (0.95 to 1.24)	0.95 (0.83 to 1.1)	1.02 (0.92 to 1.14)	1.01 (0.9 to 1.13)
1982	0.99 (0.86 to 1.14)	0.8 (0.69 to 0.93)	0.93 (0.82 to 1.04)	0.9 (0.8 to 1.02)
1983	1.1 (0.96 to 1.27)	0.83 (0.71 to 0.96)	1.1 (0.98 to 1.23)	1.01 (0.9 to 1.14)
1984	1.24 (1.08 to 1.43)	0.92 (0.79 to 1.06)	0.94 (0.83 to 1.06)	0.84 (0.74 to 0.96)
1985	1.18 (1.02 to 1.36)	0.83 (0.71 to 0.97)	1.05 (0.94 to 1.18)	0.93 (0.83 to 1.05)
1986	1.27 (1.1 to 1.46)	0.89 (0.77 to 1.03)	1.06 (0.94 to 1.19)	0.95 (0.85 to 1.08)
1987	1.31 (1.13 to 1.51)	0.9 (0.77 to 1.05)	1.13 (1 to 1.27)	0.98 (0.87 to 1.11)
1988	1.42 (1.24 to 1.63)	0.99 (0.85 to 1.15)	1.1 (0.98 to 1.24)	0.98 (0.86 to 1.1)
1989	1.32 (1.15 to 1.52)	0.84 (0.72 to 0.97)	1.08 (0.96 to 1.22)	0.94 (0.83 to 1.06)
1990	1.48 (1.28 to 1.72)	0.93 (0.79 to 1.09)	1.21 (1.08 to 1.36)	1.05 (0.93 to 1.18)
1991	1.4 (1.22 to 1.61)	0.87 (0.75 to 1.01)	1.13 (1.01 to 1.27)	0.91 (0.81 to 1.03)
1992	1.51 (1.31 to 1.75)	0.85 (0.72 to 1)	1.09 (0.97 to 1.23)	0.86 (0.76 to 0.97)
1993	1.53 (1.33 to 1.77)	0.81 (0.69 to 0.94)	1.21 (1.08 to 1.36)	0.94 (0.83 to 1.06)
1994	1.85 (1.61 to 2.13)	0.99 (0.85 to 1.15)	1.27 (1.13 to 1.43)	1 (0.89 to 1.13)
1995	2.07 (1.81 to 2.36)	1.09 (0.95 to 1.27)	1.34 (1.19 to 1.51)	1.02 (0.91 to 1.15)
1996	1.51 (1.31 to 1.75)	0.73 (0.62 to 0.86)	1.3 (1.15 to 1.47)	0.93 (0.81 to 1.06)
1998	2.27 (1.97 to 2.62)	1.24 (1.05 to 1.45)	1.46 (1.3 to 1.64)	1.06 (0.94 to 1.2)
2000	2.04 (1.77 to 2.36)	1.04 (0.89 to 1.23)	1.45 (1.28 to 1.63)	1.09 (0.96 to 1.23)
2001	2.12 (1.85 to 2.44)	1.15 (0.98 to 1.34)	1.45 (1.29 to 1.63)	1.05 (0.92 to 1.19)
2002	2.25 (1.97 to 2.58)	1.32 (1.14 to 1.53)	1.44 (1.28 to 1.62)	1.08 (0.95 to 1.22)
2003	2.01 (1.75 to 2.31)	1.1 (0.95 to 1.28)	1.48 (1.32 to 1.67)	1.11 (0.98 to 1.27)
2004	2.11 (1.83 to 2.43)	1.15 (0.98 to 1.35)	1.54 (1.37 to 1.73)	1.17 (1.03 to 1.33)
No degree	1	1		1
Degree	0.5 (0.46 to 0.54)	0.6 (0.55 to 0.65)	0.56 (0.51 to 0.61)	0.66 (0.6 to 0.72)
Owned outright	1	1	1	1
Owned with mortgage	0.72 (0.68 to 0.77)	0.95 (0.89 to 1.01)	0.96 (0.91 to 1.01)	1.09 (1.03 to 1.15)
Private rent	1.12 (1.02 to 1.22)	1.17 (1.07 to 1.29)	1.29 (1.19 to 1.39)	1.28 (1.18 to 1.39)
Social rent	1.82 (1.71 to 1.94)	1.46 (1.35 to 1.57)	1.95 (1.85 to 2.07)	1.72 (1.62 to 1.82)
No car	1	1	1	1
Car	0.53 (0.51 to 0.56)	0.85 (0.8 to 0.91)	0.6 (0.58 to 0.63)	0.73 (0.7 to 0.76)

Employed	1	1
Unemployed	2.03 (1.88 to 2.2)	1.8 (1.64 to 1.97)
Keeping house	2.64 (2.17 to 3.23)	1.81 (1.73 to 1.88)
Sick or disabled	27.93 (25.93 to 30.09)	19.86 (18.33 to 21.52)
Retired or in education	2.4 (2.08 to 2.76)	1.92 (1.72 to 2.14)
Other inactive	6.47 (5.63 to 7.45)	4.17 (3.52 to 4.94)

Overall male employment had fallen from 93% to 86% at the end of the period. For women, figure 3 (right panel) shows (reading the right hand axis) that there had been a 20 percentage point decline in those keeping home but, as for men, cyclical unemployment, a rise in those sick or disabled overtaking those unemployed and a rise in those retired or in education. However unlike men, female employment rose by 13 percentage points over the period from 61% to 74%. All forms of non employment were associated with an alleviated probability of poor health but those sick or disabled had a particularly strong association. Controlling for employment status changes (model B in table 2 and figures 1 and 2) attenuated the increases in poor health from 1978 dramatically for men and women with now a decrease in poor health up until the late 1990s and a slight increase thereafter. The linear trend after controlling for employment status changes was now only a 1.1 (0.7 to 1.6) and 0.9 (0.3 to 1.4) percentage point increase in poor health over the period for men and women respectively. The right hand panel for Figures 1 and 2 shows that the impact of including interaction terms with year on the results from models A and B was minimal as they were very similar to those derived from the no interaction models shown in the left hand panel. The results were very similar for the complete case analysis (see supplemental figures 2 and 3). Pseudo r2 statistics (taken from the complete case analysis as not returned in the multiple imputed analysis) indicated that controlling for employment status in model B improved model fit from model A (for men from 0.09 to 0.22, for women from 0.05 to 0.13) .

Discussion

The individual level analysis presented here shows that changes in employment patterns – most notably the rise of sickness or disability related economic inactivity - are associated with an increased prevalence of poor self-rated health in the UK population since the late 1970s. This complements previous research into sickness or disability related economic inactivity which found that it was a possible major factor behind the social gradient in health [14] as well as an influential issue in regional differences in health [10]. It also suggests that understanding why changes in employment status are associated with changes in self-rated health could be important for public health.

The relationship between employment status and health is complicated. Many of the economically inactive in this study classified themselves as sick or disabled who had a very high probability of reporting poor health and who increased in size as a group over time. Evidence from UK labour market studies suggest that the increases in the economically inactive population (particularly those claiming sickness related benefits) in the 1980s and 1990s were a form of "hidden unemployment" [5]. This suggests that in better labour market conditions they would be in-work or actively seeking work. Indeed, in better labour markets it is argued that there is "hidden sickness" amongst the active workforce [5]. This does not necessarily require any change in the individual level of ill-health in the population just change in the proportion of people who are employed. There is strong evidence that such a process has occurred from the early 1980s for men in the UK and a related one for women started slightly later [19]. Recent theoretical work on how people self-rate their general health suggests a cognitive process where people take account of their individual health situation but do so in the wider context in which they live [20]. Hence the assessment of one's health while being economically inactive may differ compared to when one is in or seeking work. Coupled to the health damaging psychological and material consequences of non-work [21] this may allow us to understand why economic inactivity may be associated with a higher risk of poor general health.

Of course, confounding and reverse causality are real possibilities within this repeat cross-sectional study design. For example, there could be other confounding or mediating trends that are associated with both general health and employment that could explain the impact of adjusting for changes in employment status Examples include the apparent decline in job quality over time [22] and macro-economic changes such as the rise in the level of income inequality. Moreover, it is recognised that poor health can precede job loss, so

there is the possibility that health selection or reverse causality is a factor in our research [23]. This would lead to the conclusion that rising rates of poor general health have increased economic inactivity. For general health, there is evidence of both health selection [23] but also causation [24]. The debate over the relative influence of employment on health versus health on employment is limited though because it tends to emphasise notions of people being in a state of health that either allows them to work or not: a zero-sum approach. Yet, it should be remembered that ill health for the majority is not an impediment to labour market participation [25] but that those in ill-health - particularly in lower status jobs - are most vulnerable to job loss and were increasingly so in the period under study [25] . So their job loss may not then be caused by their ill-health per se but by the prevailing labour market condition and the policy response to this [26, 27] and it is perhaps these that should be focussed on more. It will be useful to test the existence of similar trends in other countries.

Economic inactivity is also an important influence on population health, not just because of the composition of the inactive population itself, but also because it is generally a longer term state. For example, a recent cohort study of people out of work and in receipt of incapacity-related benefits in the UK found that the average length of economic inactivity amongst this group was nine years [28]. Thus the issues which are usually put forward to explain the association between unemployment and ill health – most notably poverty, social exclusion and low social status – are thus experienced for a much longer time period by those who are inactive than by those who are unemployed.

Whilst our results suggest that decreasing the numbers of economically inactive would have health benefits, this is by no means an easy task and not just because of the current economic climate. Research into welfare to work interventions for those with a disability or chronic illness has found that even in times of solid economic growth it is very difficult to increase the employment rate of this group. For example, in the UK since the 1990s there have been increasing efforts to enhance the labour market participation of this group using various interventions including education, training and work placement schemes; vocational advice and support services; vocational rehabilitation; in-work benefits; financial incentives for employers; employment rights legislation and accessibility interventions[4]. However, the evidence of effectiveness in terms of actually increasing employment is very limited [4, 29-31]. This is partly attributed to the largely supply-side orientation

of most of the interventions [4], the focus on employment rather than health improvement [28, 32] and the lack of demand from employers for workers with complicated and fluctuating health conditions [28]. From a different perspective of course, it can be argued that economic inactivity is structural unemployment and that a far more radical overhaul of the economic system would be required before full employment – and possible associated population health benefits - is achieved again in the advanced market democracies.

In addition to being only cross-sectional, another limitation of using the General Household Survey is that response rate fell over time; weighting was introduced in 2000 and we have applied this in all analysis but the possibility remains that the survey became increasingly unrepresentative over time. It is impossible to assess the impact of this on our results as we do not have details of non responders. However, evidence comparing a national census to a national health survey suggested that low socio-economic groups and the out of work were less well represented in the survey leading to a more conservative estimate of the social gradient in health in the survey [33].

Conclusion

To summarise, this study shows that poor health increased amongst both men and women from 1978 to 2004 when accounting for socio-economic changes. However, controlling for the employment status changes in the UK since 1978 attenuated the increase in poor general health. This research raises important public policy issues around the role of employment in overall public health which should be examined further.

Acknowledgements

General Household Survey Time Series Dataset 1972-2004 was created by the Office for National Statistics. The user guide for the time series dataset was created jointly by ONS and the Economic and Social Data Service (ESDS) Government and downloaded from the UK Data Archive. The data are Crown copyright. The authors alone are responsible for the analysis and interpretation.

Funding

No specific grant was associated with this was work. FP is funded by the MRC (5TK10).

Ethics approval

Not required for this secondary analysis of publically available and anonymised secondary data

Author contributions

FP had the original idea which was developed with CB. FP conducted the analysis and drafted the manuscript with revisions from CB.

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Figure 1– Prevalence difference for men from model A (before adjustment for employment status) and model B (after adjustment) with year fitted as a series of dummies as and as a continuous trend variable. The left hand panel is from models with no interaction terms and the right from models with full interaction.

Figure 2– Prevalence difference for women from model A (before adjustment for employment status) and model B (after adjustment) with year fitted as a series of dummies as and as a continuous trend variable. The left hand panel is from models with no interaction terms and the right from models with full interaction.

Figure 3 Changes over time in non employment for men and women.

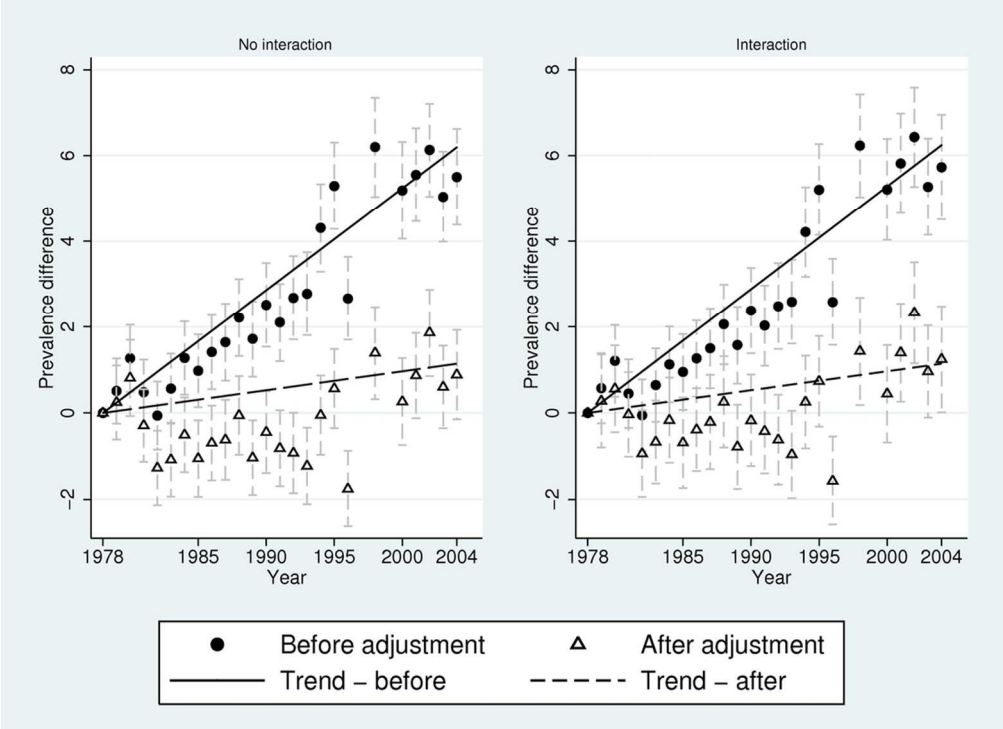

Figure 1– Prevalence difference for men from model A (before adjustment for employment status) and model B (after adjustment) with year fitted as a series of dummies as and as a continuous trend variable. The left hand panel is from models with no interaction terms and the right from models with full interaction.
101x73mm (300 x 300 DPI)

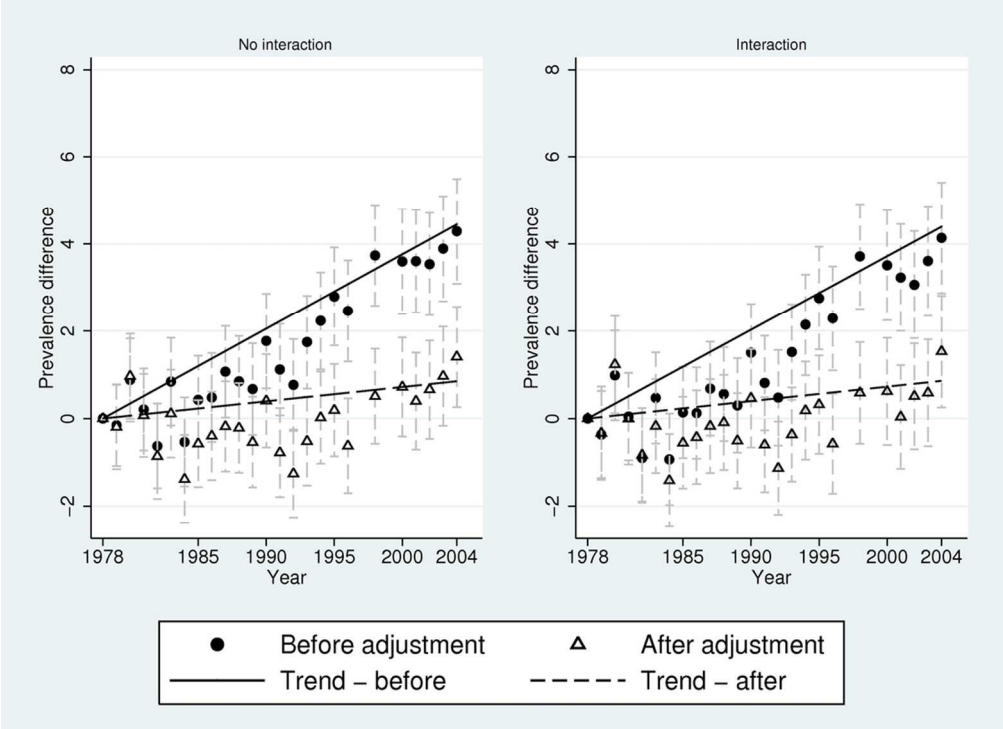

Figure 2– Prevalence difference for women from model A (before adjustment for employment status) and model B (after adjustment) with year fitted as a series of dummies as and as a continuous trend variable. The left hand panel is from models with no interaction terms and the right from models with full interaction.
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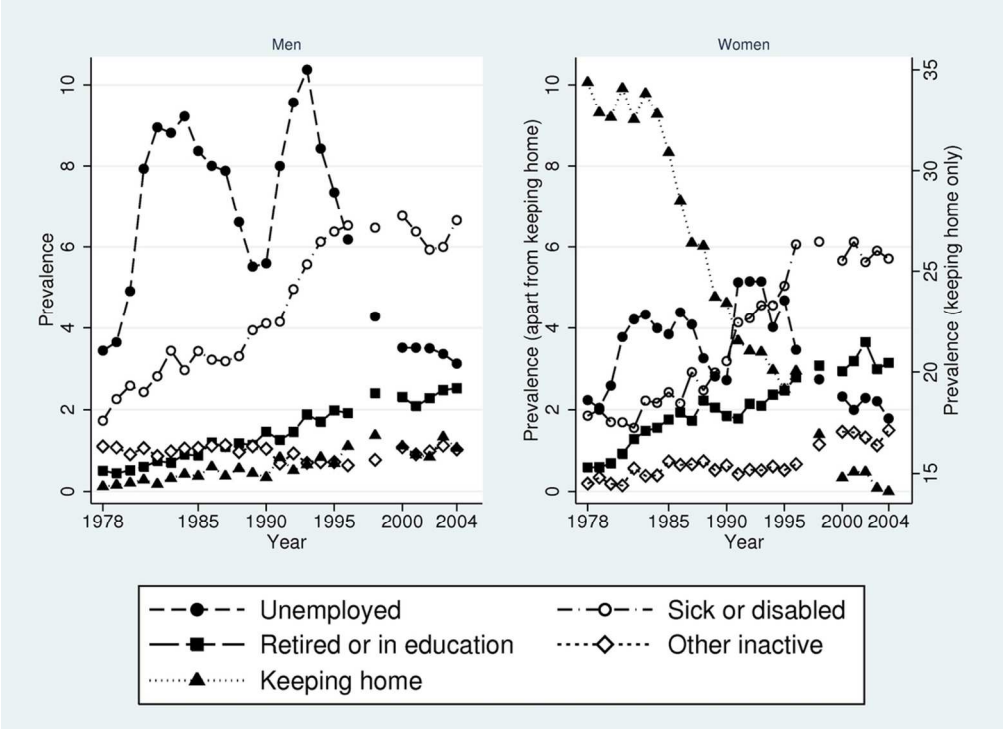
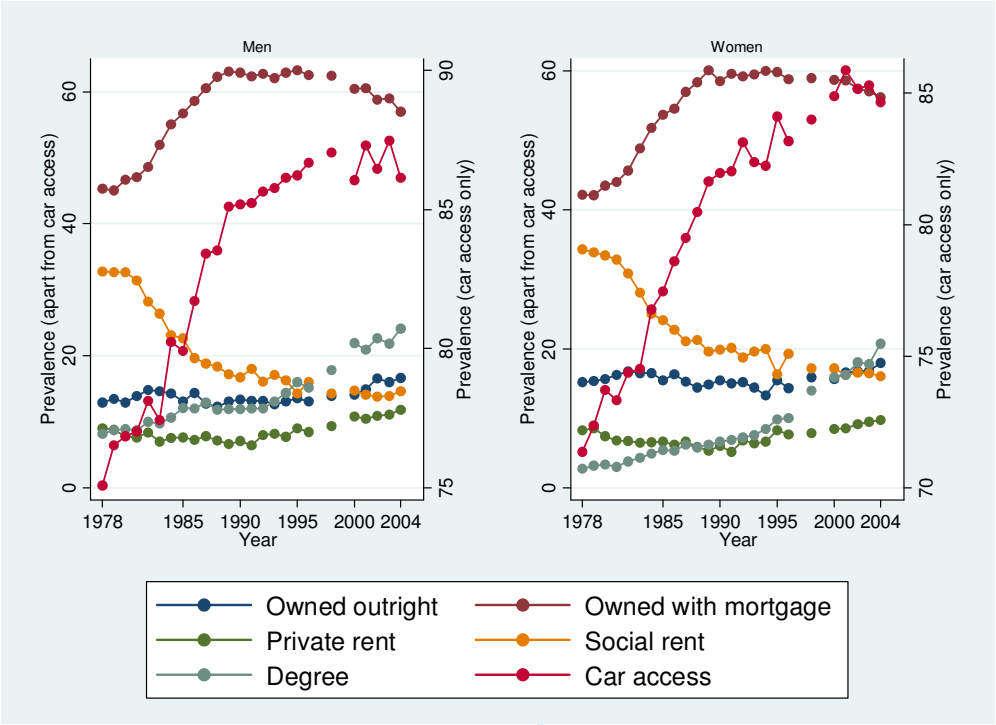
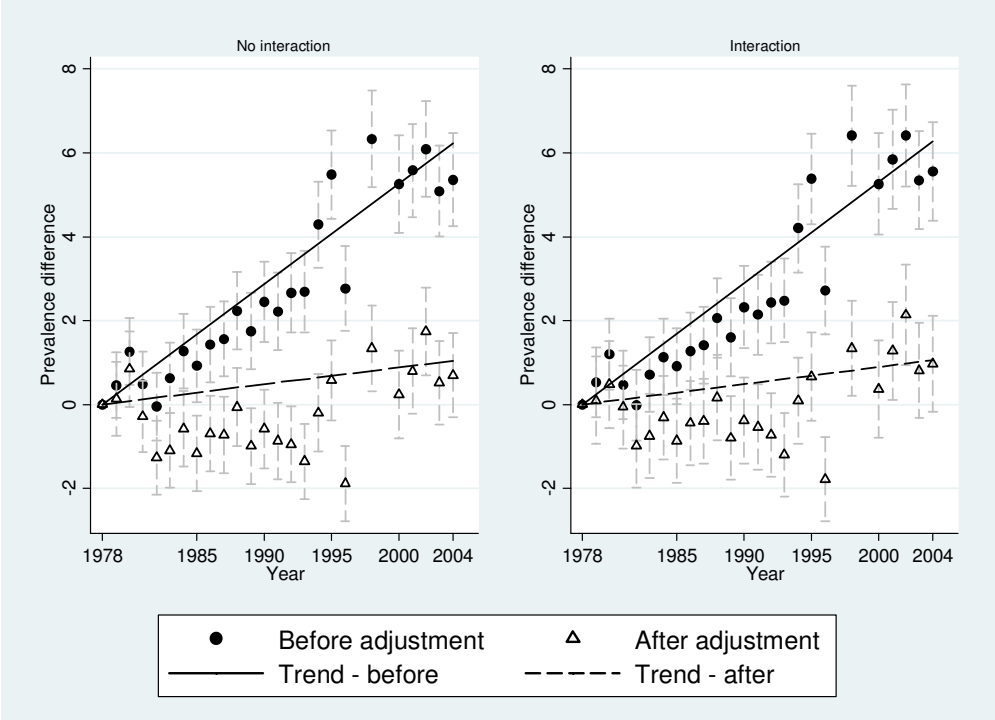


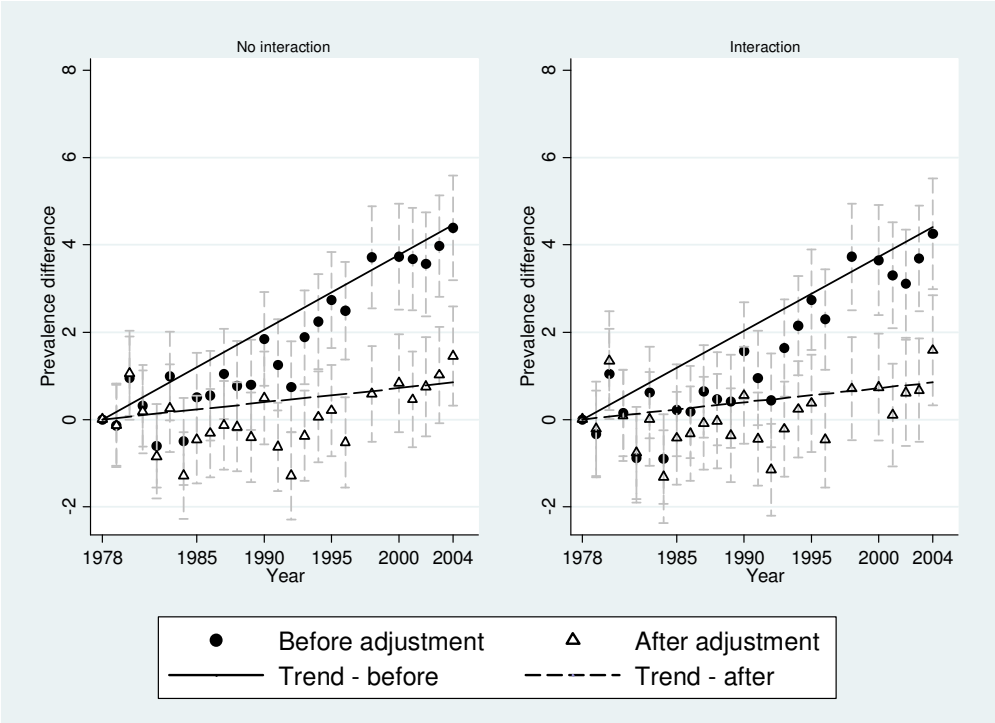
Figure 3 Changes over time in non employment for men and women.
101x73mm (300 x 300 DPI)



Supplemental figure 1 – Socio-economic changes over the period



Supplemental figure 2– Prevalence difference for men from model A (before adjustment for employment status) and model B (after adjustment) with year fitted as a series of dummies as and as a continuous trend variable. The left hand panel is from models with no interaction terms and the right from models with full interaction. From complete case analysis.



