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The Effects of the Recession on Population Mental Health: A Repeat Cross-Sectional Analysis of the Health Surveys of England

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Competing Interest Statement
All authors have completed the Unified Competing Interest form at www.icmje.org/coi_disclosure.pdf (available on request from the corresponding author) and declare that they have no conflicts of interest.

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Abstract

Objective: To assess the short-term impact of the 2008 recession on population mental health and explore how and why its impact may differ by gender, age and socio-economic position.
Design: Repeat cross-sectional analysis of survey data
Setting: England
Participants: Representative samples of the working age (25-64 years) general population participating in the Health Survey for England between 1991 and 2010 inclusive.
Main Outcome Measures: Prevalence of poor mental health (caseness) as measured by the General Health Questionnaire-12 (GHQ)
Results: Age-sex standardised prevalence of GHQ caseness increased from 13.7% (95% CI 12.9-14.5%) in 2008 to 16.4% (95% CI 14.9-17.9%) in 2009 and 15.5% (95% CI 14.4-16.7%) in 2010. Women had a consistently greater prevalence since 1991 until the current recession. However, compared to 2008, men experienced an increase in age-adjusted caseness of 5.1% (95% CI 2.6-7.6%, $p<0.001$) in 2009 and 3.0% (95% CI 1.2-4.9%, $p=0.001$) in 2010, while no statistically significant changes were seen in women. Adjustment for differences in employment status and education level did not account for the observed increase in men nor did they explain the differential gender patterning. Over the last decade, socio-economic inequalities showed a tendency to increase but no clear evidence for an increase in inequalities associated with the recession was found. Similarly, no evidence was found for a differential effect between age groups.
Conclusions: Population mental health in men has been adversely affected within two years of the onset of the current recession. These changes, and their patterning by gender, could not be accounted for by differences in employment status. Further work is needed to monitor recessionary impacts on health inequalities in response to ongoing labour market and social policy changes.

Words: 277

What is already known on this subject?

Previous studies have found differing impacts of recession on mental health, with some outcomes, such as suicide, increasing in men more than women. However, as the labour market changes and employment among women becomes increasingly important, it has been suggested that this gender difference may no longer exist. Few studies have investigated mental health morbidity and its patterning by population subgroups over prolonged periods of time.

What this study adds

The current recession is associated with an increase in the prevalence of poor mental health among men in England. These changes, and their patterning by gender, cannot be accounted for by differences in employment status over time.

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Introduction

Macro-economic factors are known to influence population health and health inequalities[1]. The onset of the global economic downturn heralded by the collapse of Lehman Brothers in September 2008 can therefore be considered a potential threat to public health [2-4]. In the UK, national gross domestic product (GDP) has fallen in real terms (with a 5.5% fall per head of population between 2008 and 2009) and unemployment rates have increased since the recession began [5]. Neither indicator has yet recovered to pre-recession levels at the time of writing [6]. Unemployment is associated with a number of adverse health impacts including poor mental health, short-term increases in adverse health behaviours and increased mortality risk [7-9]. However, the effects of recession appear to be more complex than would be expected from the impact of increases in unemployment alone. For example, there is a growing body of research suggesting that at least in the short term, recessions are associated with a faster decline in mortality although some specific causes of death, such as suicide, may rise [10]. Thus, mortality impacts of recessions may be more complex than intuition suggests and likely vary by outcome and context [4 7].

Less empirical analysis has focused on the effect of recession on trends in population mental health. Macro-economic change could potentially have a more rapid effect on mental health compared to mortality, particularly for those of working age. Historically, both periods of recession and unemployment appear to have had a greater impact on men compared to women [7]. However, it has been suggested that this differential impact may no longer be present as growing female labour market participation may increase their susceptibility to macro-economic changes [11 12]. In addition, it is not clear to what extent changes in health status associated with recessionary periods are mediated purely through changes in labour market status. The UK experienced its first recession since 1991 (defined as two quarters of negative growth in gross domestic product) in late 2008 [13]. Unemployment (which is commonly used as a marker of recession that has a more direct effect on health) showed marked increases between 1991-3 and 2008-10.

In this paper, we aim to assess the short-term impact of the recent recession on population mental health and inequalities (by gender, age and socio-economic position) by placing it in a longer historical context. We further aim to investigate to what extent any observed recessionary impacts and their patterning by subgroups can be accounted for by differences in employment status or education level.

Methods

Data sources

We used data from the Health Survey for England, a nationally representative cross-sectional survey of the community dwelling population, conducted annually from 1991 onwards. Survey methodology has been described elsewhere [14-16]. Household response rates for the period studied varied from 85% in 1991 to 64% in 2008.

Unemployment rates (available for the whole period) and gross GDP per head (comparable data available for 1991-2009) for the UK were retrieved to provide

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context for the interpretation of trends [5 17]. In addition, unemployment data for England (available for 1993 onwards) were retrieved and showed similar trends to the UK data [18]. These macro-economic indicators all show marked deterioration between 2008 and 2009; hence we use 2008 as the reference year for comparison.

Population

The study population was restricted to participants of a working age, between 25 years and 64 years inclusive. Those aged under 25 years were excluded to minimise misclassification of education level. Participants missing any data on age, sex, highest education level, employment status and outcome were excluded from the analysis (5.15% of total sample excluded). We excluded 2918 participants (2.59% of the sample) with foreign/other qualifications as we were unable to categorise their highest educational attainment accurately. We excluded 847 individuals (0.75%) who defined themselves as doing unpaid work for their family, waiting to take up employment or undertaking government training schemes. Results of overall prevalence estimates were similar when those with missing data (apart from the 1.60% missing outcome data) were included.

Exposures

Socio-economic position was assessed using highest education level (self-reported) and area-level deprivation. Comparable information on education level was available for every survey year except 1995 and 1996 and area-level deprivation was available from 2001 onwards. Educational level was coded into four categories: degree-level or equivalent qualifications, A-level or equivalent, GCSE or equivalent and no qualifications, while index for multiple deprivation (IMD) was coded into quintiles. Participants were asked to self-identify their employment status based on their activity in the previous week before the survey interview. Employment status was coded into six categories: employed, unemployed, unable to work due to ill health, looking after family/maternity care, retired and in full-time education.

Outcome Measures

Mental health was assessed in every survey year except 1996 and 2007 through the general health questionnaire (GHQ-12). GHQ-12 is a screening tool for anxiety and depression, validated for use in epidemiological studies [19]. Respondents scoring 4 or more have a high likelihood of poor mental health and are considered a 'case' [20].

Statistical Analysis

For the first stage of analysis, we analysed data for each year separately. Prevalence estimates for GHQ caseness (age-sex standardisation to the WHO European standard population) were calculated for each year, stratified by age, sex, education level and employment status.

In the second stage of analysis, logistic regression analysis was conducted for each year separately to explore any differential patterning in recession years between men and women. To measure the extent of socio-economic inequality in prevalence on a relative scale we calculated the relative index of inequality using a Poisson modelling approach [15].

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We directly tested the impact of the recent recession in the final stage of the analysis by creating a combined dataset for all years and creating a logistic regression model adjusting for year, age, education level and employment status. Men and women were analysed separately given the effect modification observed between genders and year.

All analyses were carried out using Stata v11.2. Weights for non-response (available from 2003 onwards) were used for all analyses. These were scaled to a mean of 1 for each year to allow analysis of the combined dataset. Robust standard errors were used to adjust for survey clustering at the area level. Adjusted prevalence differences were derived from the logistic regression models as well as odds ratios in order to allow comparisons across models to be made on the absolute scale [21].

Results

A total of 106,985 participants were included in the main analysis of trends in GHQ caseness (Table 1). The sample response rate declined gradually over time, but they were broadly comparable over the most recent years with no marked changes in response rates during the onset of the current recession. There was also socio-economic change with a decline in the percentage of people with no qualifications and an increase in participants with a degree.

GHQ caseness was relatively high during the time of the early 1990s recession (Figure 1). Since then, there has been an indication of a general downward trend with some variability, until a more recent increase in prevalence that occurs after 2008. Caseness increased from 13.7% (95% CI 12.9-14.5%) in 2008 to 16.4% (95% CI 14.9-17.9%) in 2009.

Impact by Subgroups

A gender differential in GHQ caseness is apparent; women have a consistently higher prevalence over most of the time period (Figure 2). However, during the early 1990s recession, men had a larger increase in prevalence of GHQ caseness from 12.3% in 1991 to 14.5% in 1992. A similar trend is seen following the 2008 recession with an increase from 11.3% to 16.6% in men, compared to 16.0% to 16.2% in women between 2008 and 2009.

Stratified analysis by age shows that changes in mental health during recessionary periods are not confined to any specific age groups (see on-line appendix). Sensitivity analysis including those aged 16-24 years showed no clear difference in trends.

In the early 1990s, stratification by education level reveals an initial reverse education gradient in GHQ caseness (Figure 3). Over time, a growing disparity in GHQ caseness between those most and least educated is apparent, with the highest levels of inequality in poor mental health observed in 2005. A similar pattern is seen when assessing caseness by area-level deprivation (Figure 4). The greatest levels of relative indices of inequality are also seen since 2005 when assessed by either measure of socio-economic position (Figure 5). No significant impact of the recession by deprivation is observed.

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Changes in population mental health do not appear to be entirely mediated by changes in employment status. For example, the prevalence of GHQ caseness amongst those in employment increased during both recessionary periods: from 13.4% (95% CI 11.4-15.5%) to 14.8% (95% CI 13.1-16.6%) in 1991-2 and from 9.9% (95% CI 9.2-10.7%) to 12.9% (11.3-14.4%) between 2008 and 2009 (Figure 6).