Supplemental figure 3– Prevalence difference for women from model A (before adjustment for employment status) and model B (after adjustment) with year fitted as a series of dummies as and as a continuous trend variable. The left hand panel is from models with no interaction terms and the right from models with full interaction. From complete case analysis.

The potential impact of employment status changes on the prevalence of poor self rated health. Findings from UK individual level repeated cross-sectional data from 1978 to 2004

Journal:	*BMJ Open*
Manuscript ID:	bmjopen-2012-001342.R1
Article Type:	Research
Date Submitted by the Author:	20-Aug-2012
Complete List of Authors:	Popham, Frank Gray, Linsay Bambra, Clare
Primary Subject Heading:	Public health
Secondary Subject Heading:	Sociology
Keywords:	employment, unemployment, economic inactivity, self rated health, socio-economic

The potential impact of employment status changes on the prevalence of poor self rated health. Findings from UK individual level repeated cross-sectional data from 1978 to 2004.

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Word count: 2903

Keywords: employment, unemployment, economic inactivity, self rated health, socio-economic

Abstract

Objectives : To assess using individual level data how the proportion of people in different employment statuses may have played a role in the prevalence of poor self rated health from 1978 to 2004 as there have been major changes in employment patterns in advanced market democracies and employment is an important correlate of health.

Design: Individual level analysis of repeated cross-sectional surveys

Setting: UK

Participants: 125,125 men and 139,535 women of working age (25 to 59)

Outcome measure: Self rated general health

Results: Compared to 1978 there was evidence of higher levels of poor health in the subsequent years. For example in 2004 the prevalence of poor health was 2.8 (95% CI 1.7 to 3.9) and 1.3 (0.1 to 2.5) percentage points higher than 1978 for men and women respectively after adjusting for age. After additional adjustment for socio-economic characteristics, annual differences compared to 1978 increased (5.4 (4.2 to 6.5) and 4.4 (3.2 to 5.6) for men and women in 2004). Further adjustment for employment status however attenuated the annual differences in poor health (0.7 (-0.3 to 1.7) for men and 1.5 (0.3 to 2.6) for women in 2004).**Conclusions:** These results suggest that the proportion of people in different employment statuses, particularly the proportion in sickness or disability related economic inactivity, could play an important role in the prevalence of poor self rated health in the UK. Whether decreasing economic inactivity would enhance population health is an open question that needs further investigation.

Trial registration: This observational study was not reregistered.

Article summary

Article focus

- There have been major changes in employment (particularly the growth of those out of work sick or disabled) since the 1970s in many OECD countries.
- Given that self rated health is associated strongly with employment status the changes in employment may potentially be important for the level of poor health in the population.

Key messages

- Accounting for population increases in socio-economic characteristics associated with good health suggests that self rated health may have worsened since 1978 for both working age men and women.
- Much of this deterioration disappeared when controlling for employment status.
- There seems to be an association between rising levels of detachment from the labour market for both men and women (even given the rise in women's employment) and the level of poor self rated health in the population.

Strengths and limitations

- The study uses consistent individual level data from a long term survey covering a period of socio-economic change.
- Further work is needed to understand whether decreasing economic inactivity would necessarily lead to improved population health.

Introduction

Since the late 1970s, there have been substantial social, political and economic changes in the UK and in other advanced market democracies. On the one hand, average levels of education and material wealth have increased in the UK since the 1970s [1] and there have been improvements to overall mortality levels and life expectancy. On the other hand, there have been increases in inequalities in wealth and health [1, 2]. Welfare provision has decreased [3] at the same time as there have been large reductions in male employment levels and a related rise in male and female (excluding keeping house) economic inactivity rates [4]. The rise of economic inactivity has been linked to the de-industrialisation experienced by the labour markets of advanced market democracies and the associated loss of full-time, permanent, well-paid and skilled industrial jobs [5].

Being out of work has consistently been associated with a heightened risk of mortality [6], mental ill-health and suicide [7, 8], unhappiness [9], poor general health [10] and limiting long term illness [11, 12]. This heightened risk of ill-health applies not just to those unemployed (out of work and actively seeking work) but also to those economically inactive (out of work and not actively seeking work) [9, 10, 13]. Indeed, previous work suggested that the distribution of economic inactivity was a potentially important factor behind the social gradient in health and in regional differences in health inequalities [10, 14].

Whilst there has been a wealth of research into the association between unemployment and adverse health, there has been much less which examines economic inactivity. Arguably, it is the latter which is of increasing importance in public health terms as whilst unemployment is generally cyclical – rising and falling in line with economic contraction and expansion – economic inactivity has increasingly become a structural labour market problem [4]. For example in the UK, according to the 1966 census 94.4% of non-student working age men were in employment and only 3% were economically inactive whilst in the 2001 census, the figures were 80.2% and 14.5% respectively [15]. This paper examines the potential impact of the changing pattern of employment status on the prevalence of poor self rated health from 1978 to 2004 using individual level data from a repeated cross-sectional survey.

Methods

The General Household Survey is a UK government repeated cross-sectional household survey that started in 1971 (with gaps in 1997 and 1999). It aimed to interview all adults in selected households. The exact sampling procedures to select households have changed over time but it has employed a stratified (by regional geography and area socio-economic characteristics) clustered sample method with the primary sample units being small (as a rough guide 5000 people) geographical areas (electoral wards until 1983 and postcode sectors thereafter). Households were then randomly selected from within these primary sampling units. It covers Britain rather than the whole of the UK (so excludes Northern Ireland). Its long running nature means that it is highly suitable for assessing change over time. The UK's Office for National Statistics (ONS) has produced a consistent (in terms of making variables as comparable as possible over time) time-series of the surveys 1972 to 2004 and it is this individual level dataset - available from the UK Data Archive - that was used in this analysis [16]. Analysis was limited to men and women aged 25 to 59. The lower age limit was chosen to limit the likelihood of people still being in higher education. Although state retirement age in the UK for the study period was 65 for men and 60 for women, it is common practice to restrict analysis to age 59 and below to limit the number of people who have taken voluntary early retirement straight from paid employment.

The health outcome was self rated general health, with respondents asked "Over the last 12 months, would you say your health has on the whole been: good; fairly good or not good?". For this analysis, it was recoded good and fairly good health (0) versus not good (1) and this latter category is referred to as poor health from now on. The question was first asked in 1977 but the introduction to the question was different in this year so 1978 is taken as the reference year. Individual level employment status was coded as employed, unemployed (out of work but actively seeking work), and the following categories of economic inactivity: retired, in education, keeping house full-time, sick or disabled and other economically inactive. As the employment status variables in the time series file had only three categories (employed, unemployed and economic inactive) we returned to the original annual survey files to compile the more nuanced categories of individual level economic inactivity. Single year of age was used in the analysis. Three measures of socio-economic position were used with categories made consistent as possible over time by the ONS, whether the person had a university level degree or not, whether they lived in owned outright housing, owned with mortgage housing, private rented housing or social (state or housing association) rented housing and finally, whether they lived in

a household with car access. Across all years, a total of 10% of men and 4% of women in the sample had missing data for one or more of the variables. In sensitivity analysis we used multiple imputation (implemented using the ice command in Stata) to impute missing data. We did the imputation for men and women and for each year separately. Twenty imputed datasets were created for each year / gender combination. The imputed models were based on all variables already described plus country of residence (England, Wales, Scotland) and marital status. The main results using the imputed datasets are shown in the supplement.

For the main analysis we pooled data from all the survey years. The prevalence of poor health amongst individual respondents in all other years (1979-2004) was compared to 1978 using a logistic regression model containing year dummy variables with standard errors accounting for the household clustering in the survey (although this was minimal as men and women in the same household were analysed separately). The initial model (model A) controlled for age only. Model B additionally adjusted for the socio-economic variables as these are variables associated with general health [17]. Model C then controlled additionally for employment status to assess its impact on the annual differences. In sensitivity analysis we checked the pattern of results using multilevel models where we treated year as a random intercept (individuals nested in years) and these results are shown in the supplement. Non-response weights are included in the time series General Household Survey file from 2000 onwards (when weights were introduced) and these have been applied in the main analysis (weights are scaled to have a mean of 1 in each year) with each individual in the years prior to 2000 being weighted equally (at 1). As odds ratios across different logistic models are not directly comparable [18] we also present the main results as adjusted prevalence differences (that are comparable across models [18]) by using the post estimation "margins" command in Stata. This shows yearly differences on an absolute scale.

Even though each annual GHS sample is relatively large, pooling the data had the advantage of increasing the sample for certain categories of the variables (economic inactivity for example) that in each year were relatively small. Pooling also provided a direct test of year-on-year differences. One disadvantage is that the coefficient for the variables is assumed to be the same over the years. We tested the possible impact of allowing coefficients to vary over the years in two ways. Firstly in our multilevel modelling we fitted a random coefficient model where we allowed the coefficients for employment status to vary over the years (models

allowing all variables (age, socio-economic characteristics and employment status) to vary in the multilevel model unfortunately did not converge).

Second we used decomposition analysis to compare the observed difference in prevalence of poor health between the initial year (1978) and the final year (2004) using separate logistic regression models for each of these years. This means that the coefficients are allowed to be different between the years. This method allows the difference in prevalence of poor health to be separated into the part associated with changes in the characteristics of the population between 2004 and 1978 and that associated with changes in size of coefficients (including the intercept) between 2004 and 1978. For example, comparing an age adjusted model would mean that the prevalence difference between the two years could be assigned to changes in the effect size of the coefficients (in this case the age coefficient and the constant) and that due to changes in the age composition of the population (for example if the population had a higher average age in 2004 compared to 1978). We apply the same models (A, B and C) from the main analysis. We use the mvdcmp command in Stata to conduct the decomposition [19]. Stata 11.2 was used for the analysis apart from the multilevel modelling that was conducted in MLwiN.

Results

The total sample sizes across all years were 138,932 men and 145,300 women and these were reduced to 125,125 and 139,535 respectively in the complete case analysis when cases with missing data were excluded. Table 1 includes the response rates and individual year sample sizes for the complete cases.

Table 1 shows that for men the prevalence of poor health was low in 1978 (it was lowest in 1982) and then increased to 10.7% in 2004 a rise of 3.3 percentage points over the period. The rate of poor health was lowest for women in 1984 having declined slightly from 1978, although in the 1990s the rate rose and was just over 1 percentage point higher at the end of period compared to the start. The rate of poor health was always higher for women than men over the period.

There was clear change in the socio-economic characteristics of the population over the period with declines in the proportion living in social rented housing and increases in the proportion living in owner occupied housing, living in households with car access and the proportion with degrees (Figure 1).

Table 1 Response rates, sample sizes** and prevalence** of poor health for men and women by year.

Year	Response rate* (%)	Number of men	% of men in poor health	Number of women	% of women in poor health
1978	82	6258	7.4	6777	11.3
1979	83	6097	8.0	6557	11.1
1980	82	6129	8.7	6659	12.2
1981	84	6348	7.7	6860	11.4
1982	84	5299	6.9	5784	10.1
1983	82	5030	7.6	5618	11.6
1984	81	4855	7.6	5375	9.5
1985	82	5041	7.3	5542	10.4
1986	84	5175	7.4	5645	10.2
1987	85	5295	7.3	5739	10.5
1988	85	5082	8.0	5578	10.2
1989	84	5205	7.4	5677	10.0
1990	81	4833	7.8	5322	11.0
1991	84	5110	7.8	5614	10.3
1992	83	5070	8.1	5690	9.8
1993	82	4890	7.9	5434	10.8
1994	80	4734	9.6	5398	11.2
1995	80	4705	10.6	5488	11.4
1996	76	4326	8.0	5111	11.4
1998	72	4044	11.3	4740	12.3
2000	67	4008	10.1	4548	12.2
2001	72	4358	10.3	5058	12.1
2002	69	4183	11.1	4818	12.0
2003	70	4885	10.1	5651	12.5
2004	69	4165	10.7	4852	12.8

*Response rates are from http://www.esds.ac.uk/doc/5640/mrdoc/pdf/5640ghs05appendixb.pdf (page 10)** Sample size and prevalence of poor health for the complete case sample.

Taking these developments in the socio-economic characteristics of the population into account by controlling for the socio-economic variables in model B generally increased annual differences compared to 1978 when model B is compared to model A which controlled only for age differences.

Overall male employment had fallen from 93% to 85% at the end of the period. Figure 2 illustrates the changes in the proportion of people in the various non-employment statuses over time with male unemployment (left panel) being cyclical, peaking in the mid 1980s and the early 1990s recession then falling away and being over taken by those sick or disabled in the late 1990s with this group now being the largest. Other forms of economic inactivity for males showed some increases but remained relatively small. For women, figure 2 (right panel) shows (reading the right hand axis) that there had been a 20 percentage point decline in those keeping home but, as for men, cyclical unemployment, a rise in those sick or disabled

overtaking those unemployed and a rise in those retired or in education. However unlike for men, female employment rose by 13 percentage points over the period from 61% to 74%

Table 2 Logistic regression results for rate of poor health for men and women controlling for age (Model A), additionally the listed socio-economic characteristics (model B) and additionally employment status (Model C)

	Men (Model A) ORs (95% CIs)	Men (Model B) ORs (95% CIs)	Men (Model C) ORs (95% CIs)	Women (Model A) ORs (95% CIs)	Women (Model B) ORs (95% CIs)	Women (Model C) ORs (95% CIs)
Age	1.06 (1.05 to 1.06)	1.05 (1.05 to 1.06)	1.04 (1.04 to 1.04)	1.04 (1.03 to 1.04)	1.03 (1.03 to 1.04)	1.03 (1.02 to 1.03)
Year						
1978	1	1	1	1	1	1
1979	1.08 (0.94 to 1.24)	1.09 (0.95 to 1.25)	1.02 (0.89 to 1.18)	0.98 (0.88 to 1.09)	0.98 (0.88 to 1.1)	0.98 (0.88 to 1.1)
1980	1.2 (1.05 to 1.37)	1.24 (1.08 to 1.42)	1.14 (0.99 to 1.31)	1.09 (0.98 to 1.21)	1.11 (1 to 1.24)	1.13 (1.01 to 1.26)
1981	1.05 (0.92 to 1.21)	1.09 (0.95 to 1.25)	0.95 (0.83 to 1.1)	1.01 (0.91 to 1.13)	1.04 (0.93 to 1.16)	1.02 (0.91 to 1.14)
1982	0.93 (0.81 to 1.08)	0.99 (0.85 to 1.15)	0.8 (0.68 to 0.93)	0.89 (0.79 to 1)	0.93 (0.83 to 1.04)	0.9 (0.8 to 1.01)
1983	1.03 (0.89 to 1.19)	1.12 (0.96 to 1.29)	0.83 (0.71 to 0.97)	1.04 (0.93 to 1.16)	1.12 (1 to 1.26)	1.03 (0.91 to 1.16)
1984	1.07 (0.92 to 1.23)	1.24 (1.07 to 1.44)	0.91 (0.78 to 1.06)	0.84 (0.74 to 0.95)	0.94 (0.83 to 1.06)	0.85 (0.75 to 0.96)
1985	1.01 (0.88 to 1.17)	1.17 (1.01 to 1.36)	0.81 (0.69 to 0.95)	0.94 (0.83 to 1.05)	1.06 (0.94 to 1.19)	0.94 (0.84 to 1.06)
1986	1.03 (0.89 to 1.19)	1.27 (1.09 to 1.47)	0.89 (0.76 to 1.04)	0.92 (0.82 to 1.03)	1.06 (0.95 to 1.2)	0.96 (0.85 to 1.08)
1987	1.01 (0.88 to 1.17)	1.3 (1.12 to 1.5)	0.88 (0.76 to 1.03)	0.95 (0.85 to 1.06)	1.13 (1 to 1.27)	0.98 (0.87 to 1.11)
1988	1.11 (0.96 to 1.27)	1.43 (1.24 to 1.65)	0.99 (0.85 to 1.15)	0.91 (0.81 to 1.02)	1.09 (0.97 to 1.23)	0.98 (0.87 to 1.1)
1989	1.01 (0.87 to 1.16)	1.33 (1.15 to 1.54)	0.84 (0.72 to 0.99)	0.9 (0.8 to 1.01)	1.1 (0.97 to 1.23)	0.95 (0.84 to 1.07)
1990	1.1 (0.95 to 1.26)	1.47 (1.27 to 1.7)	0.91 (0.77 to 1.06)	1 (0.89 to 1.12)	1.22 (1.09 to 1.38)	1.06 (0.93 to 1.19)
1991	1.08 (0.94 to 1.24)	1.43 (1.23 to 1.65)	0.86 (0.74 to 1.01)	0.93 (0.83 to 1.04)	1.15 (1.02 to 1.29)	0.93 (0.82 to 1.05)
1992	1.11 (0.97 to 1.28)	1.51 (1.31 to 1.75)	0.85 (0.73 to 0.99)	0.87 (0.77 to 0.98)	1.09 (0.97 to 1.23)	0.85 (0.75 to 0.97)
1993	1.11 (0.96 to 1.28)	1.52 (1.31 to 1.76)	0.79 (0.67 to 0.92)	0.98 (0.88 to 1.1)	1.23 (1.09 to 1.38)	0.95 (0.84 to 1.08)
1994	1.35 (1.17 to 1.55)	1.85 (1.61 to 2.13)	0.97 (0.83 to 1.13)	1.02 (0.91 to 1.15)	1.28 (1.13 to 1.43)	1.01 (0.89 to 1.14)
1995	1.5 (1.31 to 1.71)	2.11 (1.84 to 2.43)	1.1 (0.94 to 1.27)	1.03 (0.92 to 1.15)	1.34 (1.19 to 1.5)	1.02 (0.91 to 1.16)

1996	1.11 (0.96 to 1.29)	1.53 (1.32 to 1.78)	0.71 (0.6 to 0.84)	1.03 (0.92 to 1.16)	1.31 (1.16 to 1.47)	0.94 (0.83 to 1.06)
1998	1.61 (1.4 to 1.85)	2.31 (2 to 2.66)	1.22 (1.05 to 1.43)	1.11 (0.99 to 1.25)	1.47 (1.3 to 1.65)	1.07 (0.94 to 1.21)
2000	1.43 (1.24 to 1.65)	2.06 (1.78 to 2.39)	1.04 (0.88 to 1.23)	1.1 (0.98 to 1.24)	1.47 (1.3 to 1.66)	1.1 (0.97 to 1.25)
2001	1.47 (1.27 to 1.69)	2.13 (1.85 to 2.46)	1.13 (0.97 to 1.32)	1.08 (0.96 to 1.21)	1.46 (1.3 to 1.64)	1.05 (0.93 to 1.2)
2002	1.53 (1.33 to 1.76)	2.25 (1.95 to 2.59)	1.3 (1.11 to 1.52)	1.07 (0.95 to 1.2)	1.45 (1.28 to 1.63)	1.09 (0.96 to 1.24)
2003	1.38 (1.2 to 1.58)	2.03 (1.76 to 2.34)	1.08 (0.93 to 1.27)	1.11 (0.99 to 1.24)	1.5 (1.34 to 1.69)	1.12 (0.99 to 1.27)
2004	1.44 (1.25 to 1.66)	2.09 (1.81 to 2.41)	1.11 (0.95 to 1.31)	1.14 (1.01 to 1.27)	1.56 (1.38 to 1.75)	1.18 (1.04 to 1.33)
No degree		1	1		1	1
Degree		0.49 (0.45 to 0.54)	0.59 (0.54 to 0.65)		0.56 (0.51 to 0.61)	0.66 (0.6 to 0.72)
Owned outright		1	1		1	1
Owned with mortgage		0.75 (0.7 to 0.8)	0.95 (0.89 to 1.02)		0.97 (0.92 to 1.03)	1.1 (1.03 to 1.16)
Private rent		1.15 (1.05 to 1.26)	1.2 (1.08 to 1.33)		1.31 (1.21 to 1.42)	1.31 (1.2 to 1.42)
Social rent		1.88 (1.76 to 2.01)	1.46 (1.35 to 1.58)		1.98 (1.87 to 2.1)	1.72 (1.62 to 1.83)
No car		1	1		1	1
Car		0.54 (0.51 to 0.57)	0.85 (0.8 to 0.91)		0.6 (0.58 to 0.63)	0.73 (0.69 to 0.76)
Employed			1			1
Unemployed			2.01 (1.86 to 2.18)			1.81 (1.65 to 1.98)
Keeping house			2.64 (2.16 to 3.23)			1.81 (1.74 to 1.89)
Sick or disabled			28.07 (26.11 to 30.19)			20.05 (18.68 to 21.52)
Education			1.85 (1.33 to 2.58)			1.26 (0.96 to 1.65)
Retired			2.59 (2.2 to 3.04)			2.12 (1.88 to 2.4)
Other inactive			6.28 (5.46 to 7.21)			4.04 (3.44 to 4.75)

All forms of non employment were associated with an elevated probability of poor health but those sick or disabled had a particularly strong association (Table 2 – Model C). Controlling for individual level employment status (model C in table 2) attenuated the odds ratios for poor health for the years subsequent to 1978 for men and women. Pseudo r2 statistics indicated that model fit improved from model A (age only- 0.04 & 0.02 form men and women respectively) to model B (plus socio-economic characteristics – 0.09 & 0.05) to model C (plus employment – 0.22 & 0.13) for men and women respectively. Absolute prevalence differences compared to 1978 from each model are illustrated for men and women in figures 3 and 4 respectively. These highlight the possible linear increase in poor health year-on-year after controlling for socio-economic characteristics (Model B) and the attenuating impact of controlling for employment status (Model C). For men controlling for employment status led to yearly differences from 1978 being lower than for the age only model whereas for women it led to differences being very similar to the age only model. In the supplement results from the multiple imputation are shown and are very similar to those in Figure 3 and Figure 4. Results (shown in the supplement) from the multilevel modelling where year was treated as a random intercept rather than a fixed covariate showed a very similar pattern in that a clearer year-on-year increase in poor health from 1978 is apparent in model B compared to model A and that adjustment for employment status (model C) attenuated these differences even when the effect of employment status was allowed to vary over the years (model D).

The results from the decomposition analysis comparing – using separate logistic regression for each year - the unadjusted observed prevalence difference between 2004 and 1978 are presented in Table 3. For men, prevalence was 3.3 percentage points higher in 2004 (as shown in Table 1). When adding age only to the model (Model A) most of the observed difference was not due to changes in the population characteristics (the population in 2004 was slightly older hence a small part (0.4 percentage points) of the increase was due to this). Socio-economic characteristics of the population had changed in 2004 (Figure 1) and, model B shows that health in 2004 could have been considerably better (-4.2 percentage points lower) given the socio-economic characteristics in 2004 compared to 1978. Instead it was the changes in the coefficients that were associated with the actual increase in poor health from 1978 to 2004. However, when employment status is added in model C most of the increase in poor health is now explained by the change in population characteristics from

1978 to 2004. For women, the pattern of results is similar to men for the smaller 1.5 percentage point increase in poor health in 2004 although in model C most of the change is due to changes in coefficients. These results reflect those of the main analysis where controlling for both our socio-economic and employment status variables suggested that for men the difference between 2004 and 1978 would have been slightly lower than the age adjusted difference and for women it would have been very similar.

Table 3 Results for the decomposition analysis for the prevalence difference in poor health in 2004 from 1978 for men and women – model A adjusts for age, model B additionally adjusts for housing tenure, car access and degree attainment, model C adjusts additionally for employment

	Model A – Prevalence difference and 95% CIs*)	Model B	Model C
Men			
Due to population change	0.4 (0.4 to 0.5)	-4.2 (-5 to -3.5)	2.4 (1.7 to 3.2)
Due to coefficient change	2.8 (1.7 to 4.0)	7.5 (6.0 to 9.0)	0.8 (-0.5 to 2.1)
Overall difference	3.3 (2.1 to 4.4)	3.3 (2.2 to 4.4)	3.3 (2.3 to 4.3)
Women			
Due to population change	0.2 (.2 to .3)	-4.4 (-5.2 to -3.7)	-0.1 (-0.9 to 0.8)
Due to coefficient change	1.3 (0.1 to 2.5)	5.9 (4.4 to 7.5)	1.6 (0.1 to 3.1)
Overall Difference	1.5 (0.3 to 2.7)	1.5 (0.3 to 2.7)	1.5 (0.4 to 2.6)

*Confidence intervals do not account for household clustering as this option is not presently available for mvdcmp

Discussion

The individual level analysis presented here shows that accounting for shifts in the proportion of the working age population in different employment statuses – most notably the rise of sickness or disability related economic inactivity – attenuated annual differences in the prevalence of poor self rated health in the UK population since the late 1970s. This complements previous individual level analysis into sickness or disability related economic inactivity which found that it was a possible major factor behind the social gradient in health [14] as well as a possible influential issue in regional differences in health [10]. The results suggest that a fuller understanding of why employment status is associated with self-rated health could be important for public health. The relationship between employment status and health is complicated. Systematic reviews have concluded that there is evidence that poor health can cause job loss and that job loss can cause poor health with the latter possibly being the stronger effect of the two [6, 7]. For self-rated general health, there is also evidence of health selection [20] but also causation [21]. So it is possible that rising rates of poor general health have increased economic inactivity. The debate over the relative influence of employment on health versus health on employment is limited though because it tends to emphasise notions of people being in a state of health that either allows them to work or not: a zero-sum approach. Yet, it should be remembered that ill health for the majority is not an impediment to labour market participation [22] but that those in ill-health - particularly in lower socio-economic positions - are most vulnerable to non-employment and were increasingly so in the period under study [22, 23]. So their job loss may not then be caused by their ill-health per se but by the prevailing labour market conditions and the policy response to these [24, 25].

Evidence suggests that the increases in the economically inactive population (particularly those claiming sickness related benefits) in the UK during this period were due to difficult labour market conditions (particularly in de-industrialised areas) [5] [26]. This resulted in those with health conditions (particularly if also from low socio-economic positions) finding themselves towards the back of the job queue and unlikely to find employment [5]. In this sense it is argued that many of those economically inactive because of sickness or disability are “hidden unemployed” as they may be employed given different labour market conditions. [5]. Indeed, in better labour market conditions it is argued that there is “hidden sickness” amongst the active

workforce [5]. This does not necessarily require any change in the individual level of ill-health in the population just change in the proportion of people who are employed. Recent theoretical work on how people self-rate their general health suggests a cognitive process where people take account of their individual health situation but do so in the wider context in which they live [27]. Hence the assessment of one's health while being economically inactive may differ compared to when one is in or seeking work. For example, there is longitudinal evidence that the reporting of longstanding illness may depend on labour market status with employment reducing the likelihood of reporting poor health [28]. Coupled to the health damaging psychological and material consequences of non-work [29] this may allow us to understand why economic inactivity may be associated with a higher risk of poor general health at the individual level.

Of course, confounding is a real possibility within this repeated cross-sectional study. For example, there could be other confounding or mediating trends that are associated with both general health and employment that could explain the impact of adjusting for changes in employment status. Examples include the apparent decline in job quality over time [30] and macro-economic changes such as the rise in the level of income inequality.

Economic inactivity is also a potentially important influence on population health, not just because of the composition of the inactive population itself, but also because it is generally a longer term state. For example, a recent cohort study of people out of work and in receipt of incapacity-related benefits in the UK found that the average length of economic inactivity amongst this group was nine years [31]. Thus the issues which are usually put forward to explain the association between unemployment and ill health – most notably poverty, social exclusion and low social status – are thus experienced for a much longer time period by those who are inactive than by those who are unemployed.

Whilst our results suggest that decreasing the numbers of economically inactive could have health benefits, this is by no means an easy task and not just because of the current economic climate. Research into welfare to work interventions for those with a disability or chronic illness has found that even in times of solid economic growth it is very difficult to increase the employment rate of this group. For example, in the UK since the 1990s there have been increasing efforts to enhance the labour market participation of this group using various interventions including education, training and work placement schemes; vocational advice and

support services; vocational rehabilitation; in-work benefits; financial incentives for employers; employment rights legislation and accessibility interventions[4]. However, the evidence of effectiveness in terms of actually increasing employment is very limited [4, 32-34]. This is partly attributed to the largely supply-side orientation of most of the interventions [4], the focus on employment rather than health improvement [31, 35] and the lack of demand from employers for workers with complicated and fluctuating health conditions [31].

In addition to being only cross-sectional, another limitation of using the General Household Survey is that response rate fell over time; weighting was introduced in 2000 and we have applied this in all analysis but the possibility remains that the survey became increasingly unrepresentative over time. It is impossible to assess the impact of this on our results as we do not have details of non responders. However, evidence comparing a national census to a national health survey suggested that low socio-economic groups and the out of work were less well represented in the survey leading to a more conservative estimate of the social gradient in health in the survey [36].

Conclusion

To summarise, this study shows that poor health may have worsened amongst both men and women from 1978 to 2004 when accounting for socio-economic changes. However, controlling for the employment status changes in the UK since 1978 attenuated the increase in poor general health. This research raises important public policy issues around the role of employment in overall public health which should be examined further.

Acknowledgements

General Household Survey Time Series Dataset 1972-2004 was created by the Office for National Statistics. The user guide for the time series dataset was created jointly by ONS and the Economic and Social Data Service (ESDS) Government and downloaded from the UK Data Archive. The data are Crown copyright. The authors alone are responsible for the analysis and interpretation.

Funding

No specific grant was associated with this was work. LG (5TK30) and FP (5TK10) are funded by the MRC

Ethics approval

Not required for this secondary analysis of publically available and anonymised secondary data

Author contributions

FP had the original idea which was developed with CB. FP and LG conducted the analysis. FP drafted the manuscript with revisions from CB and LG.

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Figure 1 Prevalence of housing tenure types, car access and degree attainment 1978 to 2004 for men and women aged 25 to 59

Figure 2 Prevalence of the different types of employment status 1978 to 2004 from men and women aged 25 to 59

Figure 3 Prevalence difference in poor health from 1978 (reference) to 2004 for men from model A (age adjusted), model B (plus adjustment for socio-economic characteristics) and model C (plus adjustment for employment status).

Figure 4 Prevalence difference in poor health from 1978 (reference) to 2004 for women from model A (age adjusted), model B (plus adjustment for socio-economic characteristics) and model C (plus adjustment for employment status).

The potential impact of employment status changes on the prevalence of poor self rated health. Findings from UK individual level repeated cross-sectional data from 1978 to 2004.

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Word count: 2903

Keywords: employment, unemployment, economic inactivity, self rated health, socio-economic

Abstract

Objectives : To assess using individual level data how the proportion of people in different employment statuses may have played a role in the prevalence of poor self rated health from 1978 to 2004 as there have been major changes in employment patterns in advanced market democracies and employment is an important correlate of health.

Design: Individual level analysis of repeated cross-sectional surveys

Setting: UK

Participants: 125,125 men and 139,535 women of working age (25 to 59)

Outcome measure: Self rated general health

Results: Compared to 1978 there was evidence of higher levels of poor health in the subsequent years. For example in 2004 the prevalence of poor health was 2.8 (95% CI 1.7 to 3.9) and 1.3 (0.1 to 2.5) percentage points higher than 1978 for men and women respectively after adjusting for age. After additional adjustment for socio-economic characteristics, annual differences compared to 1978 increased (5.4 (4.2 to 6.5) and 4.4 (3.2 to 5.6) for men and women in 2004). Further adjustment for employment status however attenuated the annual differences in poor health (0.7 (-0.3 to 1.7) for men and 1.5 (0.3 to 2.6) for women in 2004).

Conclusions: These results suggest that the proportion of people in different employment statuses, particularly the proportion in sickness or disability related economic inactivity, could play an important role in the prevalence of poor self rated health in the UK. Whether decreasing economic inactivity would enhance population health is an open question that needs further investigation.

Trial registration: This observational study was not reregistered.

Article summary

Article focus

- There have been major changes in employment (particularly the growth of those out of work sick or disabled) since the 1970s in many OECD countries.
- Given that self rated health is associated strongly with employment status the changes in employment may potentially be important for the level of poor health in the population.

Key messages

- Accounting for population increases in socio-economic characteristics associated with good health suggests that self rated health may have worsened since 1978 for both working age men and women.
- Much of this deterioration disappeared when controlling for employment status.
- There seems to be an association between rising levels of detachment from the labour market for both men and women (even given the rise in women's employment) and the level of poor self rated health in the population.

Strengths and limitations

- The study uses consistent individual level data from a long term survey covering a period of socio-economic change.
- Further work is needed to understand whether decreasing economic inactivity would necessarily lead to improved population health.

Introduction

Since the late 1970s, there have been substantial social, political and economic changes in the UK and in other advanced market democracies. On the one hand, average levels of education and material wealth have increased in the UK since the 1970s [1] and there have been improvements to overall mortality levels and life expectancy. On the other hand, there have been increases in inequalities in wealth and health [1, 2]. Welfare provision has decreased [3] at the same time as there have been large reductions in male employment levels and a related rise in male and female (excluding keeping house) economic inactivity rates [4]. The rise of economic inactivity has been linked to the de-industrialisation experienced by the labour markets of advanced market democracies and the associated loss of full-time, permanent, well-paid and skilled industrial jobs [5].

Being out of work has consistently been associated with a heightened risk of mortality [6], mental ill-health and suicide [7, 8], unhappiness [9], poor general health [10] and limiting long term illness [11, 12]. This heightened risk of ill-health applies not just to those unemployed (out of work and actively seeking work) but also to those economically inactive (out of work and not actively seeking work) [9, 10, 13]. Indeed, previous work suggested that the distribution of economic inactivity was a potentially important factor behind the social gradient in health and in regional differences in health inequalities [10, 14].

Whilst there has been a wealth of research into the association between unemployment and adverse health, there has been much less which examines economic inactivity. Arguably, it is the latter which is of increasing importance in public health terms as whilst unemployment is generally cyclical – rising and falling in line with economic contraction and expansion – economic inactivity has increasingly become a structural labour market problem [4]. For example in the UK, according to the 1966 census 94.4% of non-student working age men were in employment and only 3% were economically inactive whilst in the 2001 census, the figures were 80.2% and 14.5% respectively [15]. This paper examines the potential impact of the changing pattern of employment status on the prevalence of poor self rated health from 1978 to 2004 using individual level data from a repeated cross-sectional survey.

Methods

The General Household Survey is a UK government repeated cross-sectional household survey that started in 1971 (with gaps in 1997 and 1999). It aimed to interview all adults in selected households. The exact sampling procedures to select households have changed over time but it has employed a stratified (by regional geography and area socio-economic characteristics) clustered sample method with the primary sample units being small (as a rough guide 5000 people) geographical areas (electoral wards until 1983 and postcode sectors thereafter). Households were then randomly selected from within these primary sampling units. It covers Britain rather than the whole of the UK (so excludes Northern Ireland). Its long running nature means that it is highly suitable for assessing change over time. The UK's Office for National Statistics (ONS) has produced a consistent (in terms of making variables as comparable as possible over time) time-series of the surveys 1972 to 2004 and it is this individual level dataset - available from the UK Data Archive - that was used in this analysis [16]. Analysis was limited to men and women aged 25 to 59. The lower age limit was chosen to limit the likelihood of people still being in higher education. Although state retirement age in the UK for the study period was 65 for men and 60 for women, it is common practice to restrict analysis to age 59 and below to limit the number of people who have taken voluntary early retirement straight from paid employment.

The health outcome was self-rated general health, with respondents asked "Over the last 12 months, would you say your health has on the whole been: good; fairly good or not good?". For this analysis, it was recoded good and fairly good health (0) versus not good (1) and this latter category is referred to as poor health from now on. The question was first asked in 1977 but the introduction to the question was different in this year so 1978 is taken as the reference year. Individual level employment status was coded as employed, unemployed (out of work but actively seeking work), and the following categories of economic inactivity: retired, in education, keeping house full-time, sick or disabled and other economically inactive. As the employment status variables in the time series file had only three categories (employed, unemployed and economic inactive) we returned to the original annual survey files to compile the more nuanced categories of individual level economic inactivity. Single year of age was used in the analysis. Three measures of socio-economic position were used with categories made consistent as possible over time by the ONS, whether the person had a university level degree or not, whether they lived in owned outright housing, owned with mortgage housing, private rented housing or social (state or housing association) rented housing and finally, whether they lived in

a household with car access. Across all years, a total of 10% of men and 4% of women in the sample had missing data for one or more of the variables. In sensitivity analysis we ~~multiple~~used multiple imputation (implemented using the ice command in Stata) to impute missing data. We did the imputation for men and women and for each year separately. Twenty imputed datasets were created for each year / gender combination. The imputed models were ~~-~~based on all variables already described plus country of residence (England, Wales, Scotland) and marital status.~~-~~ The main results using the imputed datasets are shown in the supplement.

For the main analysis we pooled data from all the survey years. The prevalence of poor health amongst individual respondents in all other years (1979-2004) was compared to 1978 using a logistic regression model containing year dummy variables with standard errors accounting for the household clustering in the survey (although this was minimal as men and women in the same household were analysed separately). The initial model (model A) controlled for age only. Model B additionally adjusted for the socio-economic variables as these are variables associated with general health [17]. Model C then controlled additionally for employment status to assess its impact on the annual differences. In sensitivity analysis we checked the pattern of results using multilevel models where we treated year as a random intercept (individuals nested in years) and these results are shown in the supplement. Non-response weights are included in the time series General Household Survey file from 2000 onwards (when weights were introduced) and these have been applied in the main analysis (weights are scaled to have a mean of 1 in each year) with each individual in the years prior to 2000 being weighted equally (at 1). As odds ratios across different logistic models are not directly comparable [18] we also present the main results as adjusted prevalence differences (that are comparable across models [18]) by using the post estimation "margins" command in Stata. This shows yearly differences on an absolute scale.

Even though each annual GHS sample is relatively large, pooling the data had the advantage of increasing the sample for certain categories of the variables (economic inactivity for example) that in each year were relatively small. Pooling also provided a direct test of year-on-year differences. One disadvantage is that the coefficient for the variables is assumed to be the same over the years. We tested the possible impact of allowing coefficients to vary over the years in two ways. Firstly in our multilevel modelling we fitted a random coefficient model where we allowed the coefficients for employment status to vary over the years (models

allowing all variables (age, socio-economic characteristics and employment status) to vary in the multilevel model unfortunately did not converge).

Second we used decomposition analysis to compare the observed difference in prevalence of poor health between the initial year (1978) and the final year (2004) using separate logistic regression models for each of these years. This means that the coefficients are allowed to be different between the years. This method allows the difference in prevalence of poor health to be separated into the part associated with changes in the characteristics of the population between 2004 and 1978 and that associated with changes in size of coefficients (including the intercept) between 2004 and 1978. For example, comparing an age adjusted model would mean that the prevalence difference between the two years could be assigned to changes in the effect size of the coefficients (in this case the age coefficient and the constant) and that due to changes in the age composition of the population (for example if the population had a higher average age in 2004 compared to 1978). We apply the same models (A, B and C) from the main analysis. We use the mvdcmp command in Stata to conduct the decomposition [19]. Stata 11.2 was used for the analysis apart from the multilevel modelling that was conducted in MLwiN.

Results

The total sample sizes across all years were 138,932 men and 145,300 women and these were reduced to 125,125 and 139,535 respectively in the complete case analysis when cases with missing data were excluded. Table 1 includes the response rates and individual year sample sizes for the complete cases.

Table 1 shows that for men the prevalence of poor health was low in 1978 (it was lowest in 1982) and then increased to 10.7% in 2004 a rise of 3.3 percentage points over the period. The rate of poor health was lowest for women in 1984 having declined slightly from 1978, although in the 1990s the rate rose and was just over 1 percentage point higher at the end of period compared to the start. The rate of poor health was always higher for women than men over the period.

There was clear change in the socio-economic ~~change~~ characteristics of the population over the period with declines in the proportion living in social rented housing and increases in the proportion living in owner occupied housing, living in households with car access and the proportion with degrees (Figure 1).

Table 1 Response rates, sample sizes** and prevalence** of~~in~~ poor health for men and women by year.

Year	Response rate* (%)	Number of men	% of men in poor health	Number of women	% of women in poor health
1978	82	6258	7.4	6777	11.3
1979	83	6097	8.0	6557	11.1
1980	82	6129	8.7	6659	12.2
1981	84	6348	7.7	6860	11.4
1982	84	5299	6.9	5784	10.1
1983	82	5030	7.6	5618	11.6
1984	81	4855	7.6	5375	9.5
1985	82	5041	7.3	5542	10.4
1986	84	5175	7.4	5645	10.2
1987	85	5295	7.3	5739	10.5
1988	85	5082	8.0	5578	10.2
1989	84	5205	7.4	5677	10.0
1990	81	4833	7.8	5322	11.0
1991	84	5110	7.8	5614	10.3
1992	83	5070	8.1	5690	9.8
1993	82	4890	7.9	5434	10.8
1994	80	4734	9.6	5398	11.2
1995	80	4705	10.6	5488	11.4
1996	76	4326	8.0	5111	11.4
1998	72	4044	11.3	4740	12.3
2000	67	4008	10.1	4548	12.2
2001	72	4358	10.3	5058	12.1
2002	69	4183	11.1	4818	12.0
2003	70	4885	10.1	5651	12.5
2004	69	4165	10.7	4852	12.8

*Response rates are from http://www.esds.ac.uk/doc/5640/mrdoc/pdf/5640ghs05appendixb.pdf (page 10)
** Sample size and prevalence of poor health for the complete case sample.

Taking these developments in the socio-economic characteristics of the population into account by controlling for the socio-economic variables in model B generally increased annual differences compared to 1978 when model B is compared to model A which controlled only for age differences.