Exploration of the Differential Trends by Gender

A combined dataset for all years was analysed separately for men and women, given the effect modification observed. Compared to a baseline of 2008, age-adjusted caseness increased by 5.1% (95% 2.6-7.6%, p<0.001) in 2009 and 3.0% (95% 1.2-4.9%, p=0.001) in 2010 amongst men but no statistically significant changes are seen in women (Table 2). Adding employment status to the model suggests that changes in employment status do not explain this increase in poor mental health. Similarly, adjustment for changes in employment status and education level does not account for this increase in prevalence.

We attempted to explore the reasons for the increased adverse effect of the recession among men. When analysing data from each year separately, adjustment for differences in education level and employment status between genders did not account for the larger increases in prevalence amongst men (see Table 3). Therefore, the differing trend in mental health in men cannot be explained by differing changes in labour market status.

Discussion

In this large repeat cross-sectional study of representative samples of the English population, we have found evidence to suggest population mental health has deteriorated following the start of the 2008 recession. Notably, this change does not appear to arise only as a result of an increase in unemployment, but mental health appears to have declined among those in employment. While some commentators have recently suggested that the current recession may affect both genders in a similar manner, we find that the deterioration in mental health appears greatest among men. Furthermore, this differential impact cannot be adequately accounted for by changes in employment status (such as greater unemployment) amongst men. We also find evidence to suggest that socio-economic inequalities (assessed by both highest education level and area-level deprivation) have increased over the course of the last decade, but the recession has not had a clear impact on socio-economic inequalities in mental health to date.

Our study has a number of strengths. We used a large nationally representative dataset which used a validated screening test for anxiety and depression. Importantly, we assessed trends over a long length of time with annual measures available for most of the period and an outcome likely to be sensitive to changes in the macro-economic environment. This allows greater certainty in attribution compared to studies limited to comparisons of single before and after surveys. However, as our study makes use of available data, a number of important limitations exist. First, data was not available for every year, with the omission of GHQ in 2007 potentially problematic as this

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represents the last full pre-recessionary year. Second, our outcome measure does not equate to a clinically-defined mental health condition. It cannot therefore be assumed that changes in GHQ caseness correlate with clinically diagnosed illness. Third, we have been limited to repeat cross-sectional analysis. Longitudinal analysis of individuals would allow greater scope for relating changes in individual employment status to health. Lastly, while our study has attempted to investigate the impact of changes in population mental health associated with the recession, we cannot establish whether this is a causal relationship, as other temporal changes could account for the observed trends. However, many factors that could potentially account for our findings, such as changes in health or social care provision, could also be considered mediating factors rather than confounders.

Much previous research has focussed on mortality, and in particular suicide, associated with recession. In an analysis of cause-specific mortality and its association with recession in European countries, Stuckler et al. found that the most consistently observed relationship was an increase in suicide amongst young men [22]. More recently, they found that increases in suicide rates have been observed across European countries following the onset of the current recession [23]. Consistent increases in male suicide rates have been noted in many other studies [24]. The relationships between morbidity in mental health, health inequalities and recessions are less well understood and findings differ between studies [7 25]. A recent before and after comparison of patients attending primary care services in Spain found a marked increase in the prevalence of mental health disorders following the onset of the current global recession [26]. Household unemployment and mortgage difficulties were particularly associated with these attendances. However, not all studies have found an effect of economic recession on mental health. For example, Vinamaki et al found no statistically significant increase in poor mental health (assessed using GHQ) following the economic recession in Finland between 1993 to 1995 in repeated general population samples [27].

While our study finds men's mental health has been affected more adversely than women, it should be noted that important indirect effects of the recession, including changes in the public sector workforce and changes in government assistance for children, had yet to be implemented during the time of this study. Our analysis does not yet show any indication of worsening mental health inequalities associated with the current recession. However, there is a general trend towards a greater level of inequality more recently and there is no evidence to suggest narrowing. Further research will be required to assess ongoing impacts of the recession by gender and socio-economic position. As our analysis was restricted to a working-age population, research focussing on retired individuals is also needed to investigate the potential impact in older age groups. The existing evidence suggests that the relationship between mental health and recessions differs, at least in part, by social welfare system [10 22 28-31]. There is therefore a need for cross-national comparisons of trends in population health and health inequalities to better identify social policy responses that protect from the adverse health impacts of recession.

The finding that mental health across the general population has been adversely impacted by the recession, and does not appear to be limited to those out of employment, has important implications. Previous research has highlighted the importance of job insecurity, rather than solely employment status, as potentially

resulting in adverse effects on mental health [32]. One potential explanation for our results would be that job insecurity during the current recession is responsible for the deterioration in mental health with men's psychological health remaining more affected by economic fluctuations despite greater female labour market participation. This paper highlights the continuing importance of addressing mental health issues using population-wide approaches by both policymakers and health professionals and not limiting such efforts to those directly affected by unemployment.

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Table 1: characteristics of study participants

	Sex (%)		Age group (%)				Highest education level (%)				Employment status in last week (%)							
Year	M	F	25-34	35-44	45-54	55-64	Degree	A-level	GCSE	None	Employed	Unemployed	Not working due to ill health	Retired	Looking after home	In education	Sample	Response rate (%)
1991	46.7	53.3	29.8	27.5	21.8	20.8	11.8	18.7	33.4	36.0	71.9	5.5	4.5	4.5	13.1	0.5	2,001	85
1992	47.3	52.7	29.2	28.4	22.6	19.8	11.8	22.0	35.6	30.6	69.3	6.1	4.4	6.1	13.0	1.1	2,484	82
1993	47.5	52.5	29.7	26.6	24.3	19.4	12.8	21.7	33.3	32.2	70.9	6.3	4.3	5.5	12.4	0.6	10,502	81
1994	46.7	53.3	30.2	27.3	23.1	19.5	13.0	21.9	34.4	30.7	70.9	5.5	4.5	5.8	12.4	1.0	9,981	77
1997	47.2	52.8	29.1	27.4	25.0	18.5	16.4	24.8	31.2	27.6	71.7	3.3	6.4	4.8	12.8	1.1	5,377	76
1998	46.6	53.4	28.4	27.5	25.2	18.9	16.6	24.1	33.0	26.3	73.4	2.0	6.1	5.4	11.6	1.4	9,748	74
1999	46.9	53.1	26.5	29.0	25.6	18.9	18.0	25.0	31.1	26.0	72.3	2.3	6.6	5.1	12.3	1.4	4,750	76
2000	45.8	54.2	26.8	30.3	23.3	19.6	18.9	27.3	31.0	22.8	72.3	2.1	6.6	5.8	11.6	1.6	4,982	75
2001	45.7	54.3	24.9	29.6	25.3	20.2	19.6	26.1	32.6	21.6	73.3	2.0	6.4	6.2	10.3	1.7	9,457	74
2002	43.4	56.6	25.7	31.8	22.7	19.8	21.0	27.9	32.7	18.5	71.4	2.1	5.6	6.0	13.6	1.4	4,619	74
2003	45.4	54.6	23.3	29.7	23.8	23.2	21.8	25.8	32.5	19.8	74.6	1.6	6.1	6.3	10.2	1.4	8,982	73
2004	43.4	56.6	22.5	29.2	23.6	24.8	23.0	25.7	29.8	21.5	73.0	1.4	5.9	7.4	10.7	1.6	4,076	72
2005	44.8	55.2	22.5	26.6	26.5	24.4	23.6	25.9	30.1	20.5	73.8	1.7	6.3	6.2	10.6	1.4	4,590	74
2006	44.7	55.3	21.2	28.8	24.9	25.2	25.5	26.8	29.2	18.5	73.9	1.8	5.9	6.8	10.3	1.3	8,605	68
2008	44.7	55.3	22.0	27.5	25.2	25.3	25.6	28.0	28.7	17.7	74.0	2.1	5.4	7.4	9.6	1.6	9,228	64
2009	45.6	54.4	21.7	28.8	25.0	24.6	26.4	25.6	30.9	17.0	73.4	3.1	5.5	7.4	9.0	1.7	2,773	68
2010	43.5	56.5	21.3	26.5	27.6	24.6	28.2	28.3	29.7	13.9	73.1	3.1	5.8	7.4	9.0	1.6	4,830	66

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Table 2: Analysis of Data from 1991-2010 in Men and Women Adjusted for Age, Employment Status and Education (Selected Years Shown)

	Model 1: Age				Model 2: Age + Employment Status				Model 3: Age + Employment Status + Education			
Males												
Year	**OR**	**P**	**Lower 95% CI**	**Upper 95% CI**	**OR**	**P**	**Lower 95% CI**	**Upper 95% CI**	**OR**	**P**	**Lower 95% CI**	**Upper 95% CI**
2005	0.97	0.723	0.82	1.15	0.92	0.370	0.78	1.10	0.93	0.394	0.78	1.10
2006	1.06	0.465	0.91	1.22	1.05	0.511	0.91	1.22	1.05	0.506	0.91	1.22
2008	1.00	-	-	-	1.00	-	-	-	1.00	-	-	-
2009	1.53	0.000	1.26	1.86	1.50	0.000	1.24	1.82	1.50	0.000	1.24	1.82
2010	1.31	0.001	1.12	1.54	1.31	0.001	1.11	1.54	1.30	0.002	1.10	1.53
	% difference	**P**	**Lower 95% CI**	**Upper 95% CI**	**% difference**	**P**	**Lower 95% CI**	**Upper 95% CI**	**% difference**	**P**	**Lower 95% CI**	**Upper 95% CI**
2005	-0.31	0.722	-2.02	1.40	-0.75	0.367	-2.12	1.32	-0.71	0.391	-2.34	0.92
2006	0.56	0.465	-0.95	2.08	0.49	0.511	-0.97	2.09	0.50	0.506	-0.96	1.95
2008	0.00	-	-	-	0.00	-	-	-	0.00		-	-
2009	5.07	0.000	2.60	7.55	4.54	0	2.67	7.65	4.52	0.000	2.21	6.83
2010	3.04	0.001	1.17	4.91	2.86	0.002	1.32	5.13	2.79	0.002	1.01	4.56
Females												
	OR	**P**	**Lower 95% CI**	**Upper 95% CI**	**OR**	**P**	**Lower 95% CI**	**Upper 95% CI**	**OR**	**P**	**Lower 95% CI**	**Upper 95% CI**

2005	1.01	0.917	0.88	1.15	1.00	0.958	0.88	1.15	1.00	0.956	0.88	1.15
2006	0.96	0.467	0.86	1.07	0.95	0.342	0.85	1.06	0.95	0.344	0.85	1.06
2008	1.00	-	-	-	1.00	-	-	-	1.00	-	-	-
2009	1.04	0.641	0.88	1.23	1.06	0.522	0.90	1.24	1.06	0.523	0.90	1.24
2010	1.06	0.369	0.93	1.22	1.05	0.493	0.91	1.20	1.05	0.482	0.92	1.20
	% difference	**P**	**Lower 95% CI**	**Upper 95% CI**	**% difference**	**P**	**Lower 95% CI**	**Upper 95% CI**	**% difference**	**P**	**Lower 95% CI**	**Upper 95% CI**
2005	0.09	0.918	-1.69	1.88	0.05	0.959	-1.70	1.79	0.05	0.956	-1.69	1.79
2006	-0.55	0.467	-2.04	0.94	-0.70	0.341	-2.13	0.74	-0.69	0.344	-2.13	0.74
2008	0.00	-	-	-	0.00	-	-	-	0.00	-	-	-
2009	0.53	0.643	-1.70	2.76	0.70	0.526	-1.48	2.89	0.70	0.527	-1.48	2.88
2010	0.84	0.372	-1.01	2.70	0.63	0.495	-1.18	2.43	0.64	0.485	-1.16	2.44

* Reference group is 2008. Selected years around the current recession shown but analyses for all years available in the on-line appendix.
CI = Confidence Interval
OR = Odds Ratio
P = P value

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Table 3: Odds ratio and % difference for GHQ caseness by year for women

	Model 1 (age adjusted)			Model 2 (adjusted for age, education level and employment status)		
Year	**OR (95% CI)***	**P**	**% difference (95% CI)**	**OR (95% CI)***	**P**	**% difference (95% CI)**
1991	1.75 (1.40 to 2.20)	0.000	7.34 (4.40 to 10.27)	1.81 (1.39 to 2.36)	0.000	7.53 (4.30 to 10.75)
1992	1.46 (1.16 to 1.84)	0.001	5.31 (2.14 to 8.48)	1.59 (1.25 to 2.02)	0.000	6.32 (3.10 to 9.54)
1993	1.43 (1.29 to 1.57)	0.000	4.87 (3.52 to 6.22)	1.55 (1.39 to 1.73)	0.000	5.83 (4.37 to 7.30)
1994	1.61 (1.45 to 1.78)	0.000	6.32 (4.98 to 7.66)	1.77 (1.58 to 1.99)	0.000	7.33 (5.90 to 8.76)
1997	1.59 (1.38 to 1.84)	0.000	6.17 (4.27 to 8.06)	1.68 (1.43 to 1.96)	0.000	6.55 (4.62 to 8.49)
1998	1.47 (1.31 to 1.64)	0.000	4.98 (3.56 to 6.39)	1.58 (1.39 to 1.79)	0.000	5.64 (4.15 to 7.13)
1999	1.29 (1.11 to 1.50)	0.001	3.59 (1.50 to 5.67)	1.40 (1.19 to 1.65)	0.000	4.44 (2.30 to 6.59)
2000	1.47 (1.24 to 1.73)	0.000	4.63 (2.66 to 6.61)	1.61 (1.33 to 1.94)	0.000	5.22 (3.19 to 7.26)
2001	1.44 (1.28 to 1.62)	0.000	4.19 (2.85 to 5.53)	1.55 (1.37 to 1.77)	0.000	4.75 (3.38 to 6.13)
2002	1.41 (1.21 to 1.64)	0.000	4.73 (2.71 to 6.76)	1.51 (1.27 to 1.78)	0.000	5.32 (3.19 to 7.45)
2003	1.29 (1.14 to 1.45)	0.000	2.91 (1.52 to 4.29)	1.38 (1.20 to 1.58)	0.000	3.44 (1.99 to 4.88)
2004	1.35 (1.11 to 1.63)	0.002	3.37 (1.25 to 5.49)	1.40 (1.14 to 1.71)	0.001	3.51 (1.38 to 5.65)
2005	1.52 (1.29 to 1.80)	0.000	4.85 (2.97 to 6.72)	1.68 (1.40 to 2.03)	0.000	5.46 (3.57 to 7.35)
2006	1.33 (1.18 to 1.49)	0.000	3.29 (1.92 to 4.67)	1.40 (1.22 to 1.60)	0.000	3.57 (2.18 to 4.96)
2008	1.46 (1.29 to 1.65)	0.000	4.41 (3.03 to 5.79)	1.54 (1.34 to 1.76)	0.000	4.52 (3.11 to 5.94)
2009	0.99 (0.79 to 1.24)	0.927	-0.15 (-3.26 to 2.97)	1.09 (0.86 to 1.39)	0.465	1.13 (-1.89 to 4.15)
2010	1.19 (1.01 to 1.39)	0.036	2.24 (0.16 to 4.32)	1.24 (1.04 to 1.48)	0.016	2.63 (0.52 to 4.75)

* Reference group is men
CI = Confidence Interval
OR = Odds Ratio
P = P value

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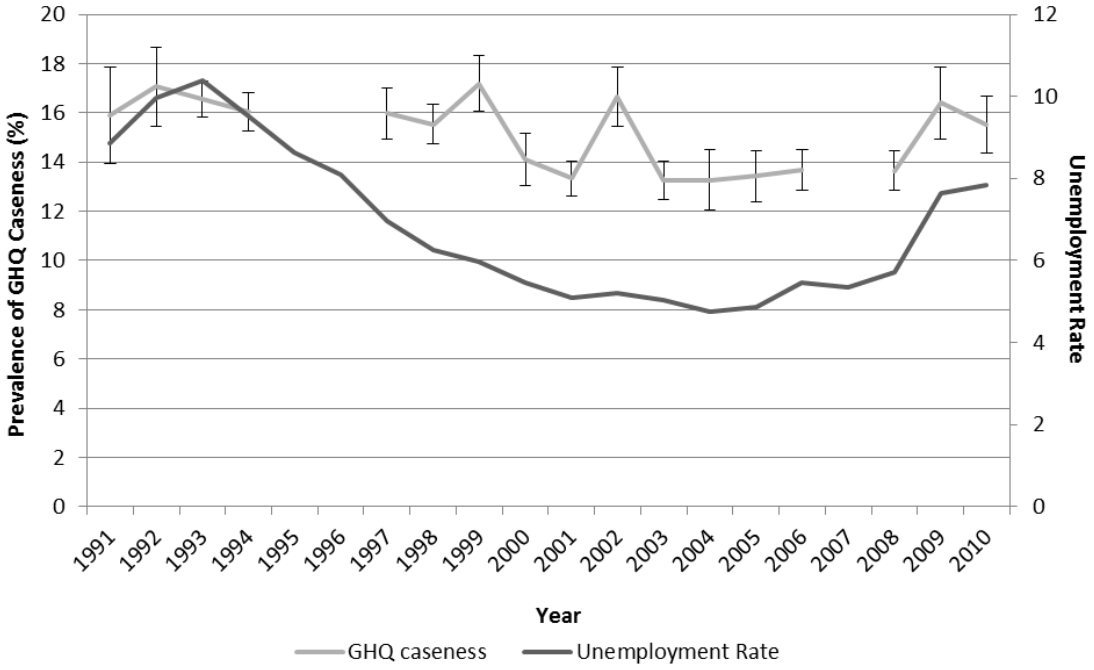