Overall male employment had fallen from 93% to 85% at the end of the period. Figure 2 illustrates the changes in the proportion of people in the various non-employment statuses over time with male unemployment (left panel) being cyclical, peaking in the mid 1980s and the early 1990s recession then falling away and being over taken by those sick or disabled in the late 1990s with this group now being the largest. Other forms of economic inactivity for males showed some increases but remained relatively small. For women, figure 2 (right panel) shows (reading the right hand axis) that there had been a 20 percentage point decline in those keeping home but, as for men, cyclical unemployment, a rise in those sick or disabled

overtaking those unemployed and a rise in those retired or in education. However unlike for men, female employment rose by 13 percentage points over the period from 61% to 74%

Table 2 Logistic regression results for rate of poor health for men and women controlling for age (Model A), additionally the listed socio-economic characteristics (model B) and additionally employment status (Model C)

	Men (Model A) ORs (95% CIs)	Men (Model B) ORs (95% CIs)	Men (Model C) ORs (95% CIs)	Women (Model A) ORs (95% CIs)	Women (Model B) ORs (95% CIs)	Women (Model C) ORs (95% CIs)
Age	1.06 (1.05 to 1.06)	1.05 (1.05 to 1.06)	1.04 (1.04 to 1.04)	1.04 (1.03 to 1.04)	1.03 (1.03 to 1.04)	1.03 (1.02 to 1.03)
Year						
1978	1	1	1	1	1	1
1979	1.08 (0.94 to 1.24)	1.09 (0.95 to 1.25)	1.02 (0.89 to 1.18)	0.98 (0.88 to 1.09)	0.98 (0.88 to 1.1)	0.98 (0.88 to 1.1)
1980	1.2 (1.05 to 1.37)	1.24 (1.08 to 1.42)	1.14 (0.99 to 1.31)	1.09 (0.98 to 1.21)	1.11 (1 to 1.24)	1.13 (1.01 to 1.26)
1981	1.05 (0.92 to 1.21)	1.09 (0.95 to 1.25)	0.95 (0.83 to 1.1)	1.01 (0.91 to 1.13)	1.04 (0.93 to 1.16)	1.02 (0.91 to 1.14)
1982	0.93 (0.81 to 1.08)	0.99 (0.85 to 1.15)	0.8 (0.68 to 0.93)	0.89 (0.79 to 1)	0.93 (0.83 to 1.04)	0.9 (0.8 to 1.01)
1983	1.03 (0.89 to 1.19)	1.12 (0.96 to 1.29)	0.83 (0.71 to 0.97)	1.04 (0.93 to 1.16)	1.12 (1 to 1.26)	1.03 (0.91 to 1.16)
1984	1.07 (0.92 to 1.23)	1.24 (1.07 to 1.44)	0.91 (0.78 to 1.06)	0.84 (0.74 to 0.95)	0.94 (0.83 to 1.06)	0.85 (0.75 to 0.96)
1985	1.01 (0.88 to 1.17)	1.17 (1.01 to 1.36)	0.81 (0.69 to 0.95)	0.94 (0.83 to 1.05)	1.06 (0.94 to 1.19)	0.94 (0.84 to 1.06)
1986	1.03 (0.89 to 1.19)	1.27 (1.09 to 1.47)	0.89 (0.76 to 1.04)	0.92 (0.82 to 1.03)	1.06 (0.95 to 1.2)	0.96 (0.85 to 1.08)
1987	1.01 (0.88 to 1.17)	1.3 (1.12 to 1.5)	0.88 (0.76 to 1.03)	0.95 (0.85 to 1.06)	1.13 (1 to 1.27)	0.98 (0.87 to 1.11)
1988	1.11 (0.96 to 1.27)	1.43 (1.24 to 1.65)	0.99 (0.85 to 1.15)	0.91 (0.81 to 1.02)	1.09 (0.97 to 1.23)	0.98 (0.87 to 1.1)
1989	1.01 (0.87 to 1.16)	1.33 (1.15 to 1.54)	0.84 (0.72 to 0.99)	0.9 (0.8 to 1.01)	1.1 (0.97 to 1.23)	0.95 (0.84 to 1.07)
1990	1.1 (0.95 to 1.26)	1.47 (1.27 to 1.7)	0.91 (0.77 to 1.06)	1 (0.89 to 1.12)	1.22 (1.09 to 1.38)	1.06 (0.93 to 1.19)
1991	1.08 (0.94 to 1.24)	1.43 (1.23 to 1.65)	0.86 (0.74 to 1.01)	0.93 (0.83 to 1.04)	1.15 (1.02 to 1.29)	0.93 (0.82 to 1.05)
1992	1.11 (0.97 to 1.28)	1.51 (1.31 to 1.75)	0.85 (0.73 to 0.99)	0.87 (0.77 to 0.98)	1.09 (0.97 to 1.23)	0.85 (0.75 to 0.97)
1993	1.11 (0.96 to 1.28)	1.52 (1.31 to 1.76)	0.79 (0.67 to 0.92)	0.98 (0.88 to 1.1)	1.23 (1.09 to 1.38)	0.95 (0.84 to 1.08)
1994	1.35 (1.17 to 1.55)	1.85 (1.61 to 2.13)	0.97 (0.83 to 1.13)	1.02 (0.91 to 1.15)	1.28 (1.13 to 1.43)	1.01 (0.89 to 1.14)
1995	1.5 (1.31 to 1.71)	2.11 (1.84 to 2.43)	1.1 (0.94 to 1.27)	1.03 (0.92 to 1.15)	1.34 (1.19 to 1.5)	1.02 (0.91 to 1.16)

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1996	1.11 (0.96 to 1.29)	1.53 (1.32 to 1.78)	0.71 (0.6 to 0.84)	1.03 (0.92 to 1.16)	1.31 (1.16 to 1.47)	0.94 (0.83 to 1.06)
1998	1.61 (1.4 to 1.85)	2.31 (2 to 2.66)	1.22 (1.05 to 1.43)	1.11 (0.99 to 1.25)	1.47 (1.3 to 1.65)	1.07 (0.94 to 1.21)
2000	1.43 (1.24 to 1.65)	2.06 (1.78 to 2.39)	1.04 (0.88 to 1.23)	1.1 (0.98 to 1.24)	1.47 (1.3 to 1.66)	1.1 (0.97 to 1.25)
2001	1.47 (1.27 to 1.69)	2.13 (1.85 to 2.46)	1.13 (0.97 to 1.32)	1.08 (0.96 to 1.21)	1.46 (1.3 to 1.64)	1.05 (0.93 to 1.2)
2002	1.53 (1.33 to 1.76)	2.25 (1.95 to 2.59)	1.3 (1.11 to 1.52)	1.07 (0.95 to 1.2)	1.45 (1.28 to 1.63)	1.09 (0.96 to 1.24)
2003	1.38 (1.2 to 1.58)	2.03 (1.76 to 2.34)	1.08 (0.93 to 1.27)	1.11 (0.99 to 1.24)	1.5 (1.34 to 1.69)	1.12 (0.99 to 1.27)
2004	1.44 (1.25 to 1.66)	2.09 (1.81 to 2.41)	1.11 (0.95 to 1.31)	1.14 (1.01 to 1.27)	1.56 (1.38 to 1.75)	1.18 (1.04 to 1.33)
No degree		1	1		1	1
Degree		0.49 (0.45 to 0.54)	0.59 (0.54 to 0.65)		0.56 (0.51 to 0.61)	0.66 (0.6 to 0.72)
Owned outright		1	1		1	1
Owned with mortgage		0.75 (0.7 to 0.8)	0.95 (0.89 to 1.02)		0.97 (0.92 to 1.03)	1.1 (1.03 to 1.16)
Private rent		1.15 (1.05 to 1.26)	1.2 (1.08 to 1.33)		1.31 (1.21 to 1.42)	1.31 (1.2 to 1.42)
Social rent		1.88 (1.76 to 2.01)	1.46 (1.35 to 1.58)		1.98 (1.87 to 2.1)	1.72 (1.62 to 1.83)
No car		1	1		1	1
Car		0.54 (0.51 to 0.57)	0.85 (0.8 to 0.91)		0.6 (0.58 to 0.63)	0.73 (0.69 to 0.76)
Employed			1			1
Unemployed			2.01 (1.86 to 2.18)			1.81 (1.65 to 1.98)
Keeping house			2.64 (2.16 to 3.23)			1.81 (1.74 to 1.89)
Sick or disabled			28.07 (26.11 to 30.19)			20.05 (18.68 to 21.52)
Education			1.85 (1.33 to 2.58)			1.26 (0.96 to 1.65)
Retired			2.59 (2.2 to 3.04)			2.12 (1.88 to 2.4)
Other inactive			6.28 (5.46 to 7.21)			4.04 (3.44 to 4.75)

All forms of non employment were associated with an elevated probability of poor health but those sick or disabled had a particularly strong association (Table 2 – Model C). Controlling for individual level employment status (model C in table 2) attenuated the odds ratios for poor health for the years subsequent to 1978 for men and women. Pseudo r2 statistics indicated that model fit improved from model A (age only- 0.04 & 0.02 form men and women respectively) to model B (plus socio-economic characteristics – 0.09 & 0.05) to model C (plus employment – 0.22 & 0.13) for men and women respectively. Absolute prevalence differences compared to 1978 from each model are illustrated for men and women in figures 3 and 4 respectively. These highlight the possible linear increase in poor health year–on-year after controlling for socio-economic characteristics (Model B) and the attenuating impact of controlling for employment status (Model C). For men controlling for employment status led to yearly differences from 1978 being lower than for the age only model whereas for women it led to differences being very similar to the age only model. In the supplement results from the multiple imputation are shown and are very similar to those in Figure 3 and Figure 4. Results (shown in the supplement) from the multilevel modelling where year was treated as a random intercept rather than a fixed covariate showed a very similar pattern in that a clearer year-on-year increase in poor health from 1978 is apparent in model B compared to model A and that adjustment for employment status (model C) attenuated these differences even when the effect of employment status was allowed to vary over the years (model D).

The results from the decomposition analysis comparing – using separate logistic regression for each year - the unadjusted observed prevalence difference between 2004 and 1978 are presented in Table 3. For men, prevalence was 3.3 percentage points higher in 2004 (as shown in Table 1). When adding age only to the model (Model A) most of the observed difference was not due ~~in~~to changes in the population characteristics (the population in 2004 was slightly older hence a small part (0.4 percentage points) of the increase was due to this). Socio-economic characteristics of the population had changed in 2004 (Figure 1) and, model B shows that health in 2004 could have been considerably better (-4.2 percentage points lower) given the socio-economic characteristics in 2004 compared to 1978. Instead it was the changes in the coefficients that were associated with the actual increase in poor health from 1978 to 2004. However, when employment status is added in model C most of the increase in poor health is now explained by the change in population characteristics from

1978 to 2004. For women, the pattern of results is similar to men for the smaller 1.5 percentage point increase in poor health in 2004 although in model C most of the change is due to changes in coefficients. These results reflect those of the main analysis where controlling for both our socio-economic and employment status variables suggested that for men the difference between 2004 and 1978 would have been slightly lower than the age adjusted difference and for women it would have been very similar.

Table 3 Results for the decomposition analysis for the prevalence difference in poor health in 2004 from 1978 for men and women – model A adjusts for age, model B additionally adjusts for housing tenure, car access and degree attainment, model C adjusts additionally for employment

	Model A – Prevalence difference and 95% CIs*)	Model B	Model C
Men			
Due to population change	0.4 (0.4 to 0.5)	-4.2 (-5 to -3.5)	2.4 (1.7 to 3.2)
Due to coefficient change	2.8 (1.7 to 4.0)	7.5 (6.0 to 9.0)	0.8 (-0.5 to 2.1)
Overall difference	3.3 (2.1 to 4.4)	3.3 (2.2 to 4.4)	3.3 (2.3 to 4.3)
Women			
Due to population change	0.2 (.2 to .3)	-4.4 (-5.2 to -3.7)	-0.1 (-0.9 to 0.8)
Due to coefficient change	1.3 (0.1 to 2.5)	5.9 (4.4 to 7.5)	1.6 (0.1 to 3.1)
Overall Difference	1.5 (0.3 to 2.7)	1.5 (0.3 to 2.7)	1.5 (0.4 to 2.6)

*Confidence intervals do not account for household clustering as this option is not presently available for mvdcmp

Discussion

The individual level analysis presented here shows that accounting for shifts in the proportion of the working age population in different employment statuses – most notably the rise of sickness or disability related economic inactivity – attenuated annual differences in the prevalence of poor self rated health in the UK population since the late 1970s. This complements previous individual level analysis into sickness or disability related economic inactivity which found that it was a possible major factor behind the social gradient in health [14] as well as a possible influential issue in regional differences in health [10]. The results suggest that a fuller understanding of why employment status is associated with self-rated health could be important for public health. The relationship between employment status and health is complicated. Systematic reviews have concluded that there is evidence that poor health can cause job loss and that job loss can cause poor health with the latter possibly being the stronger effect of the two [6, 7]. For self-rated general health, there is also evidence of health selection [20] but also causation [21]. So it is possible that rising rates of poor general health have increased economic inactivity. The debate over the relative influence of employment on health versus health on employment is limited though because it tends to emphasise notions of people being in a state of health that either allows them to work or not: a zero-sum approach. Yet, it should be remembered that ill health for the majority is not an impediment to labour market participation [22] but that those in ill-health - particularly in lower socio-economic positions - are most vulnerable to non-employment and were increasingly so in the period under study [22, 23]. So their job loss may not then be caused by their ill-health per se but by the prevailing labour market conditions and the policy response to these [24, 25].

Evidence suggests that the increases in the economically inactive population (particularly those claiming sickness related benefits) in the UK during this period were due to difficult labour market conditions (particularly in de-industrialised areas) [5] [26]. This resulted in those with health conditions (particularly if also from low socio-economic positions) finding themselves towards the back of the job queue and unlikely to find employment [5]. In this sense it is argued that many of those economically inactive because of sickness or disability are "hidden unemployed" as they may be employed given different labour market conditions. [5].

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Indeed, in better labour market conditions it is argued that there is "hidden sickness" amongst the active workforce [5]. This does not necessarily require any change in the individual level of ill-health in the population just change in the proportion of people who are employed. Recent theoretical work on how people self-rate their general health suggests a cognitive process where people take account of their individual health situation but do so in the wider context in which they live [27]. Hence the assessment of one's health while being economically inactive may differ compared to when one is in or seeking work. For example, there is longitudinal evidence that the reporting of longstanding illness may depend on labour market status with employment reducing the likelihood of reporting poor health [28]. Coupled to the health damaging psychological and material consequences of non-work [29] this may allow us to understand why economic inactivity may be associated with a higher risk of poor general health at the individual level.

Of course, confounding is a real possibility within this repeated cross-sectional study. For example, there could be other confounding or mediating trends that are associated with both general health and employment that could explain the impact of adjusting for changes in employment status. Examples include the apparent decline in job quality over time [30] and macro-economic changes such as the rise in the level of income inequality.

Economic inactivity is also a potentially important influence on population health, not just because of the composition of the inactive population itself, but also because it is generally a longer term state. For example, a recent cohort study of people out of work and in receipt of incapacity-related benefits in the UK found that the average length of economic inactivity amongst this group was nine years [31]. Thus the issues which are usually put forward to explain the association between unemployment and ill health – most notably poverty, social exclusion and low social status – are thus experienced for a much longer time period by those who are inactive than by those who are unemployed.

Whilst our results suggest that decreasing the numbers of economically inactive could have health benefits, this is by no means an easy task and not just because of the current economic climate. Research into welfare to work interventions for those with a disability or chronic illness has found that even in times of solid economic growth it is very difficult to increase the employment rate of this group. For example, in the UK since the 1990s there have been increasing efforts to enhance the labour market participation of this group using

various interventions including education, training and work placement schemes; vocational advice and support services; vocational rehabilitation; in-work benefits; financial incentives for employers; employment rights legislation and accessibility interventions[4]. However, the evidence of effectiveness in terms of actually increasing employment is very limited [4, 32-34]. This is partly attributed to the largely supply-side orientation of most of the interventions [4], the focus on employment rather than health improvement [31, 35] and the lack of demand from employers for workers with complicated and fluctuating health conditions [31].

In addition to being only cross-sectional, another limitation of using the General Household Survey is that response rate fell over time; weighting was introduced in 2000 and we have applied this in all analysis but the possibility remains that the survey became increasingly unrepresentative over time. It is impossible to assess the impact of this on our results as we do not have details of non responders. However, evidence comparing a national census to a national health survey suggested that low socio-economic groups and the out of work were less well represented in the survey leading to a more conservative estimate of the social gradient in health in the survey [36].

Conclusion

To summarise, this study shows that poor health may have worsened amongst both men and women from 1978 to 2004 when accounting for socio-economic changes. However, controlling for the employment status changes in the UK since 1978 attenuated the increase in poor general health. This research raises important public policy issues around the role of employment in overall public health which should be examined further.

Acknowledgements

General Household Survey Time Series Dataset 1972-2004 was created by the Office for National Statistics. The user guide for the time series dataset was created jointly by ONS and the Economic and Social Data Service (ESDS) Government and downloaded from the UK Data Archive. The data are Crown copyright. The authors alone are responsible for the analysis and interpretation.

Funding

No specific grant was associated with this was work. LG (5TK30) and FP (5TK10) are- funded by the MRC

Ethics approval

Not required for this secondary analysis of publically available and anonymised secondary data

Author contributions

FP had the original idea which was developed with CB. FP and LG conducted the analysis. FP drafted the manuscript with revisions from CB and LG.

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Figure 1 Prevalence of housing tenure types, car access and degree attainment 1978 to 2004 for men and women aged 25 to 59

Figure 2 Prevalence of the different types of employment status 1978 to 2004 from men and women aged 25 to 59

Figure 3 Prevalence difference in poor health from 1978 (reference) to 2004 for men from model A (age adjusted), model B (plus adjustment for socio-economic characteristics) and model C (plus adjustment for employment status).

Figure 4 Prevalence difference in poor health from 1978 (reference) to 2004 for women from model A (age adjusted), model B (plus adjustment for socio-economic characteristics) and model C (plus adjustment for employment status).

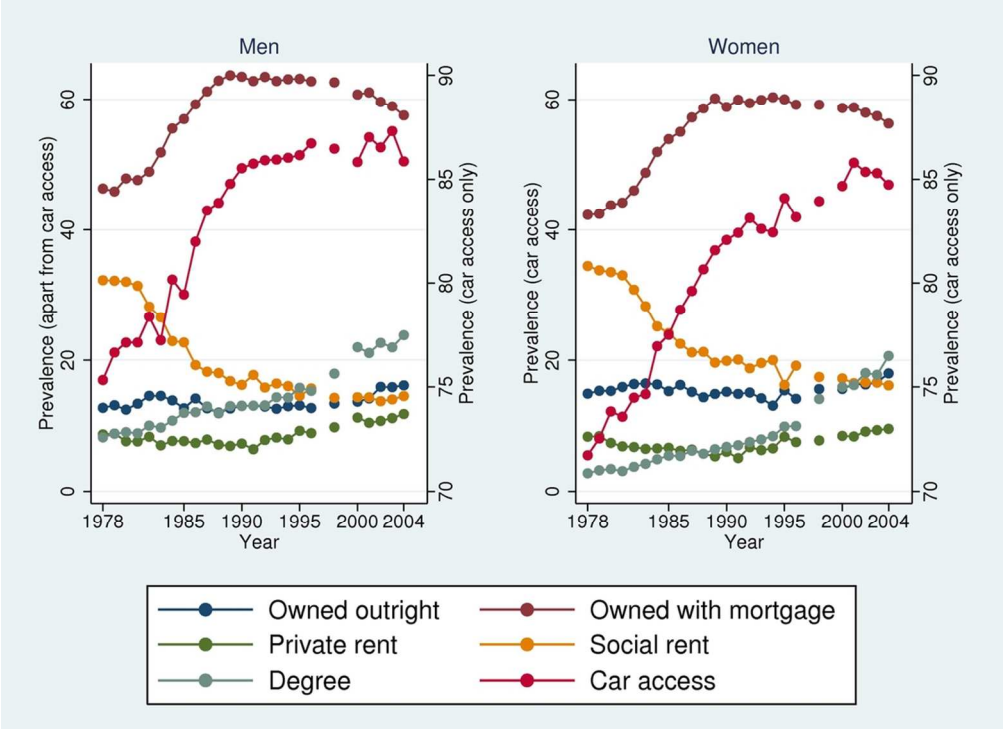


Figure 1 Prevalence of housing tenure types, car access and degree attainment 1978 to 2004 for men and women aged 25 to 59
101x73mm (300 x 300 DPI)

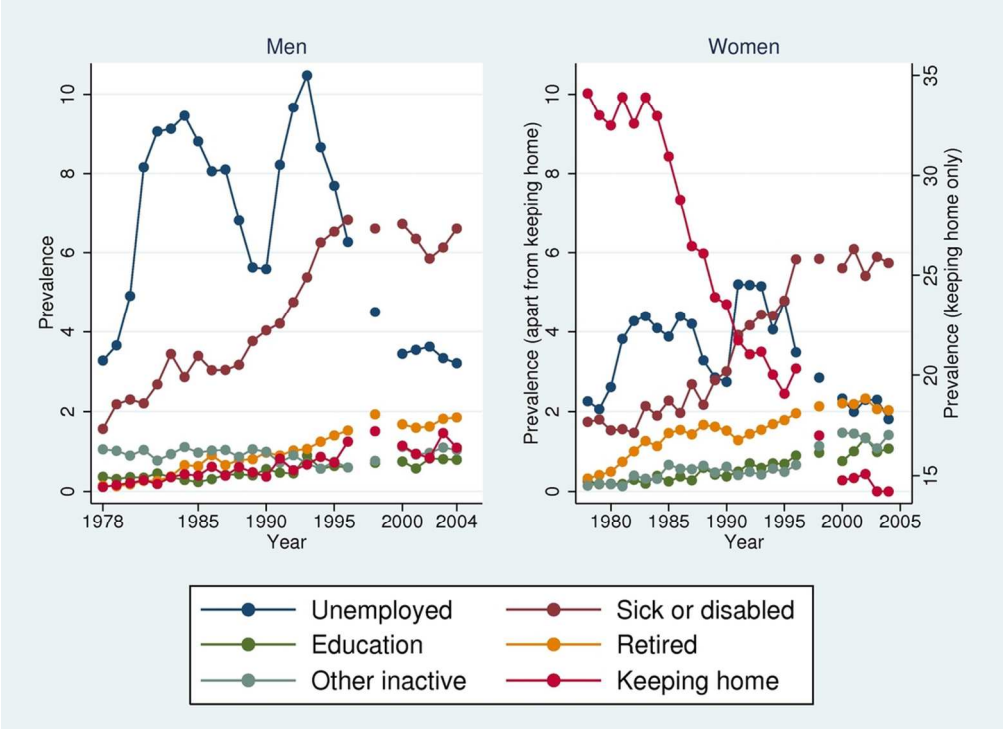


Figure 2 Prevalence of the different types of employment status 1978 to 2004 from men and women aged 25 to 59
101x73mm (300 x 300 DPI)

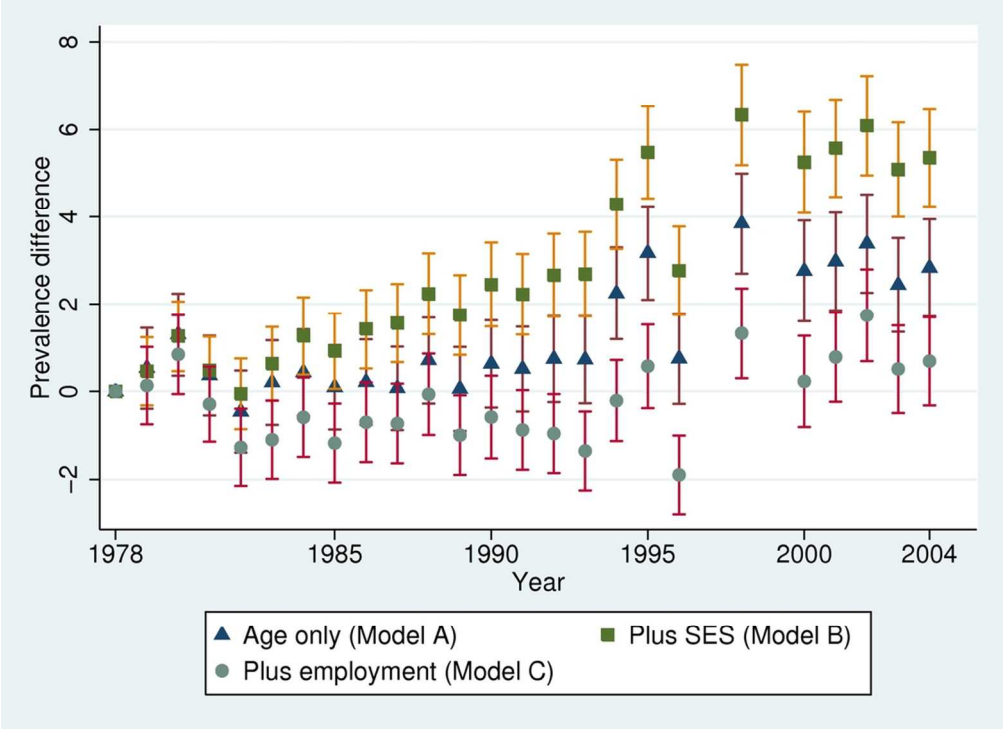


Figure 3 Prevalence difference in poor health from 1978 (reference) to 2004 for men from model A (age adjusted), model B (plus adjustment for socio-economic characteristics) and model C (plus adjustment for employment status).
101x73mm (300 x 300 DPI)