Figure 1: Overall prevalence of GHQ caseness and unemployment rate 1991 to 2010

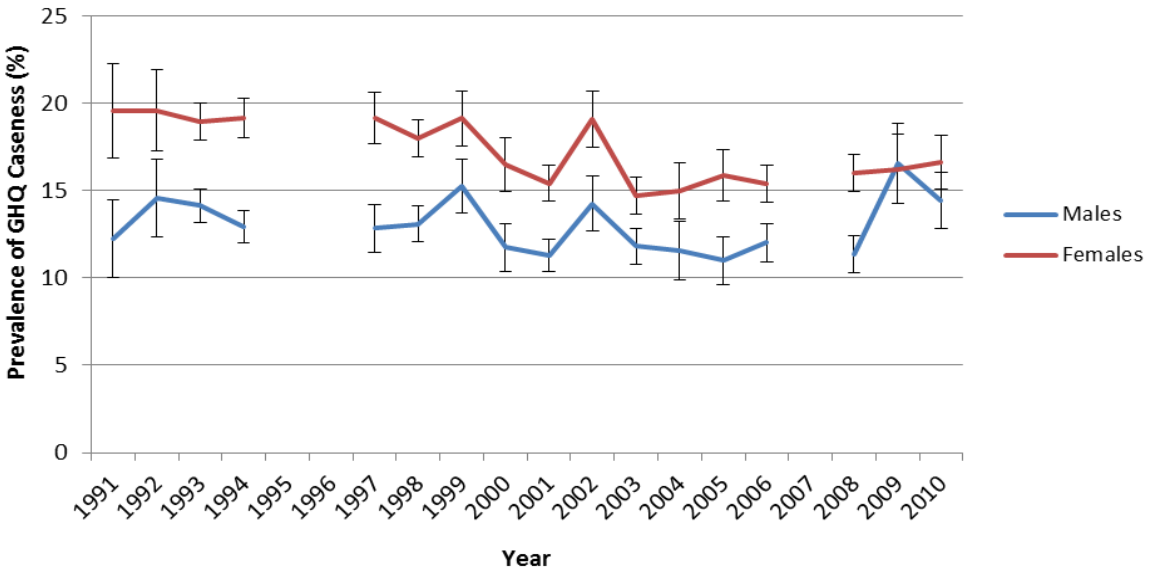

Figure 2: Prevalence of GHQ caseness by gender 1991 to 2010

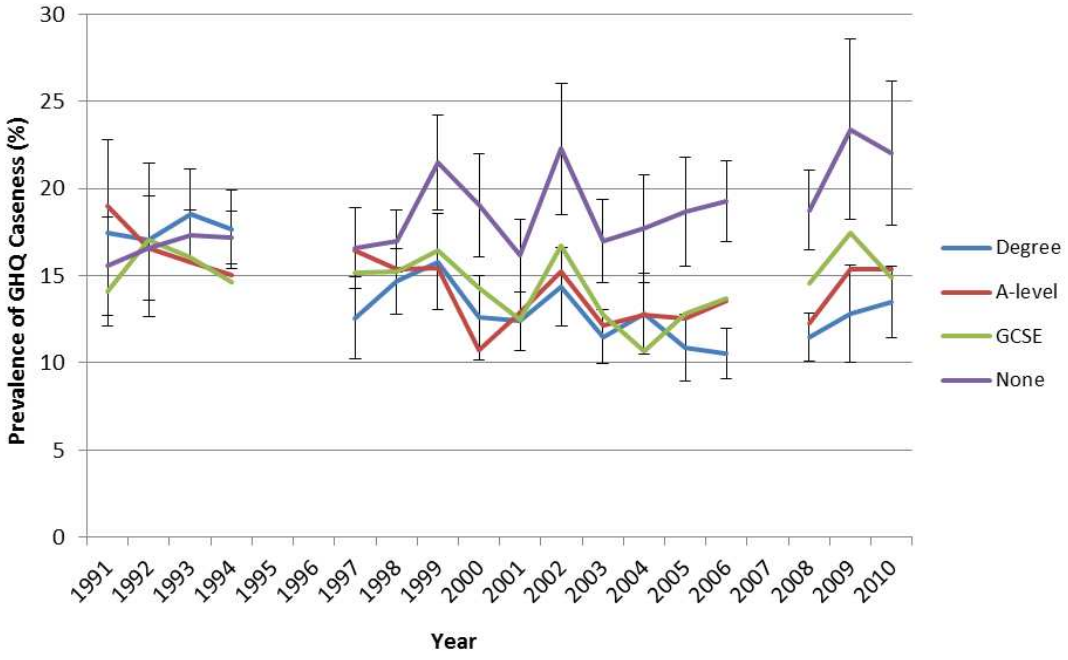

Figure 3: Prevalence of GHQ caseness by highest education level 1991 to 2010

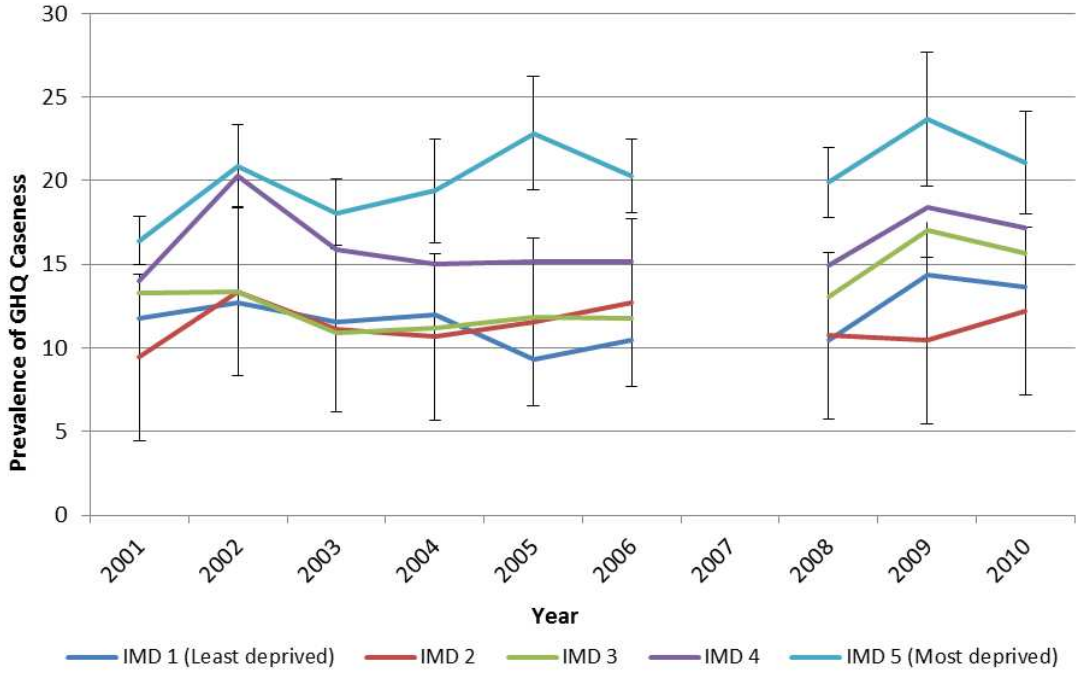

Figure 4: Prevalence of GHQ caseness by area-level deprivation (index for multiple deprivation, IMD) 2001 to 2010

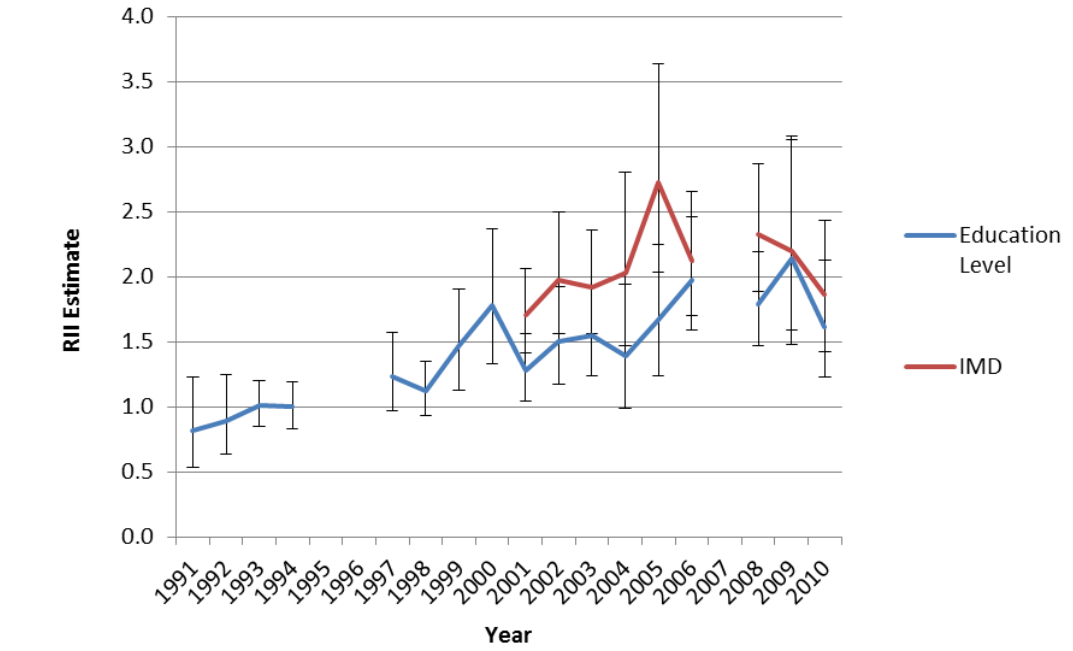

Figure 5: Relative Index of Inequality (RII) for GHQ Caseness as assessed education level and area-level deprivation (index for multiple deprivation, IMD) 1991 to 2010

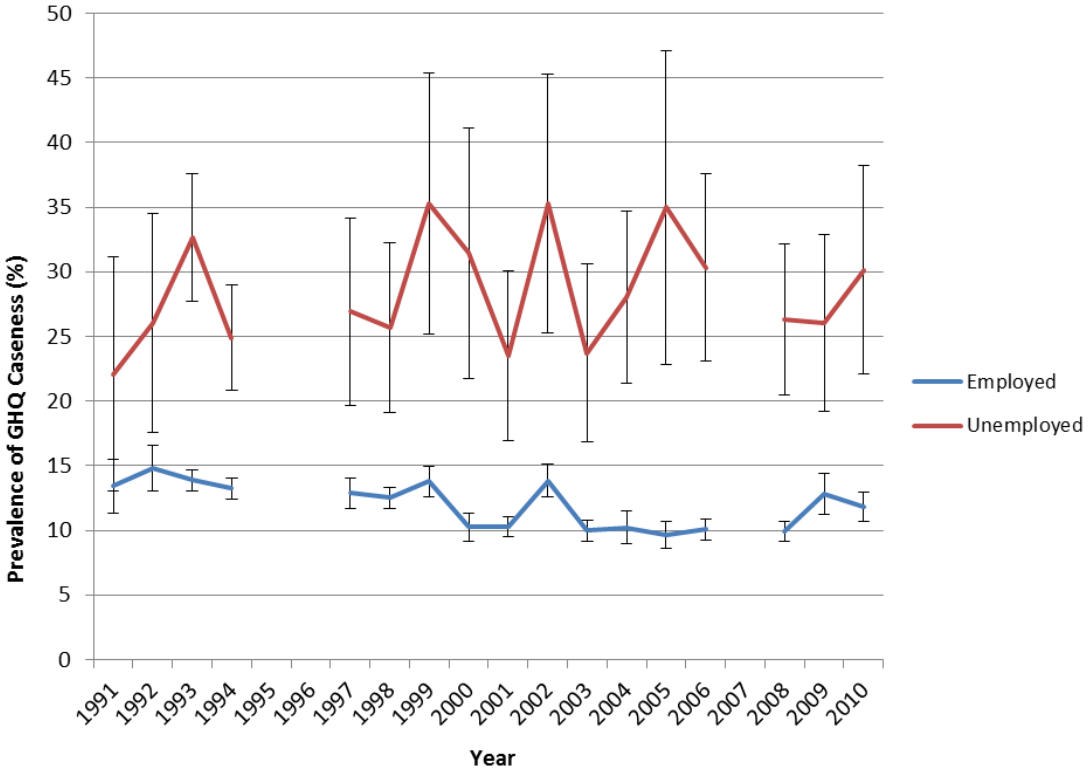

Figure 6: GHQ caseness by employment status 1991 to 2010

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Web Only Table A: Analysis of Data from 1991-2010 in Men Adjusted for Age, Employment Status and Education

Model 1: Age								
Year	**OR**	**P**	**Lower 95% CI**	**Upper 95% CI**	**% difference**	**P**	**Lower 95% CI**	**Upper 95% CI**
1991	1.09	0.484	0.86	1.36	0.85	0.492	-1.57	3.27
1992	1.30	0.013	1.06	1.59	2.91	0.018	0.50	5.31
1993	1.28	0.000	1.13	1.46	2.76	0.000	1.35	4.17
1994	1.15	0.040	1.01	1.31	1.49	0.038	0.08	2.89
1997	1.15	0.091	0.98	1.34	1.46	0.094	-0.25	3.17
1998	1.17	0.029	1.02	1.34	1.65	0.028	0.17	3.13
1999	1.40	0.000	1.20	1.64	3.89	0.000	2.03	5.75
2000	1.04	0.624	0.88	1.23	0.43	0.625	-1.31	2.17
2001	0.98	0.825	0.86	1.13	-0.16	0.825	-1.55	1.24
2002	1.29	0.003	1.09	1.52	2.79	0.004	0.91	4.68
2003	1.05	0.534	0.91	1.21	0.47	0.534	-1.00	1.94
2004	1.00	0.963	0.83	1.22	0.05	0.963	-1.88	1.97
2005	0.97	0.723	0.82	1.15	-0.31	0.722	-2.02	1.40
2006	1.06	0.465	0.91	1.22	0.56	0.465	-0.95	2.08
2008	1.00	-	-	-	0.00	-	-	-
2009	1.53	0.000	1.26	1.86	5.07	0.000	2.60	7.55
2010	1.31	0.001	1.12	1.54	3.04	0.001	1.17	4.91
Model 2: Age + Employment Status								
Year	**OR**	**P**	**Lower 95% CI**	**Upper 95% CI**	**% difference**	**P**	**Lower 95% CI**	**Upper 95% CI**
1991	1.03	0.793	0.81	1.32	0.32	0.795	-2.12	2.77
1992	1.19	0.108	0.96	1.48	1.83	0.119	-0.47	4.14
1993	1.22	0.005	1.06	1.40	2.06	0.004	0.66	3.46
1994	1.07	0.308	0.94	1.23	0.72	0.306	-0.66	2.09
1997	1.06	0.453	0.90	1.25	0.62	0.455	-1.01	2.26
1998	1.12	0.128	0.97	1.29	1.12	0.127	-0.32	2.55
1999	1.32	0.001	1.12	1.55	2.97	0.001	1.19	4.75
2000	0.95	0.549	0.80	1.13	-0.50	0.547	-2.13	1.13
2001	0.93	0.303	0.81	1.07	-0.71	0.305	-2.05	0.64
2002	1.26	0.007	1.06	1.50	2.46	0.009	0.62	4.30
2003	1.01	0.926	0.87	1.17	0.07	0.926	-1.36	1.50
2004	0.99	0.959	0.82	1.20	-0.05	0.959	-1.90	1.80
2005	0.92	0.370	0.78	1.10	-0.75	0.367	-2.39	0.88
2006	1.05	0.511	0.91	1.22	0.49	0.511	-0.98	1.96
2008	1.00	-	-	-	0.00		0.00	0.00
2009	1.50	0.000	1.24	1.82	4.54	0.000	2.23	6.86
2010	1.31	0.001	1.11	1.54	2.86	0.002	1.07	4.65
Model 3: Age + Employment Status + Education								
Year	**OR**	**P**	**Lower 95% CI**	**Upper 95% CI**	**% difference**	**P**	**Lower 95% CI**	**Upper 95% CI**
1991	1.07	0.612	0.83	1.36	0.63	0.617	-1.84	3.10
1992	1.22	0.069	0.98	1.51	2.07	0.079	-0.24	4.37
1993	1.25	0.002	1.09	1.43	2.29	0.001	0.88	3.70
1994	1.10	0.184	0.96	1.26	0.94	0.182	-0.44	2.32
1997	1.08	0.363	0.92	1.27	0.75	0.366	-0.88	2.39
1998	1.13	0.086	0.98	1.31	1.26	0.085	-0.17	2.69

1999	1.34	0.001	1.13	1.57	3.09	0.001	1.31	4.86
2000	0.96	0.607	0.81	1.13	-0.43	0.606	-2.05	1.20
2001	0.93	0.347	0.81	1.08	-0.64	0.349	-1.98	0.70
2002	1.27	0.007	1.07	1.50	2.48	0.008	0.64	4.31
2003	1.01	0.847	0.88	1.17	0.14	0.846	-1.28	1.57
2004	1.00	0.989	0.83	1.21	0.01	0.989	-1.83	1.86
2005	0.93	0.394	0.78	1.10	-0.71	0.391	-2.34	0.92
2006	1.05	0.506	0.91	1.22	0.50	0.506	-0.96	1.95
2008	1.00	-	-	-	0.00	-	-	-
2009	1.50	0.000	1.24	1.82	4.52	0.000	2.21	6.83
2010	1.30	0.002	1.10	1.53	2.79	0.002	1.01	4.56

* Reference group is 2008
CI = Confidence Interval
OR = Odds Ratio
P = P value

Web Only Table B: Analysis of Data from 1991-2010 in Women Adjusted for Age, Employment Status and Education

Model 1: Age								
Year	**OR**	**P**	**Lower 95% CI**	**Upper 95% CI**	**% difference**	**P**	**Lower 95% CI**	**Upper 95% CI**
1991	1.30	0.006	1.08	1.56	3.76	0.009	0.93	6.59
1992	1.30	0.001	1.11	1.53	3.80	0.002	1.35	6.26
1993	1.25	0.000	1.12	1.39	3.19	0.000	1.69	4.68
1994	1.26	0.000	1.14	1.40	3.36	0.000	1.84	4.88
1997	1.25	0.000	1.10	1.41	3.17	0.001	1.39	4.96
1998	1.17	0.005	1.05	1.30	2.17	0.005	0.67	3.67
1999	1.24	0.001	1.09	1.41	3.09	0.001	1.24	4.94
2000	1.05	0.521	0.91	1.20	0.60	0.523	-1.24	2.45
2001	0.97	0.642	0.87	1.09	-0.35	0.642	-1.82	1.12
2002	1.24	0.001	1.09	1.41	3.10	0.001	1.22	4.98
2003	0.92	0.171	0.82	1.04	-1.04	0.170	-2.53	0.45
2004	0.93	0.313	0.80	1.08	-1.00	0.308	-2.91	0.92
2005	1.01	0.917	0.88	1.15	0.09	0.918	-1.69	1.88
2006	0.96	0.467	0.86	1.07	-0.55	0.467	-2.04	0.94
2008	1.00	-	-	-	0.00	-	-	-
2009	1.04	0.641	0.88	1.23	0.53	0.643	-1.70	2.76
2010	1.06	0.369	0.93	1.22	0.84	0.372	-1.01	2.70
Model 2: Age + Employment Status								
Year	**OR**	**P**	**Lower 95% CI**	**Upper 95% CI**	**% difference**	**P**	**Lower 95% CI**	**Upper 95% CI**
1991	1.29	0.007	1.07	1.55	3.57	0.010	0.86	6.28
1992	1.31	0.002	1.11	1.55	3.77	0.003	1.29	6.25
1993	1.24	0.000	1.11	1.38	2.95	0.000	1.49	4.42
1994	1.26	0.000	1.13	1.41	3.25	0.000	1.76	4.73
1997	1.20	0.003	1.06	1.36	2.54	0.004	0.81	4.27
1998	1.15	0.014	1.03	1.28	1.83	0.013	0.38	3.29
1999	1.21	0.003	1.07	1.38	2.63	0.004	0.85	4.41
2000	1.02	0.766	0.89	1.17	0.27	0.766	-1.49	2.02
2001	0.94	0.308	0.84	1.06	-0.74	0.308	-2.17	0.69
2002	1.22	0.002	1.07	1.39	2.73	0.003	0.93	4.52
2003	0.92	0.170	0.82	1.04	-1.02	0.170	-2.47	0.44