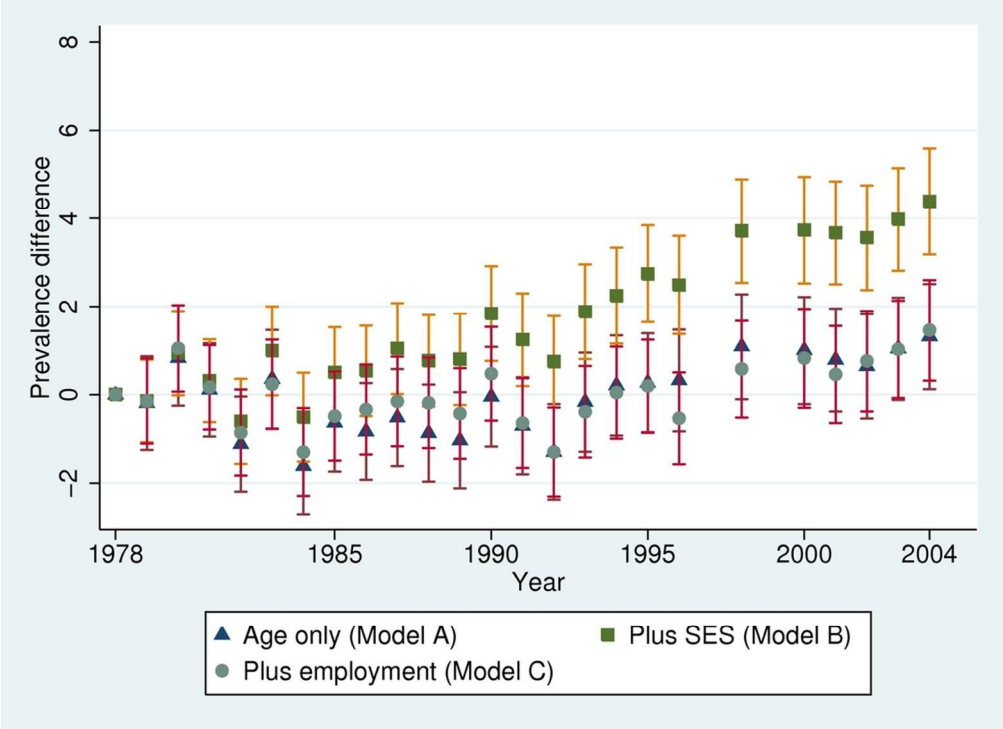
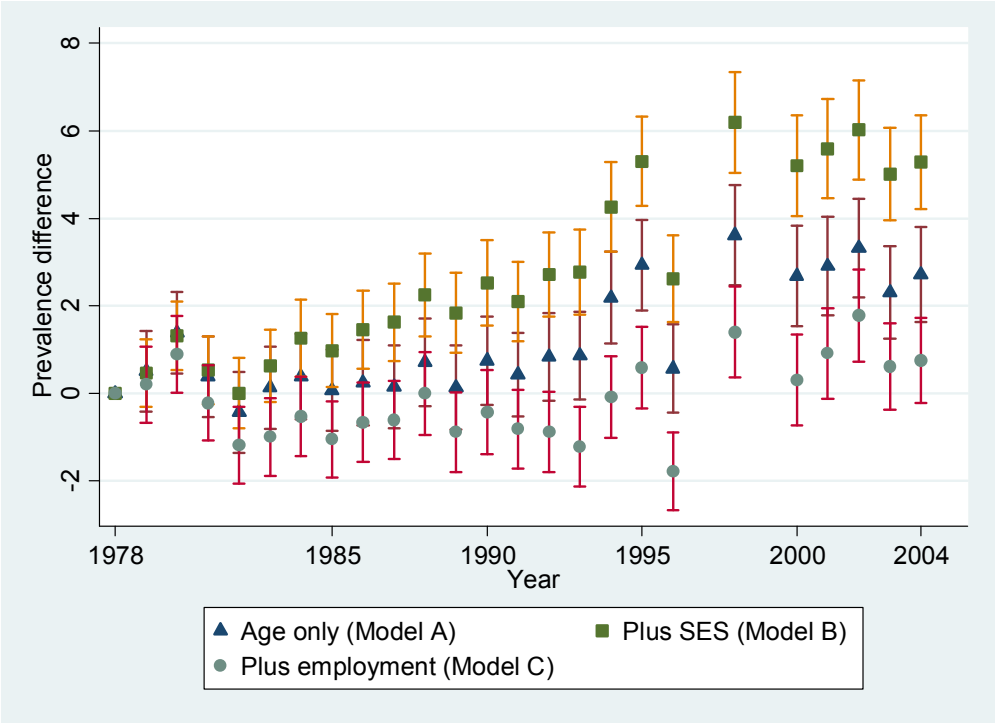
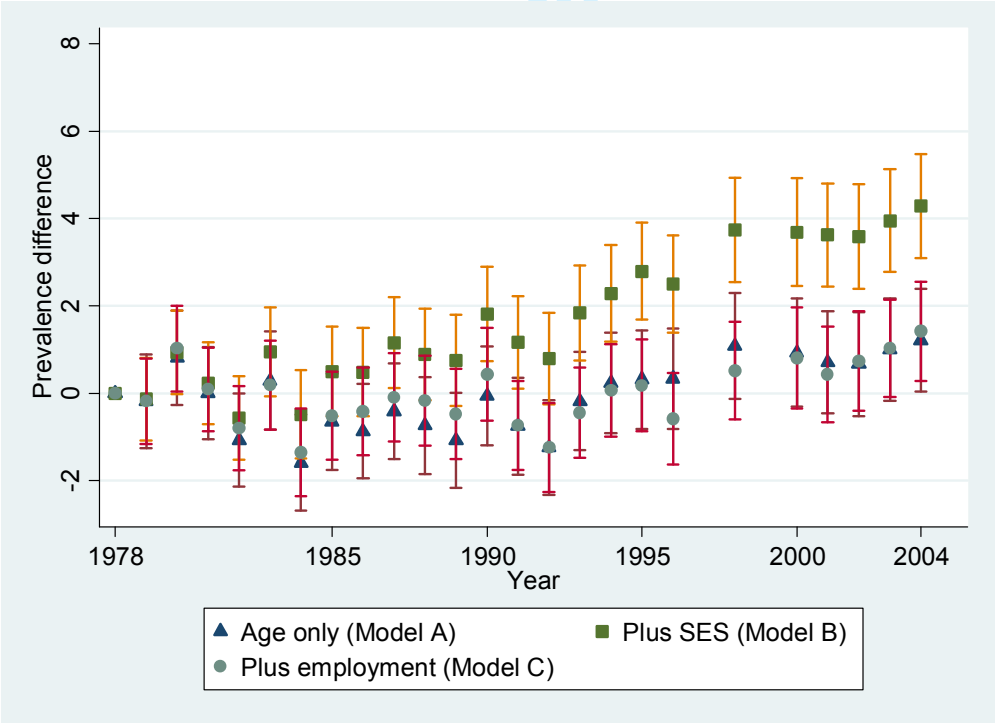


Figure 4 Prevalence difference in poor health from 1978 (reference) to 2004 for women from model A (age adjusted), model B (plus adjustment for socio-economic characteristics) and model C (plus adjustment for employment status).
101x73mm (300 x 300 DPI)

Multiple imputation results

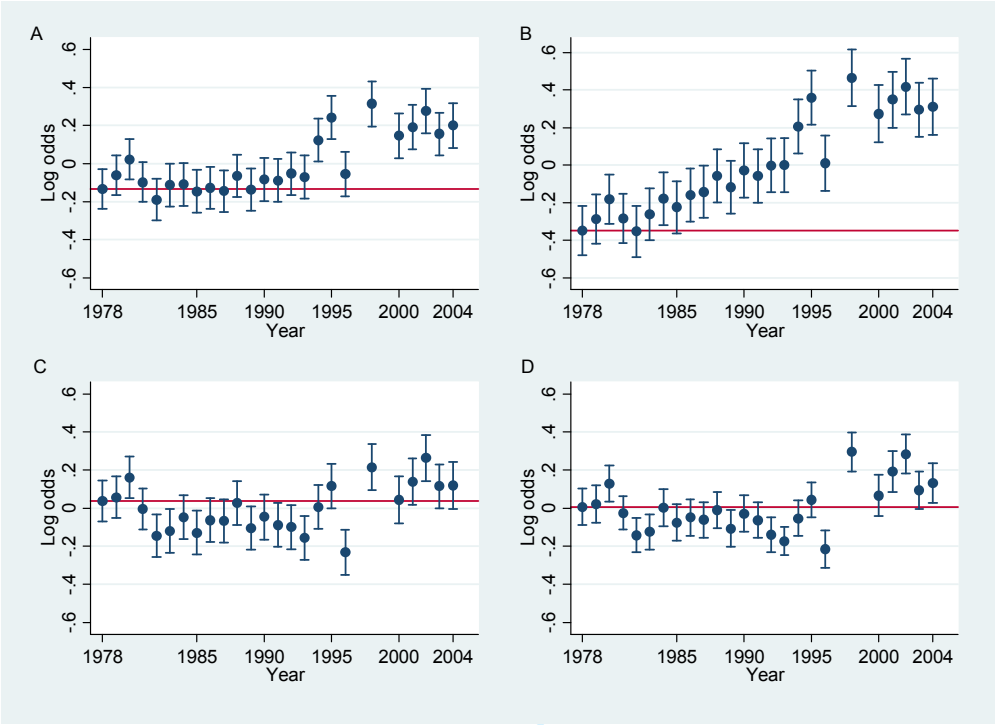


Supplemental figure 1 Prevalence difference in poor health from 1978 (reference) to 2004 for men from model A (age adjusted), model B (plus adjustment for socio-economic characteristics) and model C (plus adjustment for employment status).

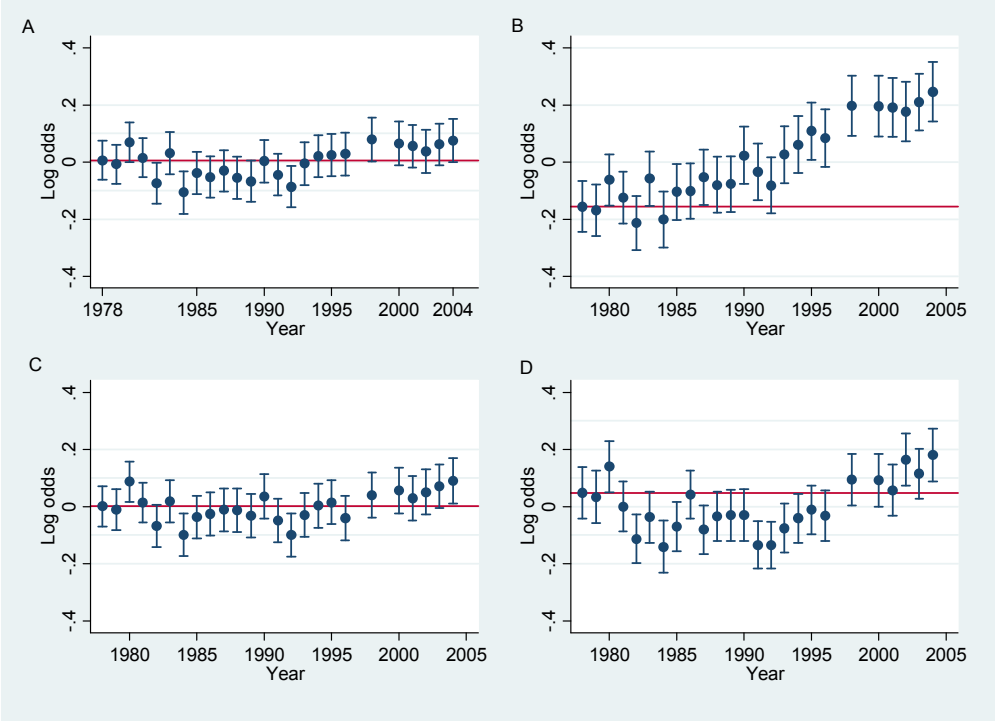


Supplemental figure 2 Prevalence difference in poor health from 1978 (reference) to 2004 for men from model A (age adjusted), model B (plus adjustment for socio-economic characteristics) and model C (plus adjustment for employment status).

Multilevel model results



Supplemental figure 3. Results (on logs odds scale) from multilevel model for men treating year as a random intercept. Estimated annual difference compared to average of all years (0) . For comparison to main results red line indicates 1978. Panel A is model A (adjusted for age only), panel B is model B (plus adjustment for socio-economic characteristics), panel C is model C (plus adjustment for employment status), panel D is model C plus allowing employment status to vary across years.



Supplemental figure 4. Results (on logs odds scale) from multilevel models for women treating year as a random intercept. Estimated annual difference compared to average of all years (0) . For comparison to main results red line indicates 1978. Panel A is model A (adjusted for age only), panel B is model B (plus adjustment for socio-economic characteristics) panel C is model C (plus adjustment for employment status), panel D is model C plus allowing employment status to vary across years.

Employment status and the prevalence of poor self rated health. Findings from UK individual level repeated cross-sectional data from 1978 to 2004

Journal:	*BMJ Open*
Manuscript ID:	bmjopen-2012-001342.R2
Article Type:	Research
Date Submitted by the Author:	24-Oct-2012
Complete List of Authors:	Popham, Frank Gray, Linsay Bambra, Clare
Primary Subject Heading:	Public health
Secondary Subject Heading:	Sociology
Keywords:	employment, unemployment, economic inactivity, self rated health, socio-economic

Employment status and the prevalence of poor self rated health. Findings from UK individual level repeated cross-sectional data from 1978 to 2004.

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Word count: 2903

Keywords: employment, unemployment, economic inactivity, self rated health, socio-economic

Abstract

Objectives : To assess using individual level data how the proportion of people in different employment statuses may have played a role in the prevalence of poor self rated health from 1978 to 2004 as there have been major changes in employment patterns in advanced market democracies and employment is an important correlate of health.

Design: Individual level analysis of repeated cross-sectional surveys

Setting: UK

Participants: 125,125 men and 139,535 women of working age (25 to 59)

Outcome measure: Self rated general health

Results: Compared to 1978 there was evidence of higher levels of poor health in the subsequent years. For example in 2004 the prevalence of poor health was 2.8 (95% CI 1.7 to 3.9) and 1.3 (0.1 to 2.5) percentage points higher than 1978 for men and women respectively after adjusting for age. After additional adjustment for socio-economic characteristics, annual differences compared to 1978 increased (5.4 (4.2 to 6.5) and 4.4 (3.2 to 5.6) for men and women in 2004). Further adjustment for employment status however attenuated the annual differences in poor health (0.7 (-0.3 to 1.7) for men and 1.5 (0.3 to 2.6) for women in 2004).**Conclusions:** These results suggest that the proportion of people in different employment statuses, particularly the proportion in sickness or disability related economic inactivity, could play an important role in the prevalence of poor self rated health in the UK. Whether decreasing economic inactivity would enhance population health is an open question that needs further investigation.

Trial registration: This observational study was not reregistered.

Article summary

Article focus

- There have been major changes in employment (particularly the growth of those out of work sick or disabled) since the 1970s in many OECD countries.
- Given that self rated health is associated strongly with employment status the changes in employment may potentially be important for the level of poor health in the population.

Key messages

- Accounting for population increases in socio-economic characteristics associated with good health suggests that self rated health may have worsened since 1978 for both working age men and women.
- Much of this deterioration disappeared when controlling for employment status.
- There seems to be an association between rising levels of detachment from the labour market for both men and women (even given the rise in women's employment) and the level of poor self rated health in the population.

Strengths and limitations

- The study uses consistent individual level data from a long term survey covering a period of socio-economic change.
- Further work is needed to understand whether decreasing economic inactivity would necessarily lead to improved population health.

Introduction

Since the late 1970s, there have been substantial social, political and economic changes in the UK and in other advanced market democracies. On the one hand, average levels of education and material wealth have increased in the UK since the 1970s [1] and there have been improvements to overall mortality levels and life expectancy. On the other hand, there have been increases in inequalities in wealth and health [1, 2]. Welfare provision has decreased [3] at the same time as there have been large reductions in male employment levels and a related rise in male and female (excluding keeping house) economic inactivity rates [4]. The rise of economic inactivity has been linked to the de-industrialisation experienced by the labour markets of advanced market democracies and the associated loss of full-time, permanent, well-paid and skilled industrial jobs [5].

Being out of work has consistently been associated with a heightened risk of mortality [6], mental ill-health and suicide [7, 8], unhappiness [9], poor general health [10] and limiting long term illness [11, 12]. This heightened risk of ill-health applies not just to those unemployed (out of work and actively seeking work) but also to those economically inactive (out of work and not actively seeking work) [9, 10, 13]. Indeed, previous work suggested that the distribution of economic inactivity was a potentially important factor behind the social gradient in health and in regional differences in health inequalities [10, 14].

Whilst there has been a wealth of research into the association between unemployment and adverse health, there has been much less which examines economic inactivity. Arguably, it is the latter which is of increasing importance in public health terms as whilst unemployment is generally cyclical – rising and falling in line with economic contraction and expansion – economic inactivity has increasingly become a structural labour market problem [4]. For example in the UK, according to the 1966 census 94.4% of non-student working age men were in employment and only 3% were economically inactive whilst in the 2001 census, the figures were 80.2% and 14.5% respectively [15]. This paper examines the potential impact of the changing pattern of employment status on the prevalence of poor self rated health from 1978 to 2004 using individual level data from a repeated cross-sectional survey.

Methods

The General Household Survey is a UK government repeated cross-sectional household survey that started in 1971 (with gaps in 1997 and 1999). It aimed to interview all adults in selected households. The exact sampling procedures to select households have changed over time but it has employed a stratified (by regional geography and area socio-economic characteristics) clustered sample method with the primary sample units being small (as a rough guide 5000 people) geographical areas (electoral wards until 1983 and postcode sectors thereafter). Households were then randomly selected from within these primary sampling units. It covers Britain rather than the whole of the UK (so excludes Northern Ireland). Its long running nature means that it is highly suitable for assessing change over time. The UK's Office for National Statistics (ONS) has produced a consistent (in terms of making variables as comparable as possible over time) time-series of the surveys 1972 to 2004 and it is this individual level dataset - available from the UK Data Archive - that was used in this analysis [16]. Analysis was limited to men and women aged 25 to 59. The lower age limit was chosen to limit the likelihood of people still being in higher education. Although state retirement age in the UK for the study period was 65 for men and 60 for women, it is common practice to restrict analysis to age 59 and below to limit the number of people who have taken voluntary early retirement straight from paid employment.

The health outcome was self rated general health, with respondents asked "Over the last 12 months, would you say your health has on the whole been: good; fairly good or not good?". For this analysis, it was recoded good and fairly good health (0) versus not good (1) and this latter category is referred to as poor health from now on. The question was first asked in 1977 but the introduction to the question was different in this year so 1978 is taken as the reference year. Individual level employment status was coded as employed, unemployed (out of work but actively seeking work), and the following categories of economic inactivity: retired, in education, keeping house full-time, sick or disabled and other economically inactive. As the employment status variables in the time series file had only three categories (employed, unemployed and economic inactive) we returned to the original annual survey files to compile the more nuanced categories of individual level economic inactivity. Given variations in question wording over time these more nuanced categories of employment status may be less consistent than the broader three category coding. As a check we reran our main analysis using the three broader categories (employed, unemployed and economic inactive) of employment status for men and for women four categories (splitting keeping house and all other forms of

economic inactivity as these showed opposing trends in prevalence). Using these broader categories we obtained very similar results. Single year of age was used in the analysis. Three measures of socio-economic position were used with categories made consistent as possible over time by the ONS, whether the person had a university level degree or not, whether they lived in owned outright housing, owned with mortgage housing, private rented housing or social (state or housing association) rented housing and finally, whether they lived in a household with car access. Across all years, a total of 10% of men and 4% of women in the sample had missing data for one or more of the variables. In sensitivity analysis we used multiple imputation (implemented using the ice command in Stata) to impute missing data. We did the imputation for men and women and for each year separately. Twenty imputed datasets were created for each year / gender combination. The imputed models were based on all variables already described plus country of residence (England, Wales, Scotland) and marital status. The main results using the imputed datasets are shown in the supplement.

For the main analysis we pooled data from all the survey years. The prevalence of poor health amongst individual respondents in all other years (1979-2004) was compared to 1978 using a logistic regression model containing year dummy variables with standard errors accounting for the household clustering in the survey (although this was minimal as men and women in the same household were analysed separately). The initial model (model A) controlled for age only. Model B additionally adjusted for the socio-economic variables as these are variables associated with self rated health [17]. Model C then controlled additionally for employment status to assess its impact on the annual differences. In sensitivity analysis we checked the pattern of results using multilevel models where we treated year as a random intercept (individuals nested in years) and these results are shown in the supplement. Non-response weights are included in the time series General Household Survey file from 2000 onwards (when weights were introduced) and these have been applied in the main analysis (weights are scaled to have a mean of 1 in each year) with each individual in the years prior to 2000 being weighted equally (at 1). As odds ratios across different logistic models are not directly comparable [18] we also present the main results as adjusted prevalence differences (that are comparable across models [18]) by using the post estimation "margins" command in Stata. This shows yearly differences on an absolute scale.

Even though each annual GHS sample is relatively large, pooling the data had the advantage of increasing the sample for certain categories of the variables (economic inactivity for example) that in each year were relatively small. Pooling also provided a direct test of year-on-year differences. One disadvantage is that the coefficient for the variables is assumed to be the same over the years. We tested the possible impact of allowing coefficients to vary over the years in two ways. Firstly in our multilevel modelling we fitted a random coefficient model where we allowed the coefficients for employment status to vary over the years (models allowing all variables (age, socio-economic characteristics and employment status) to vary in the multilevel model unfortunately did not converge).

Second we used decomposition analysis to compare the observed difference in prevalence of poor health between the initial year (1978) and the final year (2004) using separate logistic regression models for each of these years. This means that the coefficients are allowed to be different between the years. This method allows the difference in prevalence of poor health to be separated into the part associated with changes in the characteristics of the population between 2004 and 1978 and that associated with changes in size of coefficients (including the intercept) between 2004 and 1978. For example, comparing an age adjusted model would mean that the prevalence difference between the two years could be assigned to changes in the effect size of the coefficients (in this case the age coefficient and the constant) and that due to changes in the age composition of the population (for example if the population had a higher average age in 2004 compared to 1978). We apply the same models (A, B and C) from the main analysis. We use the mvdcmp command in Stata to conduct the decomposition [19]. Stata 11.2 was used for the analysis apart from the multilevel modelling that was conducted in MLwiN.

Results

The total sample sizes across all years were 138,932 men and 145,300 women and these were reduced to 125,125 and 139,535 respectively in the complete case analysis when cases with missing data were excluded. Table 1 includes the response rates and individual year sample sizes for the complete cases.

Table 1 shows that for men the prevalence of poor health was low in 1978 (it was lowest in 1982) and then increased to 10.7% in 2004 a rise of 3.3 percentage points over the period. The rate of poor health was lowest for women in 1984 having declined slightly from 1978, although in the 1990s the rate rose and was just over 1

percentage point higher at the end of period compared to the start. The rate of poor health was always higher for women than men over the period.