2004	0.92	0.261	0.79	1.07	-1.09	0.254	-2.97	0.79
2005	1.00	0.958	0.88	1.15	0.05	0.959	-1.70	1.79
2006	0.95	0.342	0.85	1.06	-0.70	0.341	-2.13	0.74
2008	1.00	-	-	-	0.00	-	-	-
2009	1.06	0.522	0.90	1.24	0.70	0.526	-1.48	2.89
2010	1.05	0.493	0.91	1.20	0.63	0.495	-1.18	2.43
Model 3: Age + Employment Status + Education								
Year	**OR**	**P**	**Lower 95% CI**	**Upper 95% CI**	**% difference**	**P**	**Lower 95% CI**	**Upper 95% CI**
1991	1.29	0.007	1.07	1.55	3.56	0.011	0.83	6.28
1992	1.31	0.002	1.11	1.55	3.79	0.003	1.31	6.26
1993	1.24	0.000	1.11	1.38	2.96	0.000	1.48	4.44
1994	1.26	0.000	1.14	1.41	3.26	0.000	1.77	4.76
1997	1.20	0.004	1.06	1.36	2.54	0.004	0.81	4.27
1998	1.15	0.013	1.03	1.28	1.85	0.013	0.39	3.30
1999	1.21	0.003	1.07	1.38	2.64	0.004	0.85	4.42
2000	1.02	0.752	0.89	1.17	0.28	0.753	-1.47	2.04
2001	0.94	0.319	0.84	1.06	-0.72	0.319	-2.15	0.70
2002	1.22	0.002	1.07	1.39	2.75	0.003	0.96	4.55
2003	0.92	0.179	0.82	1.04	-1.00	0.178	-2.45	0.46
2004	0.92	0.263	0.79	1.07	-1.09	0.257	-2.97	0.79
2005	1.00	0.956	0.88	1.15	0.05	0.956	-1.69	1.79
2006	0.95	0.344	0.85	1.06	-0.69	0.344	-2.13	0.74
2008	1.00	-	-	-	0.00	-	-	-
2009	1.06	0.523	0.90	1.24	0.70	0.527	-1.48	2.88
2010	1.05	0.482	0.92	1.20	0.64	0.485	-1.16	2.44

* Reference group is 2008
CI = Confidence Interval
OR = Odds Ratio
P = P value

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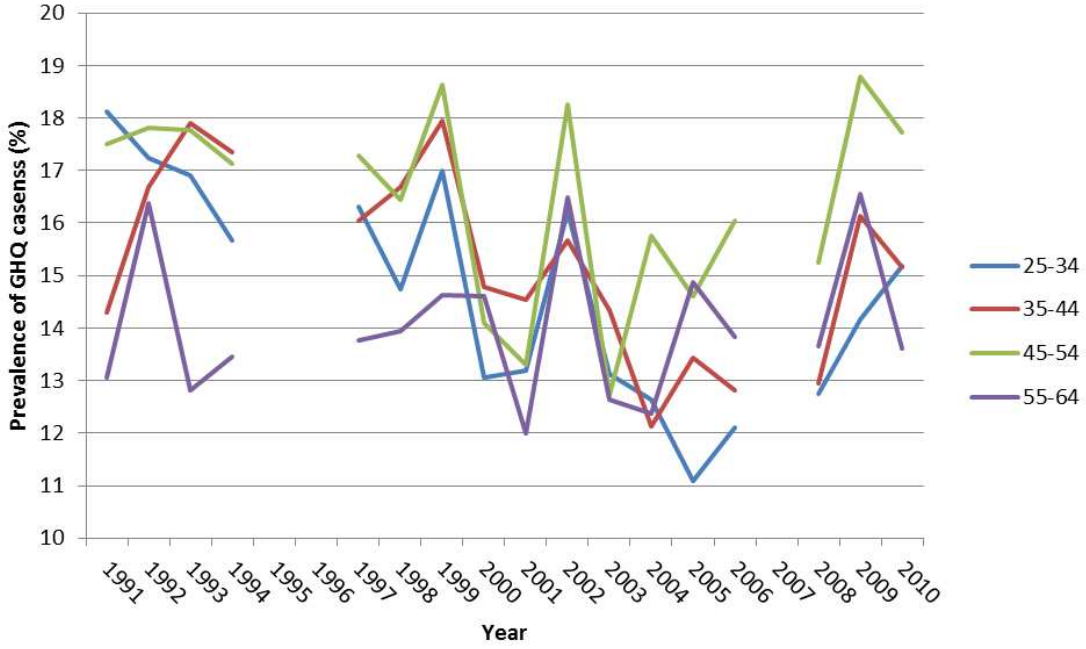

Web figure: Prevalence of GHQ caseness by age group 1991 to 2010

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Unemployement Rate & % GHQ caseness by gender

		Both sexes			Male	
Year	Unemployment Rate	Mean	Lower 95% CI	Upper 95% CI	Mean	Lower 95% CI
1991	8.85	15.90	13.92	17.87	12.26	10.04
1992	9.95	17.06	15.46	18.66	14.54	12.31
1993	10.38	16.55	15.81	17.29	14.13	13.20
1994	9.50	16.04	15.27	16.81	12.92	11.98
1995	8.63					
1996	8.10					
1997	6.95	15.97	14.93	17.01	12.83	11.48
1998	6.25	15.54	14.75	16.32	13.09	12.04
1999	5.98	17.19	16.04	18.33	15.24	13.70
2000	5.45	14.11	13.03	15.18	11.73	10.35
2001	5.10	13.33	12.61	14.05	11.25	10.33
2002	5.20	16.67	15.46	17.87	14.25	12.67
2003	5.03	13.24	12.46	14.02	11.80	10.77
2004	4.75	13.27	12.03	14.51	11.57	9.91
2005	4.88	13.42	12.38	14.46	10.98	9.63
2006	5.45	13.69	12.87	14.52	12.02	10.92
2007	5.35					
2008	5.73	13.65	12.85	14.45	11.33	10.27
2009	7.65	16.40	14.94	17.86	16.57	14.28
2010	7.85	15.53	14.37	16.68	14.42	12.83

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		Female	
Upper 95% CI	Mean	Lower 95% CI	Upper 95% CI
14.48	19.53	16.84	22.22
16.77	19.58	17.23	21.92
15.07	18.96	17.90	20.02
13.86	19.16	18.05	20.27
14.18	19.11	17.65	20.58
14.13	17.99	16.91	19.06
16.79	19.13	17.56	20.70
13.12	16.48	14.94	18.01
12.17	15.40	14.37	16.44
15.83	19.08	17.50	20.67
12.84	14.68	13.62	15.74
13.22	14.98	13.35	16.61
12.34	15.86	14.42	17.31
13.11	15.37	14.30	16.44
12.39	15.97	14.91	17.03
18.85	16.23	14.25	18.21
16.01	16.63	15.11	18.16

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STROBE Statement—checklist of items that should be included in reports of observational studies

The Effects of the Recession on Population Mental Health: A Repeat Cross-Sectional Analysis of the Health Surveys of England

	Item No	Recommendation
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract **Title**
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found **Abstract**
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported **Introduction, Paragraph 2**
Objectives	3	State specific objectives, including any prespecified hypotheses **Introduction, Paragraph 3**
Methods		
Study design	4	Present key elements of study design early in the paper **Methods, Paragraph 2**
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection **Methods, Paragraph 1**
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants **Methods, Paragraph 3 and cited references therein**
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable **Methods, Paragraphs 3-5**
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group **Methods, Paragraphs 3-5**
Bias	9	Describe any efforts to address potential sources of bias **Methods, Paragraph 4 of Statistical Analysis**
Study size	10	Explain how the study size was arrived at **Existing data analysis. Methods, Paragraph 3and Table 1.**

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Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why **Methods, Paragraphs 3-5**
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding **Methods, Statistical Analysis section**
		(*b*) Describe any methods used to examine subgroups and interactions **Methods, Statistical Analysis section**
		(*c*) Explain how missing data were addressed **Methods, Paragraph 3 (Population)**
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed *Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy **Methods, Paragraph 4 of Statistical Analysis section**
		(*e*) Describe any sensitivity analyses **Methods, Paragraph 3**

Continued on next page

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Results		
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed **Table 1 and Methods, Paragraph 3 and cited references**
		(b) Give reasons for non-participation at each stage **Methods, Paragraph 3 and cited references**
		(c) Consider use of a flow diagram **Table 1**
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders **Table 1**
		(b) Indicate number of participants with missing data for each variable of interest **Methods, Paragraph 3**
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time
		Case-control study—Report numbers in each exposure category, or summary measures of exposure
		Cross-sectional study—Report numbers of outcome events or summary measures **Table 1 and Figures provided**
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included **Tables 1-3**
		(*b*) Report category boundaries when continuous variables were categorized **Methods, Paragraph 5**
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period **Reported in Tables 2-3 and main text.**
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses **Provided in on-line appendix**
Discussion		
Key results	18	Summarise key results with reference to study objectives **Discussion, Paragraph 1**
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias **Discussion, Paragraph 2**
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence **Discussion, Paragraph 3**
Generalisability	21	Discuss the generalisability (external validity) of the study results **Discussion, Paragraph 4**
Other information		
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based

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Funding statement provided

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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Trends in Population Mental Health Before and After the 2008 Recession: A Repeat Cross-Sectional Analysis of the 1991-2010 Health Surveys of England

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Trends in Population Mental Health Before and After the 2008 Recession: A Repeat Cross-Sectional Analysis of the 1991-2010 Health Surveys of England

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SVK acts as guarantor for this article.

Data sharing: Additional results are available as a supplemental file from the BMJ website. The Health Surveys for England are available from the UK Data Archive.

Ethics approval: This study is an analysis of previously collected data and therefore ethical approval was not required for this study. Ethical approval for each survey was obtained by the Health Survey for England team.

Word count (of main manuscript): 2,771

Competing Interest Statement
All authors have completed the Unified Competing Interest form at www.icmje.org/coi_disclosure.pdf (available on request from the corresponding author) and declare that they have no conflicts of interest.

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Abstract

Objective: To assess short-term differences in population mental health before and after the 2008 recession and explore how and why these changes differ by gender, age and socio-economic position.
Design: Repeat cross-sectional analysis of survey data
Setting: England
Participants: Representative samples of the working age (25-64 years) general population participating in the Health Survey for England between 1991 and 2010 inclusive.
Main Outcome Measures: Prevalence of poor mental health (caseness) as measured by the General Health Questionnaire-12 (GHQ)
Results: Age-sex standardised prevalence of GHQ caseness increased from 13.7% (95% CI 12.9-14.5%) in 2008 to 16.4% (95% CI 14.9-17.9%) in 2009 and 15.5% (95% CI 14.4-16.7%) in 2010. Women had a consistently greater prevalence since 1991 until the current recession. However, compared to 2008, men experienced an increase in age-adjusted caseness of 5.1% (95% CI 2.6-7.6%, $p<0.001$) in 2009 and 3.0% (95% CI 1.2-4.9%, $p=0.001$) in 2010, while no statistically significant changes were seen in women. Adjustment for differences in employment status and education level did not account for the observed increase in men nor did they explain the differential gender patterning. Over the last decade, socio-economic inequalities showed a tendency to increase but no clear evidence for an increase in inequalities associated with the recession was found. Similarly, no evidence was found for a differential effect between age groups.
Conclusions: Population mental health in men has deteriorated within two years of the onset of the current recession. These changes, and their patterning by gender, could not be accounted for by differences in employment status. Further work is needed to monitor recessionary impacts on health inequalities in response to ongoing labour market and social policy changes.

Words: 275

What is already known on this subject?

Previous studies have found differing impacts of recession on mental health, with some outcomes, such as suicide, increasing in men more than women. However, as the labour market changes and employment among women becomes increasingly important, it has been suggested that this gender difference may no longer exist. Few studies have investigated mental health morbidity and its patterning by population subgroups over prolonged periods of time.

What this study adds

There has been an increase in the prevalence of poor mental health among men in England in the two years after the start of the current recession. These changes, and their patterning by gender, cannot be accounted for by differences in employment status over time.

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Article Focus

- Previous studies have found differing impacts of recession on mental health, with some deteriorations in health outcomes (such as suicide) being worse in men than women.
- Few studies have investigated mental health morbidity and its patterning by population subgroups over prolonged periods of time.
- We assess short-term changes in population mental health and inequalities (by gender, age and socio-economic position) following the recent recession, by placing it in a longer historical context.

Key Messages

- Population mental health in men has deteriorated within two years of the onset of the current recession.
- These changes in population mental health, and their patterning by gender, cannot be accounted for by differences in employment status over time.

Strengths & Limitations

- Our study uses a large nationally representative dataset to assess trends over a long length of time and an outcome likely to be sensitive to changes in the macro-economic environment.
- We assess trends across a number of dimensions (and measures) of inequality, helping to address an important gap in the current literature.
- Establishing causality from this research is difficult given the cross-sectional (rather than longitudinal) nature of the surveys and lack of available data for some time periods.

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Introduction

Macro-economic factors are known to influence population health and health inequalities[1]. The onset of the global economic downturn heralded by the collapse of Lehman Brothers in September 2008 can therefore be considered a potential threat to public health [2-4]. In the UK, national gross domestic product (GDP) has fallen in real terms (with a 5.5% fall per head of population between 2008 and 2009) and unemployment rates have increased since the recession began [5]. Neither indicator has yet recovered to pre-recession levels at the time of writing [6]. Unemployment is associated with a number of adverse health impacts including poor mental health, short-term increases in adverse health behaviours and increased mortality risk [7-9]. However, the effects of recession appear to be more complex than would be expected from the impact of increases in unemployment alone. For example, there is a growing body of research suggesting that at least in the short term, recessions are associated with a faster decline in mortality although some specific causes of death, such as suicide, may rise [10]. Thus, mortality impacts of recessions may be more complex than intuition suggests and likely vary by outcome and context [4 7].

Less empirical analysis has focused on the effect of recession on trends in population mental health. Macro-economic change could potentially have a more rapid effect on mental health compared to mortality, particularly for those of working age. Historically, both periods of recession and unemployment appear to have had a greater impact on men compared to women [7]. However, it has been suggested that this differential impact may no longer be present as growing female labour market participation may increase their susceptibility to macro-economic changes [11 12]. In addition, it is not clear to what extent changes in health status associated with recessionary periods are mediated purely through changes in labour market status. The UK experienced its first recession since 1991 (defined as two quarters of negative growth in gross domestic product) in late 2008 [13]. Unemployment (which is commonly used as a marker of recession that has a more direct effect on health) showed marked increases between 1991-3 and 2008-10.

In this paper, we aim to assess short-term changes in population mental health and inequalities (by gender, age and socio-economic position) following the onset of the recent recession by placing it in a longer historical context. We further aim to investigate to what extent any observed associations and their patterning by subgroups can be accounted for by differences in employment status and education level.

Methods

Data sources

We used data from the Health Survey for England, a nationally representative cross-sectional survey of the community dwelling population, conducted annually from 1991 onwards. Survey methodology has been described elsewhere [14-16]. Household response rates for the period studied varied from 85% in 1991 to 64% in 2008.

Unemployment rates (available for the whole period) and gross GDP per head (comparable data available for 1991-2009) for the UK were retrieved to provide

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context for the interpretation of trends [5 17]. In addition, unemployment data for England (available for 1993 onwards) were retrieved and showed similar trends to the UK data [18]. These macro-economic indicators all show marked deterioration between 2008 and 2009; hence we use 2008 as the reference year for comparison.

Population

The general population samples from the Health Surveys for England were used for all analyses. The study population was restricted to participants of a working age, between 25 years and 64 years inclusive. Those aged under 25 years were excluded to minimise misclassification of education level. Participants missing any data on age, sex, highest education level, employment status and outcome were excluded from the analysis (5.15% of total sample excluded). We excluded 2918 participants (2.59% of the sample) with foreign/other qualifications as we were unable to categorise their highest educational attainment accurately. We excluded 847 individuals (0.75%) who defined themselves as doing unpaid work for their family, waiting to take up employment or undertaking government training schemes. Results of overall prevalence estimates were similar when those with missing data (apart from the 1.60% missing outcome data) were included. Similar results were also obtained when the population was limited to those aged 25-59 years, to investigate the potential for gender differentials arising from a younger age of retirement among women.

Exposures

Socio-economic position was assessed using highest education level (self-reported) and area-level deprivation. Comparable information on education level was available for every survey year except 1995 and 1996 and area-level deprivation was available from 2001 onwards. Educational level was coded into four categories: degree-level or equivalent qualifications, A-level or equivalent, GCSE or equivalent and no qualifications, while the index of multiple deprivation (IMD) was coded into quintiles. Participants were asked to self-identify their employment status based on their activity in the previous week before the survey interview. Employment status was coded into six categories: employed, unemployed, unable to work due to ill health, looking after family/maternity care, retired and in full-time education. Equivalised household income (coded into quintiles and in a sensitivity analysis as a continuous variable) was analysed for the years 2000 onwards in an exploratory analysis.

Outcome Measures

Mental health was assessed in every survey year except 1996 and 2007 through the general health questionnaire (GHQ-12). GHQ-12 is a screening tool for anxiety and depression, validated for use in epidemiological studies [19]. Respondents scoring 4 or more have a high likelihood of poor mental health and are considered a 'case' [20].

Statistical Analysis

For the first stage of analysis, we analysed data for each year separately. Prevalence estimates for GHQ caseness (age-sex standardisation to the WHO European standard population) were calculated for each year, stratified by age, sex, education level and employment status.

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In the second stage of analysis, logistic regression analysis was conducted for each year separately to explore any differential patterning in recession years between men and women. To measure the extent of socio-economic inequality in prevalence on a relative scale we calculated the relative index of inequality using a Poisson modelling approach [15].

We directly tested the impact of the recent recession in the final stage of the analysis by creating a combined dataset for all years and creating a logistic regression model adjusting for year, age, education level and employment status. Men and women were analysed separately given the effect modification observed between genders and year. A final stage of analysis investigated if equivalised household income helped explain differences in GHQ prevalence before and after the recession.

All analyses were carried out using Stata v11.2. Weights for non-response (available from 2003 onwards) were used for all analyses. These were scaled to a mean of 1 for each year to allow analysis of the combined dataset. Robust standard errors were used to adjust for survey clustering at the area level. Adjusted prevalence differences were derived from the logistic regression models as well as odds ratios in order to allow comparisons across models to be made on the absolute scale [21].

Results

A total of 106,985 participants were included in the main analysis of trends in GHQ caseness (Table 1). The sample response rate declined gradually over time, but they were broadly comparable over the most recent years with no marked changes in response rates during the onset of the current recession. There was also socio-economic change with a decline in the percentage of people with no qualifications and an increase in participants with a degree.

GHQ caseness was relatively high during the time of the early 1990s recession (Figure 1). Since then, there has been an indication of a general downward trend with some variability, until a more recent increase in prevalence that occurs after 2008. Caseness increased from 13.7% (95% CI 12.9-14.5%) in 2008 to 16.4% (95% CI 14.9-17.9%) in 2009.

Impact by Subgroups

A gender differential in GHQ caseness is apparent; women have a consistently higher prevalence over most of the time period (Figure 2). However, during the early 1990s recession, men had a larger increase in prevalence of GHQ caseness from 12.3% in 1991 to 14.5% in 1992. A similar trend is seen following the 2008 recession with an increase from 11.3% to 16.6% in men, compared to 16.0% to 16.2% in women between 2008 and 2009.

Stratified analysis by age shows that changes in mental health during recessionary periods are not confined to any specific age groups (see on-line appendix). Sensitivity analysis including those aged 16-24 years showed no clear difference in trends.

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In the early 1990s, stratification by education level reveals an initial reverse education gradient in GHQ caseness (Figure 3). Over time, a growing disparity in GHQ caseness between those most and least educated is apparent, with the highest levels of inequality in poor mental health observed in 2005. A similar pattern is seen when assessing caseness by area-level deprivation (Figure 4). The greatest levels of relative indices of inequality are also seen since 2005 when assessed by either measure of socio-economic position (Figure 5). No significant differences before and after the recession by area-level deprivation are observed.