There was clear change in the socio-economic characteristics of the population over the period with declines in the proportion living in social rented housing and increases in the proportion living in owner occupied housing, living in households with car access and the proportion with degrees (Figure 1).

Table 1 Response rates, sample sizes** and prevalence** of poor health for men and women by year.

Year	Response rate* (%)	Number of men	% of men in poor health	Number of women	% of women in poor health
1978	82	6258	7.4	6777	11.3
1979	83	6097	8.0	6557	11.1
1980	82	6129	8.7	6659	12.2
1981	84	6348	7.7	6860	11.4
1982	84	5299	6.9	5784	10.1
1983	82	5030	7.6	5618	11.6
1984	81	4855	7.6	5375	9.5
1985	82	5041	7.3	5542	10.4
1986	84	5175	7.4	5645	10.2
1987	85	5295	7.3	5739	10.5
1988	85	5082	8.0	5578	10.2
1989	84	5205	7.4	5677	10.0
1990	81	4833	7.8	5322	11.0
1991	84	5110	7.8	5614	10.3
1992	83	5070	8.1	5690	9.8
1993	82	4890	7.9	5434	10.8
1994	80	4734	9.6	5398	11.2
1995	80	4705	10.6	5488	11.4
1996	76	4326	8.0	5111	11.4
1998	72	4044	11.3	4740	12.3
2000	67	4008	10.1	4548	12.2
2001	72	4358	10.3	5058	12.1
2002	69	4183	11.1	4818	12.0
2003	70	4885	10.1	5651	12.5
2004	69	4165	10.7	4852	12.8

*Response rates are from http://www.esds.ac.uk/doc/5640/mrdoc/pdf/5640ghs05appendixb.pdf (page 10)** Sample size and prevalence of poor health for the complete case sample.

Taking these developments in the socio-economic characteristics of the population into account by controlling for the socio-economic variables in model B (table 2) generally increased annual differences compared to 1978 when model B is compared to model A which controlled only for age differences.

Overall male employment had fallen from 93% to 85% at the end of the period. Figure 2 illustrates the changes in the proportion of people in the various non-employment statuses over time with male unemployment (left panel) being cyclical, peaking in the mid 1980s and the early 1990s recession then falling away and being over taken by those sick or disabled in the late 1990s with this group now being the largest. Other forms of economic inactivity for males showed some increases but remained relatively small. For women, figure 2 (right panel) shows (reading the right hand axis) that there had been a 20 percentage point decline in those keeping home but, as for men, cyclical unemployment, a rise in those sick or disabled

overtaking those unemployed and a rise in those retired or in education. However unlike for men, female employment rose by 13 percentage points over the period from 61% to 74%

Table 2 Logistic regression results for rate of poor health for men and women controlling for age (Model A), additionally the listed socio-economic characteristics (model B) and additionally employment status (Model C)

	Men (Model A) ORs (95% CIs)	Men (Model B) ORs (95% CIs)	Men (Model C) ORs (95% CIs)	Women (Model A) ORs (95% CIs)	Women (Model B) ORs (95% CIs)	Women (Model C) ORs (95% CIs)
Age	1.06 (1.05 to 1.06)	1.05 (1.05 to 1.06)	1.04 (1.04 to 1.04)	1.04 (1.03 to 1.04)	1.03 (1.03 to 1.04)	1.03 (1.02 to 1.03)
Year						
1978	1	1	1	1	1	1
1979	1.08 (0.94 to 1.24)	1.09 (0.95 to 1.25)	1.02 (0.89 to 1.18)	0.98 (0.88 to 1.09)	0.98 (0.88 to 1.1)	0.98 (0.88 to 1.1)
1980	1.2 (1.05 to 1.37)	1.24 (1.08 to 1.42)	1.14 (0.99 to 1.31)	1.09 (0.98 to 1.21)	1.11 (1 to 1.24)	1.13 (1.01 to 1.26)
1981	1.05 (0.92 to 1.21)	1.09 (0.95 to 1.25)	0.95 (0.83 to 1.1)	1.01 (0.91 to 1.13)	1.04 (0.93 to 1.16)	1.02 (0.91 to 1.14)
1982	0.93 (0.81 to 1.08)	0.99 (0.85 to 1.15)	0.8 (0.68 to 0.93)	0.89 (0.79 to 1)	0.93 (0.83 to 1.04)	0.9 (0.8 to 1.01)
1983	1.03 (0.89 to 1.19)	1.12 (0.96 to 1.29)	0.83 (0.71 to 0.97)	1.04 (0.93 to 1.16)	1.12 (1 to 1.26)	1.03 (0.91 to 1.16)
1984	1.07 (0.92 to 1.23)	1.24 (1.07 to 1.44)	0.91 (0.78 to 1.06)	0.84 (0.74 to 0.95)	0.94 (0.83 to 1.06)	0.85 (0.75 to 0.96)
1985	1.01 (0.88 to 1.17)	1.17 (1.01 to 1.36)	0.81 (0.69 to 0.95)	0.94 (0.83 to 1.05)	1.06 (0.94 to 1.19)	0.94 (0.84 to 1.06)
1986	1.03 (0.89 to 1.19)	1.27 (1.09 to 1.47)	0.89 (0.76 to 1.04)	0.92 (0.82 to 1.03)	1.06 (0.95 to 1.2)	0.96 (0.85 to 1.08)
1987	1.01 (0.88 to 1.17)	1.3 (1.12 to 1.5)	0.88 (0.76 to 1.03)	0.95 (0.85 to 1.06)	1.13 (1 to 1.27)	0.98 (0.87 to 1.11)
1988	1.11 (0.96 to 1.27)	1.43 (1.24 to 1.65)	0.99 (0.85 to 1.15)	0.91 (0.81 to 1.02)	1.09 (0.97 to 1.23)	0.98 (0.87 to 1.1)
1989	1.01 (0.87 to 1.16)	1.33 (1.15 to 1.54)	0.84 (0.72 to 0.99)	0.9 (0.8 to 1.01)	1.1 (0.97 to 1.23)	0.95 (0.84 to 1.07)
1990	1.1 (0.95 to 1.26)	1.47 (1.27 to 1.7)	0.91 (0.77 to 1.06)	1 (0.89 to 1.12)	1.22 (1.09 to 1.38)	1.06 (0.93 to 1.19)
1991	1.08 (0.94 to 1.24)	1.43 (1.23 to 1.65)	0.86 (0.74 to 1.01)	0.93 (0.83 to 1.04)	1.15 (1.02 to 1.29)	0.93 (0.82 to 1.05)
1992	1.11 (0.97 to 1.28)	1.51 (1.31 to 1.75)	0.85 (0.73 to 0.99)	0.87 (0.77 to 0.98)	1.09 (0.97 to 1.23)	0.85 (0.75 to 0.97)
1993	1.11 (0.96 to 1.28)	1.52 (1.31 to 1.76)	0.79 (0.67 to 0.92)	0.98 (0.88 to 1.1)	1.23 (1.09 to 1.38)	0.95 (0.84 to 1.08)
1994	1.35 (1.17 to 1.55)	1.85 (1.61 to 2.13)	0.97 (0.83 to 1.13)	1.02 (0.91 to 1.15)	1.28 (1.13 to 1.43)	1.01 (0.89 to 1.14)
1995	1.5 (1.31 to 1.71)	2.11 (1.84 to 2.43)	1.1 (0.94 to 1.27)	1.03 (0.92 to 1.15)	1.34 (1.19 to 1.5)	1.02 (0.91 to 1.16)

1996	1.11 (0.96 to 1.29)	1.53 (1.32 to 1.78)	0.71 (0.6 to 0.84)	1.03 (0.92 to 1.16)	1.31 (1.16 to 1.47)	0.94 (0.83 to 1.06)
1998	1.61 (1.4 to 1.85)	2.31 (2 to 2.66)	1.22 (1.05 to 1.43)	1.11 (0.99 to 1.25)	1.47 (1.3 to 1.65)	1.07 (0.94 to 1.21)
2000	1.43 (1.24 to 1.65)	2.06 (1.78 to 2.39)	1.04 (0.88 to 1.23)	1.1 (0.98 to 1.24)	1.47 (1.3 to 1.66)	1.1 (0.97 to 1.25)
2001	1.47 (1.27 to 1.69)	2.13 (1.85 to 2.46)	1.13 (0.97 to 1.32)	1.08 (0.96 to 1.21)	1.46 (1.3 to 1.64)	1.05 (0.93 to 1.2)
2002	1.53 (1.33 to 1.76)	2.25 (1.95 to 2.59)	1.3 (1.11 to 1.52)	1.07 (0.95 to 1.2)	1.45 (1.28 to 1.63)	1.09 (0.96 to 1.24)
2003	1.38 (1.2 to 1.58)	2.03 (1.76 to 2.34)	1.08 (0.93 to 1.27)	1.11 (0.99 to 1.24)	1.5 (1.34 to 1.69)	1.12 (0.99 to 1.27)
2004	1.44 (1.25 to 1.66)	2.09 (1.81 to 2.41)	1.11 (0.95 to 1.31)	1.14 (1.01 to 1.27)	1.56 (1.38 to 1.75)	1.18 (1.04 to 1.33)
No degree		1	1		1	1
Degree		0.49 (0.45 to 0.54)	0.59 (0.54 to 0.65)		0.56 (0.51 to 0.61)	0.66 (0.6 to 0.72)
Owned outright		1	1		1	1
Owned with mortgage		0.75 (0.7 to 0.8)	0.95 (0.89 to 1.02)		0.97 (0.92 to 1.03)	1.1 (1.03 to 1.16)
Private rent		1.15 (1.05 to 1.26)	1.2 (1.08 to 1.33)		1.31 (1.21 to 1.42)	1.31 (1.2 to 1.42)
Social rent		1.88 (1.76 to 2.01)	1.46 (1.35 to 1.58)		1.98 (1.87 to 2.1)	1.72 (1.62 to 1.83)
No car		1	1		1	1
Car		0.54 (0.51 to 0.57)	0.85 (0.8 to 0.91)		0.6 (0.58 to 0.63)	0.73 (0.69 to 0.76)
Employed			1			1
Unemployed			2.01 (1.86 to 2.18)			1.81 (1.65 to 1.98)
Keeping house			2.64 (2.16 to 3.23)			1.81 (1.74 to 1.89)
Sick or disabled			28.07 (26.11 to 30.19)			20.05 (18.68 to 21.52)
In education			1.85 (1.33 to 2.58)			1.26 (0.96 to 1.65)
Retired			2.59 (2.2 to 3.04)			2.12 (1.88 to 2.4)
Other inactive			6.28 (5.46 to 7.21)			4.04 (3.44 to 4.75)

All forms of non employment were associated with an elevated probability of poor health but those sick or disabled had a particularly strong association (Table 2 – Model C). Controlling for individual level employment status (model C in table 2) attenuated the odds ratios for poor health for the years subsequent to 1978 for men and women. Pseudo r2 statistics indicated that model fit improved from model A (age only- 0.04 & 0.02 form men and women respectively) to model B (plus socio-economic characteristics – 0.09 & 0.05) to model C (plus employment – 0.22 & 0.13) for men and women respectively. Absolute prevalence differences compared to 1978 from each model are illustrated for men and women in figures 3 and 4 respectively. These highlight the possible linear increase in poor health year-on-year after controlling for socio-economic characteristics (Model B) and the attenuating impact of controlling for employment status (Model C). For men controlling for employment status led to yearly differences from 1978 being lower than for the age only model whereas for women it led to differences being very similar to the age only model. In the supplement results from the multiple imputation are shown and are very similar to those in Figure 3 and Figure 4. Results (shown in the supplement) from the multilevel modelling where year was treated as a random intercept rather than a fixed covariate showed a very similar pattern in that a clearer year-on-year increase in poor health from 1978 is apparent in model B compared to model A and that adjustment for employment status (model C) attenuated these differences even when the effect of employment status was allowed to vary over the years (model D).

The results from the decomposition analysis comparing – using separate logistic regression for each year - the unadjusted observed prevalence difference between 2004 and 1978 are presented in Table 3. For men, prevalence was 3.3 percentage points higher in 2004 (as shown in Table 1). When adding age only to the model (Model A) most of the observed difference was not due to changes in the population characteristics (the population in 2004 was slightly older hence a small part (0.4 percentage points) of the increase was due to this). Socio-economic characteristics of the population had changed in 2004 (Figure 1) and, model B shows that health in 2004 could have been considerably better (-4.2 percentage points lower) given the socio-economic characteristics in 2004 compared to 1978. Instead it was the changes in the coefficients that were associated with the actual increase in poor health from 1978 to 2004. However, when employment status is added in model C most of the increase in poor health is now explained by the change in population characteristics from

1978 to 2004. For women, the pattern of results is similar to men for the smaller 1.5 percentage point increase in poor health in 2004 although in model C most of the change is due to changes in coefficients. These results reflect those of the main analysis where controlling for both our socio-economic and employment status variables suggested that for men the difference between 2004 and 1978 would have been slightly lower than the age adjusted difference and for women it would have been very similar.

Table 3 Results for the decomposition analysis for the prevalence difference in poor health in 2004 from 1978 for men and women – model A adjusts for age, model B additionally adjusts for housing tenure, car access and degree attainment, model C adjusts additionally for employment

	Model A – Prevalence difference and 95% CIs*)	Model B	Model C
Men			
Due to population change	0.4 (0.4 to 0.5)	-4.2 (-5 to -3.5)	2.4 (1.7 to 3.2)
Due to coefficient change	2.8 (1.7 to 4.0)	7.5 (6.0 to 9.0)	0.8 (-0.5 to 2.1)
Overall difference	3.3 (2.1 to 4.4)	3.3 (2.2 to 4.4)	3.3 (2.3 to 4.3)
Women			
Due to population change	0.2 (.2 to .3)	-4.4 (-5.2 to -3.7)	-0.1 (-0.9 to 0.8)
Due to coefficient change	1.3 (0.1 to 2.5)	5.9 (4.4 to 7.5)	1.6 (0.1 to 3.1)
Overall Difference	1.5 (0.3 to 2.7)	1.5 (0.3 to 2.7)	1.5 (0.4 to 2.6)

*Confidence intervals do not account for household clustering as this option is not presently available for mvdcmp

Discussion

The individual level analysis presented here shows that accounting for shifts in the proportion of the working age population in different employment statuses – most notably the rise of sickness or disability related economic inactivity – attenuated annual differences in the prevalence of poor self rated health in the UK population since the late 1970s. This complements previous individual level analysis into sickness or disability related economic inactivity which found that it was a possible major factor behind the social gradient in health [14] as well as a possible influential issue in regional differences in health [10]. The results suggest that a fuller understanding of why employment status is associated with self-rated health could be important for public health. The relationship between employment status and health is complicated. Systematic reviews have concluded that there is evidence that poor health can cause job loss and that job loss can cause poor health with the latter possibly being the stronger effect of the two [6, 7]. For self-rated general health, there is also evidence of health selection [20] but also causation [21]. So it is possible that rising rates of poor general health have increased economic inactivity. The debate over the relative influence of employment on health versus health on employment is limited though because it tends to emphasise notions of people being in a state of health that either allows them to work or not: a zero-sum approach. Yet, it should be remembered that ill health for the majority is not an impediment to labour market participation [22] but that those in ill-health - particularly in lower socio-economic positions - are most vulnerable to non-employment and were increasingly so in the period under study [22, 23]. So their job loss may not then be caused by their ill-health per se but by the prevailing labour market conditions and the policy response to these [24, 25].

Evidence suggests that the increases in the economically inactive population (particularly those claiming sickness related benefits) in the UK during this period were due to difficult labour market conditions (particularly in de-industrialised areas) [5] [26]. This resulted in those with health conditions (particularly if also from low socio-economic positions) finding themselves towards the back of the job queue and unlikely to find employment [5]. In this sense it is argued that many of those economically inactive because of sickness or disability are “hidden unemployed” as they may be employed given different labour market conditions. [5]. Indeed, in better labour market conditions it is argued that there is “hidden sickness” amongst the active

workforce [5]. This does not necessarily require any change in the individual level of ill-health in the population just change in the proportion of people who are employed. Recent theoretical work on how people self-rate their general health suggests a cognitive process where people take account of their individual health situation but do so in the wider context in which they live [27]. Hence the assessment of one's health while being economically inactive may differ compared to when one is in or seeking work. For example, there is longitudinal evidence that the reporting of longstanding illness may depend on labour market status with employment reducing the likelihood of reporting poor health [28]. Coupled to the health damaging psychological and material consequences of non-work [29] this may allow us to understand why economic inactivity may be associated with a higher risk of poor general health at the individual level.

Of course, confounding is a real possibility within this repeated cross-sectional study. For example, there could be other confounding or mediating trends that are associated with both general health and employment that could explain the impact of adjusting for changes in employment status. Examples include the apparent decline in job quality over time [30] and macro-economic changes such as the rise in the level of income inequality.

Economic inactivity is also a potentially important influence on population health, not just because of the composition of the inactive population itself, but also because it is generally a longer term state. For example, a recent cohort study of people out of work and in receipt of incapacity-related benefits in the UK found that the average length of economic inactivity amongst this group was nine years [31]. Thus the issues which are usually put forward to explain the association between unemployment and ill health – most notably poverty, social exclusion and low social status – are thus experienced for a much longer time period by those who are inactive than by those who are unemployed.

Whilst our results suggest that decreasing the numbers of economically inactive could have health benefits, this is by no means an easy task and not just because of the current economic climate. Research into welfare to work interventions for those with a disability or chronic illness has found that even in times of solid economic growth it is very difficult to increase the employment rate of this group. For example, in the UK since the 1990s there have been increasing efforts to enhance the labour market participation of this group using various interventions including education, training and work placement schemes; vocational advice and

support services; vocational rehabilitation; in-work benefits; financial incentives for employers; employment rights legislation and accessibility interventions[4]. However, the evidence of effectiveness in terms of actually increasing employment is very limited [4, 32-34]. This is partly attributed to the largely supply-side orientation of most of the interventions [4], the focus on employment rather than health improvement [31, 35] and the lack of demand from employers for workers with complicated and fluctuating health conditions [31].

In addition to being only cross-sectional, another limitation of using the General Household Survey is that response rate fell over time; weighting was introduced in 2000 and we have applied this in all analysis but the possibility remains that the survey became increasingly unrepresentative over time. It is impossible to assess the impact of this on our results as we do not have details of non responders. However, evidence comparing a national census to a national health survey suggested that low socio-economic groups and the out of work were less well represented in the survey leading to a more conservative estimate of the social gradient in health in the survey [36].

Conclusion

To summarise, this study shows that poor health may have worsened amongst both men and women from 1978 to 2004 when accounting for socio-economic changes. However, controlling for the employment status changes in the UK since 1978 attenuated the increase in poor general health. This research raises important public policy issues around the role of employment in overall public health which should be examined further.

Acknowledgements

General Household Survey Time Series Dataset 1972-2004 was created by the Office for National Statistics. The user guide for the time series dataset was created jointly by ONS and the Economic and Social Data Service (ESDS) Government and downloaded from the UK Data Archive. The data are Crown copyright. The authors alone are responsible for the analysis and interpretation.

Funding

No specific grant was associated with this was work. LG (5TK30) and FP (5TK10) are funded by the MRC

Ethics approval

Not required for this secondary analysis of publically available and anonymised secondary data

Author contributions

FP had the original idea which was developed with CB. FP and LG conducted the analysis. FP drafted the manuscript with revisions from CB and LG.

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Figure 1 Prevalence of housing tenure types, car access and degree attainment 1978 to 2004 for men and women aged 25 to 59

Figure 2 Prevalence of the different types of employment status 1978 to 2004 from men and women aged 25 to 59

Figure 3 Prevalence difference in poor health from 1978 (reference) to 2004 for men from model A (age adjusted), model B (plus adjustment for socio-economic characteristics) and model C (plus adjustment for employment status).

Figure 4 Prevalence difference in poor health from 1978 (reference) to 2004 for women from model A (age adjusted), model B (plus adjustment for socio-economic characteristics) and model C (plus adjustment for employment status).

~~The potential impact of employment status changes on~~ Employment status and the prevalence of poor self rated health. Findings from UK individual level repeated cross-sectional data from 1978 to 2004.

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Word count: 2903

Keywords: employment, unemployment, economic inactivity, self rated health, socio-economic

Abstract

Objectives : To assess using individual level data how the proportion of people in different employment statuses may have played a role in the prevalence of poor self rated health from 1978 to 2004 as there have been major changes in employment patterns in advanced market democracies and employment is an important correlate of health.

Design: Individual level analysis of repeated cross-sectional surveys

Setting: UK

Participants: 125,125 men and 139,535 women of working age (25 to 59)

Outcome measure: Self rated general health

Results: Compared to 1978 there was evidence of higher levels of poor health in the subsequent years. For example in 2004 the prevalence of poor health was 2.8 (95% CI 1.7 to 3.9) and 1.3 (0.1 to 2.5) percentage points higher than 1978 for men and women respectively after adjusting for age. After additional adjustment for socio-economic characteristics, annual differences compared to 1978 increased (5.4 (4.2 to 6.5) and 4.4 (3.2 to 5.6) for men and women in 2004). Further adjustment for employment status however attenuated the annual differences in poor health (0.7 (-0.3 to 1.7) for men and 1.5 (0.3 to 2.6) for women in 2004).**Conclusions:** These results suggest that the proportion of people in different employment statuses, particularly the proportion in sickness or disability related economic inactivity, could play an important role in the prevalence of poor self rated health in the UK. Whether decreasing economic inactivity would enhance population health is an open question that needs further investigation.

Trial registration: This observational study was not reregistered.

Article summary

Article focus

- There have been major changes in employment (particularly the growth of those out of work sick or disabled) since the 1970s in many OECD countries.
- Given that self rated health is associated strongly with employment status the changes in employment may potentially be important for the level of poor health in the population.

Key messages

- Accounting for population increases in socio-economic characteristics associated with good health suggests that self rated health may have worsened since 1978 for both working age men and women.
- Much of this deterioration disappeared when controlling for employment status.
- There seems to be an association between rising levels of detachment from the labour market for both men and women (even given the rise in women's employment) and the level of poor self rated health in the population.

Strengths and limitations

- The study uses consistent individual level data from a long term survey covering a period of socio-economic change.
- Further work is needed to understand whether decreasing economic inactivity would necessarily lead to improved population health.

Introduction

Since the late 1970s, there have been substantial social, political and economic changes in the UK and in other advanced market democracies. On the one hand, average levels of education and material wealth have increased in the UK since the 1970s [1] and there have been improvements to overall mortality levels and life expectancy. On the other hand, there have been increases in inequalities in wealth and health [1, 2]. Welfare provision has decreased [3] at the same time as there have been large reductions in male employment levels and a related rise in male and female (excluding keeping house) economic inactivity rates [4]. The rise of economic inactivity has been linked to the de-industrialisation experienced by the labour markets of advanced market democracies and the associated loss of full-time, permanent, well-paid and skilled industrial jobs [5].

Being out of work has consistently been associated with a heightened risk of mortality [6], mental ill-health and suicide [7, 8], unhappiness [9], poor general health [10] and limiting long term illness [11, 12]. This heightened risk of ill-health applies not just to those unemployed (out of work and actively seeking work) but also to those economically inactive (out of work and not actively seeking work) [9, 10, 13]. Indeed, previous work suggested that the distribution of economic inactivity was a potentially important factor behind the social gradient in health and in regional differences in health inequalities [10, 14].

Whilst there has been a wealth of research into the association between unemployment and adverse health, there has been much less which examines economic inactivity. Arguably, it is the latter which is of increasing importance in public health terms as whilst unemployment is generally cyclical – rising and falling in line with economic contraction and expansion – economic inactivity has increasingly become a structural labour market problem [4]. For example in the UK, according to the 1966 census 94.4% of non-student working age men were in employment and only 3% were economically inactive whilst in the 2001 census, the figures were 80.2% and 14.5% respectively [15]. This paper examines the potential impact of the changing pattern of employment status on the prevalence of poor self rated health from 1978 to 2004 using individual level data from a repeated cross-sectional survey.

Methods

The General Household Survey is a UK government repeated cross-sectional household survey that started in 1971 (with gaps in 1997 and 1999). It aimed to interview all adults in selected households. The exact sampling procedures to select households have changed over time but it has employed a stratified (by regional geography and area socio-economic characteristics) clustered sample method with the primary sample units being small (as a rough guide 5000 people) geographical areas (electoral wards until 1983 and postcode sectors thereafter). Households were then randomly selected from within these primary sampling units. It covers Britain rather than the whole of the UK (so excludes Northern Ireland). Its long running nature means that it is highly suitable for assessing change over time. The UK's Office for National Statistics (ONS) has produced a consistent (in terms of making variables as comparable as possible over time) time-series of the surveys 1972 to 2004 and it is this individual level dataset - available from the UK Data Archive - that was used in this analysis [16]. Analysis was limited to men and women aged 25 to 59. The lower age limit was chosen to limit the likelihood of people still being in higher education. Although state retirement age in the UK for the study period was 65 for men and 60 for women, it is common practice to restrict analysis to age 59 and below to limit the number of people who have taken voluntary early retirement straight from paid employment.

The health outcome was self rated general health, with respondents asked "Over the last 12 months, would you say your health has on the whole been: good; fairly good or not good?". For this analysis, it was recoded good and fairly good health (0) versus not good (1) and this latter category is referred to as poor health from now on. The question was first asked in 1977 but the introduction to the question was different in this year so 1978 is taken as the reference year. Individual level employment status was coded as employed, unemployed (out of work but actively seeking work), and the following categories of economic inactivity: retired, in education, keeping house full-time, sick or disabled and other economically inactive. As the employment status variables in the time series file had only three categories (employed, unemployed and economic inactive) we returned to the original annual survey files to compile the more nuanced categories of individual level economic inactivity. Given variations in question wording over time these more nuanced categories of employment status may be less consistent than the broader three category coding. As a check we reran our main analysis using the three broader categories (employed, unemployed and economic inactive) of employment status for men and for women four categories (splitting keeping house and all other forms of

economic inactivity as these showed opposing trends in prevalence). Using these broader categories we obtained very similar results. Single year of age was used in the analysis. Three measures of socio-economic position were used with categories made consistent as possible over time by the ONS, whether the person had a university level degree or not, whether they lived in owned outright housing, owned with mortgage housing, private rented housing or social (state or housing association) rented housing and finally, whether they lived in a household with car access. Across all years, a total of 10% of men and 4% of women in the sample had missing data for one or more of the variables. In sensitivity analysis we used multiple imputation (implemented using the ice command in Stata) to impute missing data. We did the imputation for men and women and for each year separately. Twenty imputed datasets were created for each year / gender combination. The imputed models were based on all variables already described plus country of residence (England, Wales, Scotland) and marital status. The main results using the imputed datasets are shown in the supplement.

For the main analysis we pooled data from all the survey years. The prevalence of poor health amongst individual respondents in all other years (1979-2004) was compared to 1978 using a logistic regression model containing year dummy variables with standard errors accounting for the household clustering in the survey (although this was minimal as men and women in the same household were analysed separately). The initial model (model A) controlled for age only. Model B additionally adjusted for the socio-economic variables as these are variables associated with ~~general~~ self rated health [17]. Model C then controlled additionally for employment status to assess its impact on the annual differences. In sensitivity analysis we checked the pattern of results using multilevel models where we treated year as a random intercept (individuals nested in years) and these results are shown in the supplement. Non-response weights are included in the time series General Household Survey file from 2000 onwards (when weights were introduced) and these have been applied in the main analysis (weights are scaled to have a mean of 1 in each year) with each individual in the years prior to 2000 being weighted equally (at 1). As odds ratios across different logistic models are not directly comparable [18] we also present the main results as adjusted prevalence differences (that are comparable across models [18]) by using the post estimation "margins" command in Stata. This shows yearly differences on an absolute scale.

Even though each annual GHS sample is relatively large, pooling the data had the advantage of increasing the sample for certain categories of the variables (economic inactivity for example) that in each year were relatively small. Pooling also provided a direct test of year-on-year differences. One disadvantage is that the coefficient for the variables is assumed to be the same over the years. We tested the possible impact of allowing coefficients to vary over the years in two ways. Firstly in our multilevel modelling we fitted a random coefficient model where we allowed the coefficients for employment status to vary over the years (models allowing all variables (age, socio-economic characteristics and employment status) to vary in the multilevel model unfortunately did not converge).

Second we used decomposition analysis to compare the observed difference in prevalence of poor health between the initial year (1978) and the final year (2004) using separate logistic regression models for each of these years. This means that the coefficients are allowed to be different between the years. This method allows the difference in prevalence of poor health to be separated into the part associated with changes in the characteristics of the population between 2004 and 1978 and that associated with changes in size of coefficients (including the intercept) between 2004 and 1978. For example, comparing an age adjusted model would mean that the prevalence difference between the two years could be assigned to changes in the effect size of the coefficients (in this case the age coefficient and the constant) and that due to changes in the age composition of the population (for example if the population had a higher average age in 2004 compared to 1978). We apply the same models (A, B and C) from the main analysis. We use the mvdcmp command in Stata to conduct the decomposition [19]. Stata 11.2 was used for the analysis apart from the multilevel modelling that was conducted in MLwiN.

Results

The total sample sizes across all years were 138,932 men and 145,300 women and these were reduced to 125,125 and 139,535 respectively in the complete case analysis when cases with missing data were excluded. Table 1 includes the response rates and individual year sample sizes for the complete cases.

Table 1 shows that for men the prevalence of poor health was low in 1978 (it was lowest in 1982) and then increased to 10.7% in 2004 a rise of 3.3 percentage points over the period. The rate of poor health was lowest for women in 1984 having declined slightly from 1978, although in the 1990s the rate rose and was just over 1

percentage point higher at the end of period compared to the start. The rate of poor health was always higher for women than men over the period.

There was clear change in the socio-economic characteristics of the population over the period with declines in the proportion living in social rented housing and increases in the proportion living in owner occupied housing, living in households with car access and the proportion with degrees (Figure 1).

Table 1 Response rates, sample sizes** and prevalence** of poor health for men and women by year.

Year	Response rate* (%)	Number of men	% of men in poor health	Number of women	% of women in poor health
1978	82	6258	7.4	6777	11.3
1979	83	6097	8.0	6557	11.1
1980	82	6129	8.7	6659	12.2
1981	84	6348	7.7	6860	11.4
1982	84	5299	6.9	5784	10.1
1983	82	5030	7.6	5618	11.6
1984	81	4855	7.6	5375	9.5
1985	82	5041	7.3	5542	10.4
1986	84	5175	7.4	5645	10.2
1987	85	5295	7.3	5739	10.5
1988	85	5082	8.0	5578	10.2
1989	84	5205	7.4	5677	10.0
1990	81	4833	7.8	5322	11.0
1991	84	5110	7.8	5614	10.3
1992	83	5070	8.1	5690	9.8
1993	82	4890	7.9	5434	10.8
1994	80	4734	9.6	5398	11.2
1995	80	4705	10.6	5488	11.4
1996	76	4326	8.0	5111	11.4
1998	72	4044	11.3	4740	12.3
2000	67	4008	10.1	4548	12.2
2001	72	4358	10.3	5058	12.1
2002	69	4183	11.1	4818	12.0
2003	70	4885	10.1	5651	12.5
2004	69	4165	10.7	4852	12.8

*Response rates are from http://www.esds.ac.uk/doc/5640/mrdoc/pdf/5640ghs05appendixb.pdf (page 10)** Sample size and prevalence of poor health for the complete case sample.

Taking these developments in the socio-economic characteristics of the population into account by controlling for the socio-economic variables in model B (table 2) generally increased annual differences compared to 1978 when model B is compared to model A which controlled only for age differences.

Overall male employment had fallen from 93% to 85% at the end of the period. Figure 2 illustrates the changes in the proportion of people in the various non-employment statuses over time with male unemployment (left panel) being cyclical, peaking in the mid 1980s and the early 1990s recession then falling away and being over taken by those sick or disabled in the late 1990s with this group now being the largest. Other forms of economic inactivity for males showed some increases but remained relatively small. For women, figure 2 (right panel) shows (reading the right hand axis) that there had been a 20 percentage point decline in those keeping home but, as for men, cyclical unemployment, a rise in those sick or disabled

overtaking those unemployed and a rise in those retired or in education. However unlike for men, female employment rose by 13 percentage points over the period from 61% to 74%

Table 2 Logistic regression results for rate of poor health for men and women controlling for age (Model A), additionally the listed socio-economic characteristics (model B) and additionally employment status (Model C)

	Men (Model A) ORs (95% CIs)	Men (Model B) ORs (95% CIs)	Men (Model C) ORs (95% CIs)	Women (Model A) ORs (95% CIs)	Women (Model B) ORs (95% CIs)	Women (Model C) ORs (95% CIs)
Age	1.06 (1.05 to 1.06)	1.05 (1.05 to 1.06)	1.04 (1.04 to 1.04)	1.04 (1.03 to 1.04)	1.03 (1.03 to 1.04)	1.03 (1.02 to 1.03)
Year						
1978	1	1	1	1	1	1
1979	1.08 (0.94 to 1.24)	1.09 (0.95 to 1.25)	1.02 (0.89 to 1.18)	0.98 (0.88 to 1.09)	0.98 (0.88 to 1.1)	0.98 (0.88 to 1.1)
1980	1.2 (1.05 to 1.37)	1.24 (1.08 to 1.42)	1.14 (0.99 to 1.31)	1.09 (0.98 to 1.21)	1.11 (1 to 1.24)	1.13 (1.01 to 1.26)
1981	1.05 (0.92 to 1.21)	1.09 (0.95 to 1.25)	0.95 (0.83 to 1.1)	1.01 (0.91 to 1.13)	1.04 (0.93 to 1.16)	1.02 (0.91 to 1.14)
1982	0.93 (0.81 to 1.08)	0.99 (0.85 to 1.15)	0.8 (0.68 to 0.93)	0.89 (0.79 to 1)	0.93 (0.83 to 1.04)	0.9 (0.8 to 1.01)
1983	1.03 (0.89 to 1.19)	1.12 (0.96 to 1.29)	0.83 (0.71 to 0.97)	1.04 (0.93 to 1.16)	1.12 (1 to 1.26)	1.03 (0.91 to 1.16)
1984	1.07 (0.92 to 1.23)	1.24 (1.07 to 1.44)	0.91 (0.78 to 1.06)	0.84 (0.74 to 0.95)	0.94 (0.83 to 1.06)	0.85 (0.75 to 0.96)
1985	1.01 (0.88 to 1.17)	1.17 (1.01 to 1.36)	0.81 (0.69 to 0.95)	0.94 (0.83 to 1.05)	1.06 (0.94 to 1.19)	0.94 (0.84 to 1.06)
1986	1.03 (0.89 to 1.19)	1.27 (1.09 to 1.47)	0.89 (0.76 to 1.04)	0.92 (0.82 to 1.03)	1.06 (0.95 to 1.2)	0.96 (0.85 to 1.08)
1987	1.01 (0.88 to 1.17)	1.3 (1.12 to 1.5)	0.88 (0.76 to 1.03)	0.95 (0.85 to 1.06)	1.13 (1 to 1.27)	0.98 (0.87 to 1.11)
1988	1.11 (0.96 to 1.27)	1.43 (1.24 to 1.65)	0.99 (0.85 to 1.15)	0.91 (0.81 to 1.02)	1.09 (0.97 to 1.23)	0.98 (0.87 to 1.1)
1989	1.01 (0.87 to 1.16)	1.33 (1.15 to 1.54)	0.84 (0.72 to 0.99)	0.9 (0.8 to 1.01)	1.1 (0.97 to 1.23)	0.95 (0.84 to 1.07)
1990	1.1 (0.95 to 1.26)	1.47 (1.27 to 1.7)	0.91 (0.77 to 1.06)	1 (0.89 to 1.12)	1.22 (1.09 to 1.38)	1.06 (0.93 to 1.19)
1991	1.08 (0.94 to 1.24)	1.43 (1.23 to 1.65)	0.86 (0.74 to 1.01)	0.93 (0.83 to 1.04)	1.15 (1.02 to 1.29)	0.93 (0.82 to 1.05)
1992	1.11 (0.97 to 1.28)	1.51 (1.31 to 1.75)	0.85 (0.73 to 0.99)	0.87 (0.77 to 0.98)	1.09 (0.97 to 1.23)	0.85 (0.75 to 0.97)
1993	1.11 (0.96 to 1.28)	1.52 (1.31 to 1.76)	0.79 (0.67 to 0.92)	0.98 (0.88 to 1.1)	1.23 (1.09 to 1.38)	0.95 (0.84 to 1.08)
1994	1.35 (1.17 to 1.55)	1.85 (1.61 to 2.13)	0.97 (0.83 to 1.13)	1.02 (0.91 to 1.15)	1.28 (1.13 to 1.43)	1.01 (0.89 to 1.14)
1995	1.5 (1.31 to 1.71)	2.11 (1.84 to 2.43)	1.1 (0.94 to 1.27)	1.03 (0.92 to 1.15)	1.34 (1.19 to 1.5)	1.02 (0.91 to 1.16)

1996	1.11 (0.96 to 1.29)	1.53 (1.32 to 1.78)	0.71 (0.6 to 0.84)	1.03 (0.92 to 1.16)	1.31 (1.16 to 1.47)	0.94 (0.83 to 1.06)
1998	1.61 (1.4 to 1.85)	2.31 (2 to 2.66)	1.22 (1.05 to 1.43)	1.11 (0.99 to 1.25)	1.47 (1.3 to 1.65)	1.07 (0.94 to 1.21)
2000	1.43 (1.24 to 1.65)	2.06 (1.78 to 2.39)	1.04 (0.88 to 1.23)	1.1 (0.98 to 1.24)	1.47 (1.3 to 1.66)	1.1 (0.97 to 1.25)
2001	1.47 (1.27 to 1.69)	2.13 (1.85 to 2.46)	1.13 (0.97 to 1.32)	1.08 (0.96 to 1.21)	1.46 (1.3 to 1.64)	1.05 (0.93 to 1.2)
2002	1.53 (1.33 to 1.76)	2.25 (1.95 to 2.59)	1.3 (1.11 to 1.52)	1.07 (0.95 to 1.2)	1.45 (1.28 to 1.63)	1.09 (0.96 to 1.24)
2003	1.38 (1.2 to 1.58)	2.03 (1.76 to 2.34)	1.08 (0.93 to 1.27)	1.11 (0.99 to 1.24)	1.5 (1.34 to 1.69)	1.12 (0.99 to 1.27)
2004	1.44 (1.25 to 1.66)	2.09 (1.81 to 2.41)	1.11 (0.95 to 1.31)	1.14 (1.01 to 1.27)	1.56 (1.38 to 1.75)	1.18 (1.04 to 1.33)
No degree		1	1		1	1
Degree		0.49 (0.45 to 0.54)	0.59 (0.54 to 0.65)		0.56 (0.51 to 0.61)	0.66 (0.6 to 0.72)
Owned outright		1	1		1	1
Owned with mortgage		0.75 (0.7 to 0.8)	0.95 (0.89 to 1.02)		0.97 (0.92 to 1.03)	1.1 (1.03 to 1.16)
Private rent		1.15 (1.05 to 1.26)	1.2 (1.08 to 1.33)		1.31 (1.21 to 1.42)	1.31 (1.2 to 1.42)
Social rent		1.88 (1.76 to 2.01)	1.46 (1.35 to 1.58)		1.98 (1.87 to 2.1)	1.72 (1.62 to 1.83)
No car		1	1		1	1
Car		0.54 (0.51 to 0.57)	0.85 (0.8 to 0.91)		0.6 (0.58 to 0.63)	0.73 (0.69 to 0.76)
Employed			1			1
Unemployed			2.01 (1.86 to 2.18)			1.81 (1.65 to 1.98)
Keeping house			2.64 (2.16 to 3.23)			1.81 (1.74 to 1.89)
Sick or disabled			28.07 (26.11 to 30.19)			20.05 (18.68 to 21.52)
In ~~E~~education			1.85 (1.33 to 2.58)			1.26 (0.96 to 1.65)
Retired			2.59 (2.2 to 3.04)			2.12 (1.88 to 2.4)
Other inactive			6.28 (5.46 to 7.21)			4.04 (3.44 to 4.75)

All forms of non employment were associated with an elevated probability of poor health but those sick or disabled had a particularly strong association (Table 2 – Model C). Controlling for individual level employment status (model C in table 2) attenuated the odds ratios for poor health for the years subsequent to 1978 for men and women. Pseudo r2 statistics indicated that model fit improved from model A (age only- 0.04 & 0.02 form men and women respectively) to model B (plus socio-economic characteristics – 0.09 & 0.05) to model C (plus employment – 0.22 & 0.13) for men and women respectively. Absolute prevalence differences compared to 1978 from each model are illustrated for men and women in figures 3 and 4 respectively. These highlight the possible linear increase in poor health year-on-year after controlling for socio-economic characteristics (Model B) and the attenuating impact of controlling for employment status (Model C). For men controlling for employment status led to yearly differences from 1978 being lower than for the age only model whereas for women it led to differences being very similar to the age only model. In the supplement results from the multiple imputation are shown and are very similar to those in Figure 3 and Figure 4. Results (shown in the supplement) from the multilevel modelling where year was treated as a random intercept rather than a fixed covariate showed a very similar pattern in that a clearer year-on-year increase in poor health from 1978 is apparent in model B compared to model A and that adjustment for employment status (model C) attenuated these differences even when the effect of employment status was allowed to vary over the years (model D).

The results from the decomposition analysis comparing – using separate logistic regression for each year - the unadjusted observed prevalence difference between 2004 and 1978 are presented in Table 3. For men, prevalence was 3.3 percentage points higher in 2004 (as shown in Table 1). When adding age only to the model (Model A) most of the observed difference was not due to changes in the population characteristics (the population in 2004 was slightly older hence a small part (0.4 percentage points) of the increase was due to this). Socio-economic characteristics of the population had changed in 2004 (Figure 1) and, model B shows that health in 2004 could have been considerably better (-4.2 percentage points lower) given the socio-economic characteristics in 2004 compared to 1978. Instead it was the changes in the coefficients that were associated with the actual increase in poor health from 1978 to 2004. However, when employment status is added in model C most of the increase in poor health is now explained by the change in population characteristics from

1978 to 2004. For women, the pattern of results is similar to men for the smaller 1.5 percentage point increase in poor health in 2004 although in model C most of the change is due to changes in coefficients. These results reflect those of the main analysis where controlling for both our socio-economic and employment status variables suggested that for men the difference between 2004 and 1978 would have been slightly lower than the age adjusted difference and for women it would have been very similar.

Table 3 Results for the decomposition analysis for the prevalence difference in poor health in 2004 from 1978 for men and women – model A adjusts for age, model B additionally adjusts for housing tenure, car access and degree attainment, model C adjusts additionally for employment

	Model A – Prevalence difference and 95% CIs*)	Model B	Model C
Men			
Due to population change	0.4 (0.4 to 0.5)	-4.2 (-5 to -3.5)	2.4 (1.7 to 3.2)
Due to coefficient change	2.8 (1.7 to 4.0)	7.5 (6.0 to 9.0)	0.8 (-0.5 to 2.1)
Overall difference	3.3 (2.1 to 4.4)	3.3 (2.2 to 4.4)	3.3 (2.3 to 4.3)
Women			
Due to population change	0.2 (.2 to .3)	-4.4 (-5.2 to -3.7)	-0.1 (-0.9 to 0.8)
Due to coefficient change	1.3 (0.1 to 2.5)	5.9 (4.4 to 7.5)	1.6 (0.1 to 3.1)
Overall Difference	1.5 (0.3 to 2.7)	1.5 (0.3 to 2.7)	1.5 (0.4 to 2.6)

*Confidence intervals do not account for household clustering as this option is not presently available for mvdcmp

Discussion

The individual level analysis presented here shows that accounting for shifts in the proportion of the working age population in different employment statuses – most notably the rise of sickness or disability related economic inactivity – attenuated annual differences in the prevalence of poor self rated health in the UK population since the late 1970s. This complements previous individual level analysis into sickness or disability related economic inactivity which found that it was a possible major factor behind the social gradient in health [14] as well as a possible influential issue in regional differences in health [10]. The results suggest that a fuller understanding of why employment status is associated with self-rated health could be important for public health. The relationship between employment status and health is complicated. Systematic reviews have concluded that there is evidence that poor health can cause job loss and that job loss can cause poor health with the latter possibly being the stronger effect of the two [6, 7]. For self-rated general health, there is also evidence of health selection [20] but also causation [21]. So it is possible that rising rates of poor general health have increased economic inactivity. The debate over the relative influence of employment on health versus health on employment is limited though because it tends to emphasise notions of people being in a state of health that either allows them to work or not: a zero-sum approach. Yet, it should be remembered that ill health for the majority is not an impediment to labour market participation [22] but that those in ill-health - particularly in lower socio-economic positions - are most vulnerable to non-employment and were increasingly so in the period under study [22, 23]. So their job loss may not then be caused by their ill-health per se but by the prevailing labour market conditions and the policy response to these [24, 25].

Evidence suggests that the increases in the economically inactive population (particularly those claiming sickness related benefits) in the UK during this period were due to difficult labour market conditions (particularly in de-industrialised areas) [5] [26]. This resulted in those with health conditions (particularly if also from low socio-economic positions) finding themselves towards the back of the job queue and unlikely to find employment [5]. In this sense it is argued that many of those economically inactive because of sickness or disability are “hidden unemployed” as they may be employed given different labour market conditions. [5]. Indeed, in better labour market conditions it is argued that there is “hidden sickness” amongst the active

workforce [5]. This does not necessarily require any change in the individual level of ill-health in the population just change in the proportion of people who are employed. Recent theoretical work on how people self-rate their general health suggests a cognitive process where people take account of their individual health situation but do so in the wider context in which they live [27]. Hence the assessment of one's health while being economically inactive may differ compared to when one is in or seeking work. For example, there is longitudinal evidence that the reporting of longstanding illness may depend on labour market status with employment reducing the likelihood of reporting poor health [28]. Coupled to the health damaging psychological and material consequences of non-work [29] this may allow us to understand why economic inactivity may be associated with a higher risk of poor general health at the individual level.

Of course, confounding is a real possibility within this repeated cross-sectional study. For example, there could be other confounding or mediating trends that are associated with both general health and employment that could explain the impact of adjusting for changes in employment status. Examples include the apparent decline in job quality over time [30] and macro-economic changes such as the rise in the level of income inequality.

Economic inactivity is also a potentially important influence on population health, not just because of the composition of the inactive population itself, but also because it is generally a longer term state. For example, a recent cohort study of people out of work and in receipt of incapacity-related benefits in the UK found that the average length of economic inactivity amongst this group was nine years [31]. Thus the issues which are usually put forward to explain the association between unemployment and ill health – most notably poverty, social exclusion and low social status – are thus experienced for a much longer time period by those who are inactive than by those who are unemployed.

Whilst our results suggest that decreasing the numbers of economically inactive could have health benefits, this is by no means an easy task and not just because of the current economic climate. Research into welfare to work interventions for those with a disability or chronic illness has found that even in times of solid economic growth it is very difficult to increase the employment rate of this group. For example, in the UK since the 1990s there have been increasing efforts to enhance the labour market participation of this group using various interventions including education, training and work placement schemes; vocational advice and

support services; vocational rehabilitation; in-work benefits; financial incentives for employers; employment rights legislation and accessibility interventions[4]. However, the evidence of effectiveness in terms of actually increasing employment is very limited [4, 32-34]. This is partly attributed to the largely supply-side orientation of most of the interventions [4], the focus on employment rather than health improvement [31, 35] and the lack of demand from employers for workers with complicated and fluctuating health conditions [31].

In addition to being only cross-sectional, another limitation of using the General Household Survey is that response rate fell over time; weighting was introduced in 2000 and we have applied this in all analysis but the possibility remains that the survey became increasingly unrepresentative over time. It is impossible to assess the impact of this on our results as we do not have details of non responders. However, evidence comparing a national census to a national health survey suggested that low socio-economic groups and the out of work were less well represented in the survey leading to a more conservative estimate of the social gradient in health in the survey [36].

Conclusion

To summarise, this study shows that poor health may have worsened amongst both men and women from 1978 to 2004 when accounting for socio-economic changes. However, controlling for the employment status changes in the UK since 1978 attenuated the increase in poor general health. This research raises important public policy issues around the role of employment in overall public health which should be examined further.

Acknowledgements

General Household Survey Time Series Dataset 1972-2004 was created by the Office for National Statistics. The user guide for the time series dataset was created jointly by ONS and the Economic and Social Data Service (ESDS) Government and downloaded from the UK Data Archive. The data are Crown copyright. The authors alone are responsible for the analysis and interpretation.

Funding

No specific grant was associated with this was work. LG (5TK30) and FP (5TK10) are funded by the MRC

Ethics approval

Not required for this secondary analysis of publically available and anonymised secondary data

Author contributions

FP had the original idea which was developed with CB. FP and LG conducted the analysis. FP drafted the manuscript with revisions from CB and LG.

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Figure 1 Prevalence of housing tenure types, car access and degree attainment 1978 to 2004 for men and women aged 25 to 59

Figure 2 Prevalence of the different types of employment status 1978 to 2004 from men and women aged 25 to 59

Figure 3 Prevalence difference in poor health from 1978 (reference) to 2004 for men from model A (age adjusted), model B (plus adjustment for socio-economic characteristics) and model C (plus adjustment for employment status).

Figure 4 Prevalence difference in poor health from 1978 (reference) to 2004 for women from model A (age adjusted), model B (plus adjustment for socio-economic characteristics) and model C (plus adjustment for employment status).

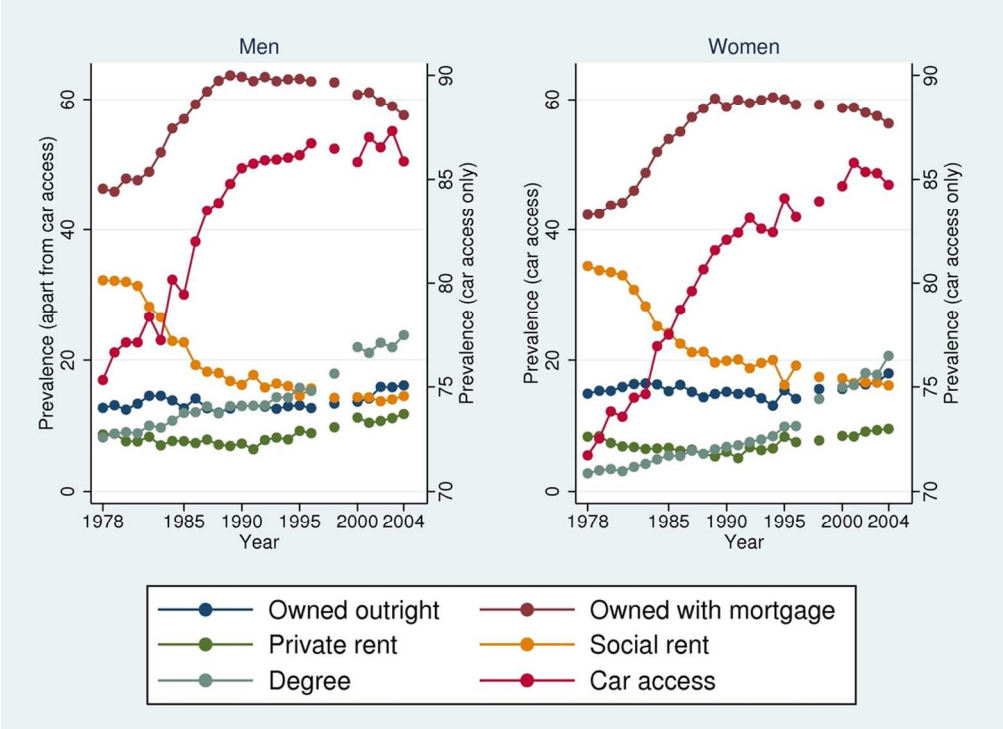

Figure 1 Prevalence of housing tenure types, car access and degree attainment 1978 to 2004 for men and women aged 25 to 59
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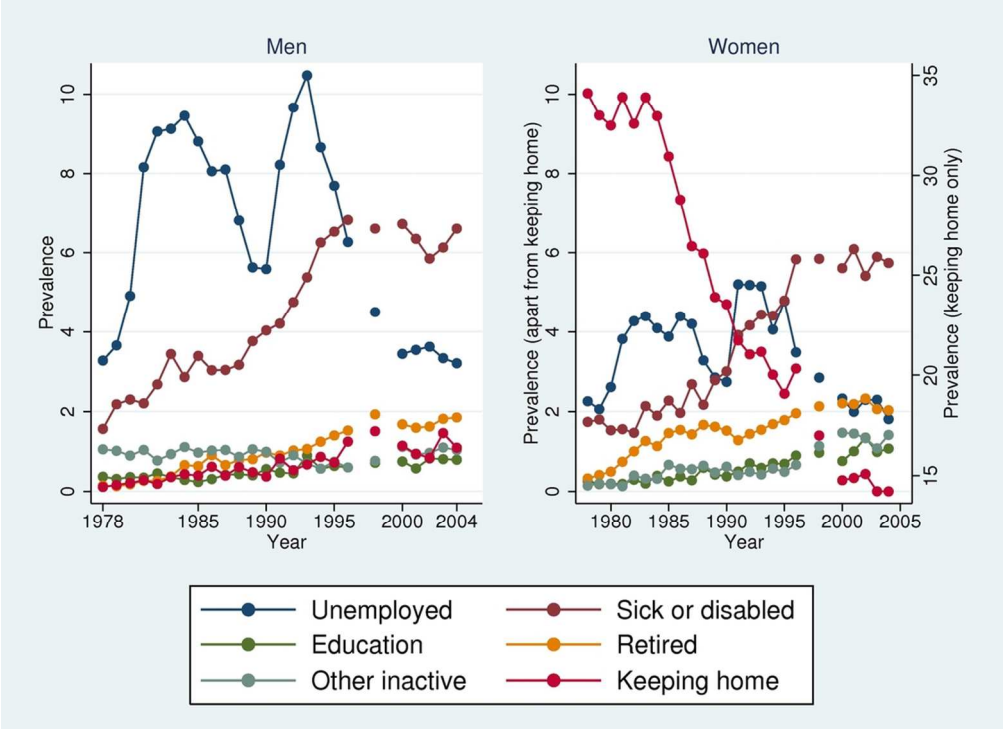

Figure 2 Prevalence of the different types of employment status 1978 to 2004 from men and women aged 25 to 59
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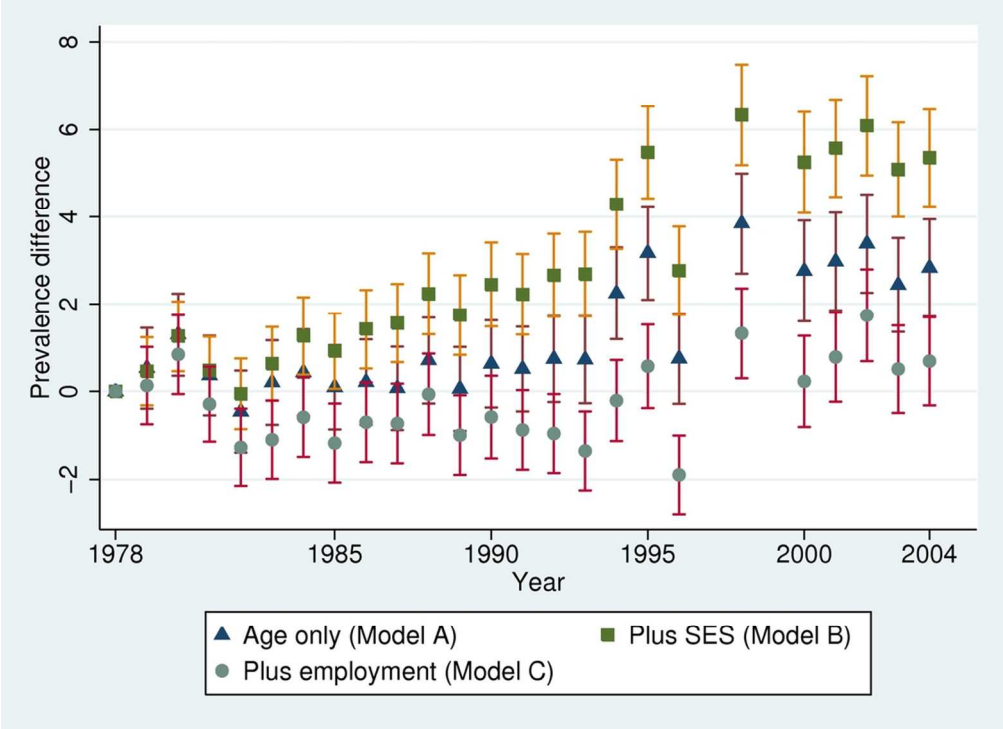

Figure 3 Prevalence difference in poor health from 1978 (reference) to 2004 for men from model A (age adjusted), model B (plus adjustment for socio-economic characteristics) and model C (plus adjustment for employment status).
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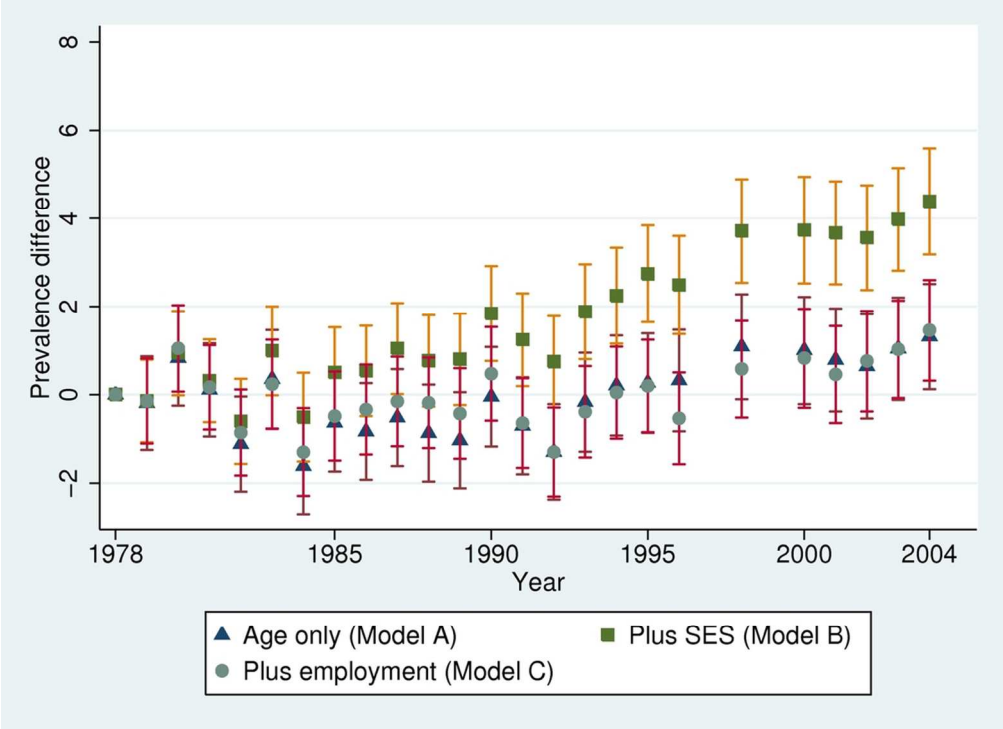
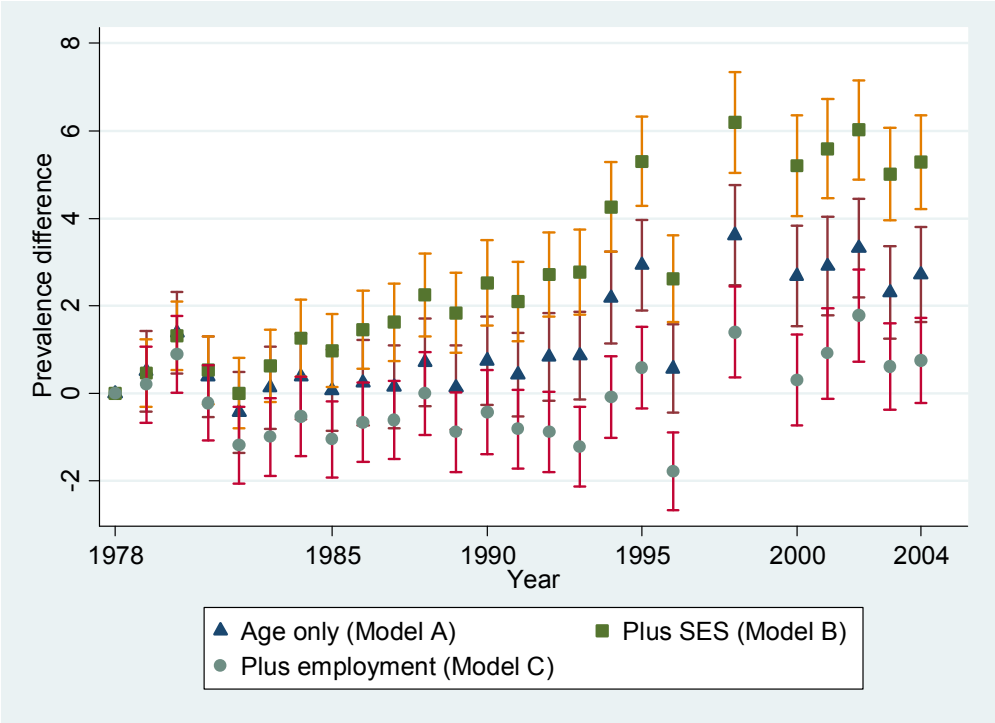
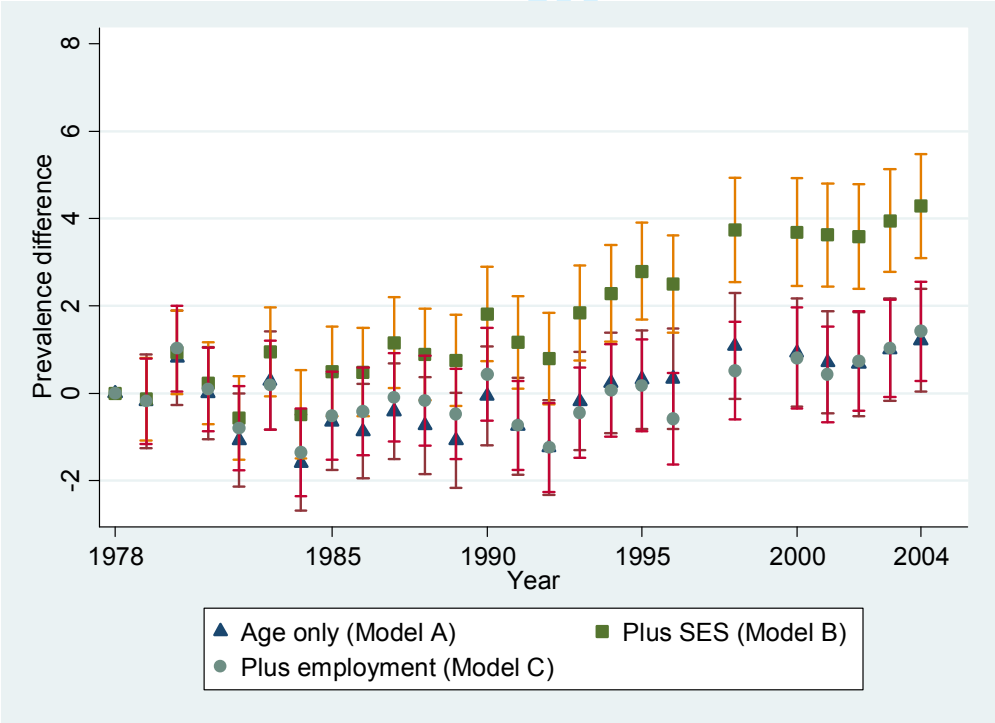


Figure 4 Prevalence difference in poor health from 1978 (reference) to 2004 for women from model A (age adjusted), model B (plus adjustment for socio-economic characteristics) and model C (plus adjustment for employment status).
101x73mm (300 x 300 DPI)

Multiple imputation results

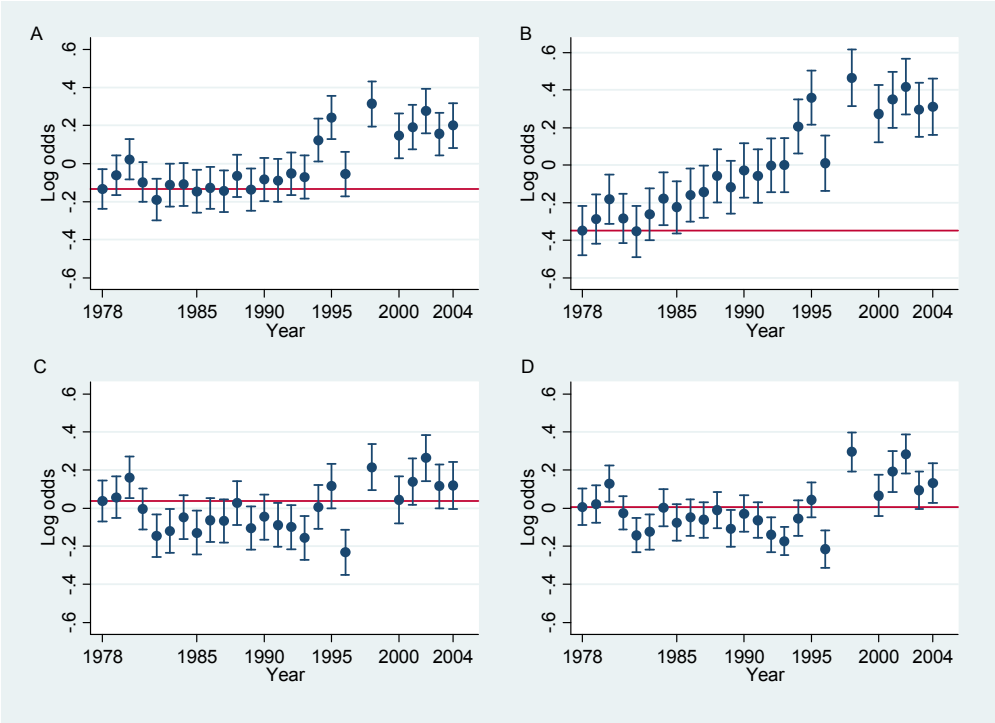


Supplemental figure 1 Prevalence difference in poor health from 1978 (reference) to 2004 for men from model A (age adjusted), model B (plus adjustment for socio-economic characteristics) and model C (plus adjustment for employment status).

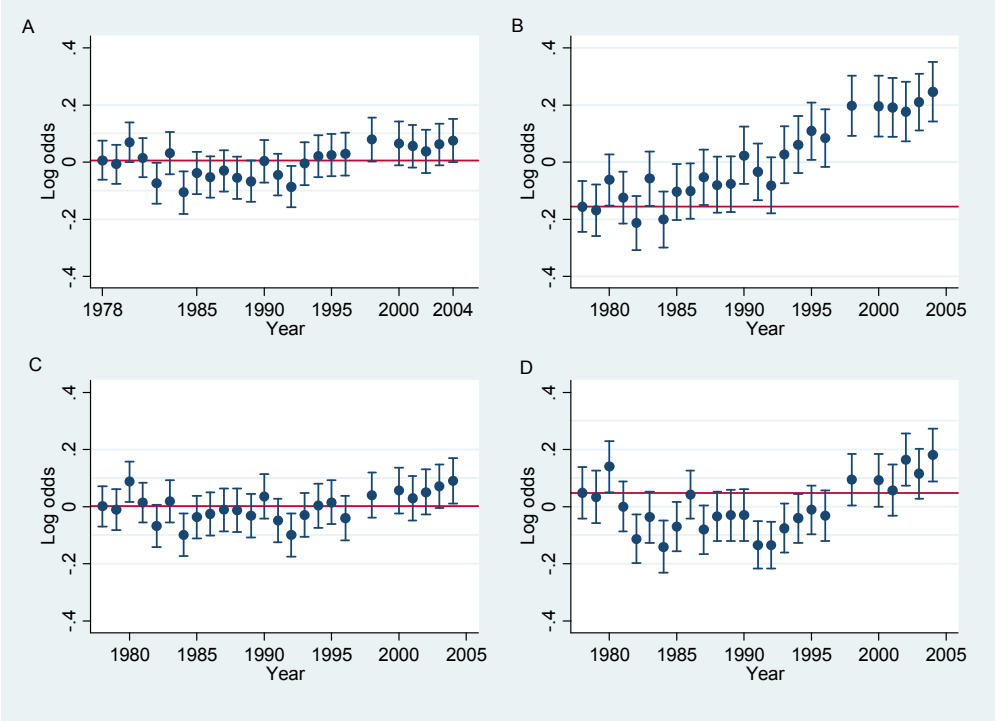


Supplemental figure 2 Prevalence difference in poor health from 1978 (reference) to 2004 for men from model A (age adjusted), model B (plus adjustment for socio-economic characteristics) and model C (plus adjustment for employment status).

Multilevel model results



Supplemental figure 3. Results (on logs odds scale) from multilevel model for men treating year as a random intercept. Estimated annual difference compared to average of all years (0) . For comparison to main results red line indicates 1978. Panel A is model A (adjusted for age only), panel B is model B (plus adjustment for socio-economic characteristics), panel C is model C (plus adjustment for employment status), panel D is model C plus allowing employment status to vary across years.



Supplemental figure 4. Results (on logs odds scale) from multilevel models for women treating year as a random intercept. Estimated annual difference compared to average of all years (0) . For comparison to main results red line indicates 1978. Panel A is model A (adjusted for age only), panel B is model B (plus adjustment for socio-economic characteristics) panel C is model C (plus adjustment for employment status), panel D is model C plus allowing employment status to vary across years.