Changes in population mental health do not appear to be entirely mediated by changes in employment status. For example, the prevalence of GHQ caseness amongst those in employment increased during both recessionary periods: from 13.4% (95% CI 11.4-15.5%) to 14.8% (95% CI 13.1-16.6%) in 1991-2 and from 9.9% (95% CI 9.2-10.7%) to 12.9% (11.3-14.4%) between 2008 and 2009 (Figure 6).

Exploration of the Differential Trends by Gender

A combined dataset for all years was analysed separately for men and women, given the effect modification observed. Compared to a baseline of 2008, age-adjusted caseness increased by 5.1% (95% 2.6-7.6%, p<0.001) in 2009 and 3.0% (95% 1.2-4.9%, p=0.001) in 2010 amongst men but no statistically significant changes are seen in women (Table 2 and Web Tables A-B). Adding employment status to the model suggests that changes in employment status do not explain this increase in poor mental health. Similarly, adjustment for changes in employment status and education level does not account for this increase in prevalence. Finally, adjustment for equivalised household income in a post-hoc exploratory analysis also did not explain changes in prevalence (see Web Table C).

We attempted to explore the reasons for the adverse changes in the years following the recession among men. When analysing data from each year separately, adjustment for differences in education level and employment status between genders did not account for the larger increase in prevalence amongst men (see Table 3). Therefore, the differing trend in mental health in men appears not to be explained by differing changes in labour market status.

Discussion

In this large repeat cross-sectional study of representative samples of the English population, we have found evidence to suggest population mental health has deteriorated in men following the start of the 2008 recession. Notably, this change does not appear to arise only as a result of an increase in unemployment, but mental health appears to have declined among those in employment. Household income also does not account for the observed trend in mental health. While some commentators have recently suggested that the current recession may affect both genders in a similar manner, we find that the deterioration in mental health appears only amongst men. Furthermore, this differential association cannot be adequately accounted for by changes in employment status (such as greater unemployment) amongst men. We also find evidence to suggest that socio-economic inequalities (assessed by both highest

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education level and area-level deprivation) have increased over the course of the last decade, but the recession had not been associated with a widening of socio-economic inequalities in mental health by the year 2010.

Our study has a number of strengths. We used a large nationally representative dataset which used a validated screening test for anxiety and depression. Importantly, we assessed trends over a long length of time with annual measures available for most of the period and an outcome likely to be sensitive to changes in the macro-economic environment. This allows greater certainty in attribution compared to studies limited to comparisons of single before and after surveys.

As our study makes use of available data, a number of important limitations exist. First, data was not available for every year, with the omission of GHQ in 2007 potentially problematic as this represents the last full pre-recessionary year. Second, we have been limited to repeat cross-sectional analysis. Longitudinal analysis of individuals would allow greater scope for relating changes in individual employment status to health. Third, while we have chosen a validated outcome measure, it is possible that framing effects could account for some of the observed changes. In particular, GHQ items were asked first in the self-completion questionnaire in 1999, 2002 and 2009, all years with a high prevalence. However, the higher prevalence following 2008 among men remains in 2010. Fourth, defining recessionary periods and exploring their effects are notoriously difficult. We have studied changes over time period but did not directly incorporate macro-economic measures into our analysis. In addition, we have only been able to investigate a few of the potential pathways between recession and mental health. Further work is needed to explore other pathways such as temporary employment and increased job insecurity. Lastly, although our study has investigated changes in population mental health associated with the recession, we cannot establish whether this is a causal relationship, as other temporal changes could account for the observed trends. However, many factors that could potentially account for our findings, such as changes in health or social care provision, could also be considered mediating factors rather than confounders.

Much previous research has focussed on mortality, and in particular suicide, associated with recession. In an analysis of cause-specific mortality and its association with recession in European countries, Stuckler et al. found that the most consistently observed relationship was an increase in suicide amongst young men [22]. More recently, they found that increases in suicide rates have been observed across European countries following the onset of the current recession [23]. Consistent increases in male suicide rates have been noted in many other studies [24]. The relationships between morbidity in mental health, health inequalities and recessions are less well understood and findings differ between studies [7 25]. A recent before and after comparison of patients attending primary care services in Spain found a marked increase in the prevalence of mental health disorders following the onset of the current global recession [26]. Household unemployment and mortgage difficulties were particularly associated with these attendances. However, not all studies have found a negative association between economic recession and mental health. For example, Vinamaki et al found no statistically significant increase in poor mental health (assessed using GHQ) following the economic recession in Finland between 1993 to 1995 in repeated general population samples [27].

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While our study finds men's mental health has declined while women's has not, it should be noted that important indirect effects of the recession, including changes in the public sector workforce and changes in government assistance for children, had yet to be implemented during the time of this study. Our analysis does not yet show any indication of worsening mental health inequalities associated with the current recession. However, there is a general trend towards a greater level of inequality more recently and there is no evidence to suggest narrowing. Further research will be required to assess ongoing impacts of the recession by gender and socio-economic position. As our analysis was restricted to a working-age population, research focussing on retired individuals is also needed to investigate the potential impact in older age groups. The existing evidence suggests that the relationship between mental health and recessions differs, at least in part, by social welfare system [10 22 28-31]. There is therefore a need for cross-national comparisons of trends in population health and health inequalities to better identify social policy responses that protect from any adverse health impacts of recession.

The finding that mental health across the general population has deteriorated following the recession's onset, and this association does not appear to be limited to those out of employment nor those whose household income has declined, has important implications. Previous research has highlighted the importance of job insecurity, rather than solely employment status, as potentially resulting in adverse effects on mental health [32]. One potential explanation for our results would be that job insecurity during the current recession is responsible for the deterioration in mental health with men's psychological health remaining more affected by economic fluctuations despite greater female labour market participation. This paper highlights the continuing importance of addressing mental health issues using population-wide approaches by both policymakers and health professionals and not limiting such efforts to those directly affected by unemployment.

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Table 1: characteristics of study participants

	Sex (%)		Age group (%)				Highest education level (%)				Employment status in last week (%)							
Year	M	F	25-34	35-44	45-54	55-64	Degree	A-level	GCSE	None	Employed	Unemployed	Not working due to ill health	Retired	Looking after home	In education	Sample	Response rate (%)
1991	46.7	53.3	29.8	27.5	21.8	20.8	11.8	18.7	33.4	36.0	71.9	5.5	4.5	4.5	13.1	0.5	2,001	85
1992	47.3	52.7	29.2	28.4	22.6	19.8	11.8	22.0	35.6	30.6	69.3	6.1	4.4	6.1	13.0	1.1	2,484	82
1993	47.5	52.5	29.7	26.6	24.3	19.4	12.8	21.7	33.3	32.2	70.9	6.3	4.3	5.5	12.4	0.6	10,502	81
1994	46.7	53.3	30.2	27.3	23.1	19.5	13.0	21.9	34.4	30.7	70.9	5.5	4.5	5.8	12.4	1.0	9,981	77
1997	47.2	52.8	29.1	27.4	25.0	18.5	16.4	24.8	31.2	27.6	71.7	3.3	6.4	4.8	12.8	1.1	5,377	76
1998	46.6	53.4	28.4	27.5	25.2	18.9	16.6	24.1	33.0	26.3	73.4	2.0	6.1	5.4	11.6	1.4	9,748	74
1999	46.9	53.1	26.5	29.0	25.6	18.9	18.0	25.0	31.1	26.0	72.3	2.3	6.6	5.1	12.3	1.4	4,750	76
2000	45.8	54.2	26.8	30.3	23.3	19.6	18.9	27.3	31.0	22.8	72.3	2.1	6.6	5.8	11.6	1.6	4,982	75
2001	45.7	54.3	24.9	29.6	25.3	20.2	19.6	26.1	32.6	21.6	73.3	2.0	6.4	6.2	10.3	1.7	9,457	74
2002	43.4	56.6	25.7	31.8	22.7	19.8	21.0	27.9	32.7	18.5	71.4	2.1	5.6	6.0	13.6	1.4	4,619	74
2003	45.4	54.6	23.3	29.7	23.8	23.2	21.8	25.8	32.5	19.8	74.6	1.6	6.1	6.3	10.2	1.4	8,982	73
2004	43.4	56.6	22.5	29.2	23.6	24.8	23.0	25.7	29.8	21.5	73.0	1.4	5.9	7.4	10.7	1.6	4,076	72
2005	44.8	55.2	22.5	26.6	26.5	24.4	23.6	25.9	30.1	20.5	73.8	1.7	6.3	6.2	10.6	1.4	4,590	74
2006	44.7	55.3	21.2	28.8	24.9	25.2	25.5	26.8	29.2	18.5	73.9	1.8	5.9	6.8	10.3	1.3	8,605	68
2008	44.7	55.3	22.0	27.5	25.2	25.3	25.6	28.0	28.7	17.7	74.0	2.1	5.4	7.4	9.6	1.6	9,228	64
2009	45.6	54.4	21.7	28.8	25.0	24.6	26.4	25.6	30.9	17.0	73.4	3.1	5.5	7.4	9.0	1.7	2,773	68
2010	43.5	56.5	21.3	26.5	27.6	24.6	28.2	28.3	29.7	13.9	73.1	3.1	5.8	7.4	9.0	1.6	4,830	66

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Table 2: Analysis of Data from 1991-2010 in Men and Women Adjusted for Age, Employment Status and Education (Selected Years Shown)

	Model 1: Age				Model 2: Age + Employment Status				Model 3: Age + Employment Status + Education			
Males												
Year	**OR**	**P**	**Lower 95% CI**	**Upper 95% CI**	**OR**	**P**	**Lower 95% CI**	**Upper 95% CI**	**OR**	**P**	**Lower 95% CI**	**Upper 95% CI**
2005	0.97	0.723	0.82	1.15	0.92	0.370	0.78	1.10	0.93	0.394	0.78	1.10
2006	1.06	0.465	0.91	1.22	1.05	0.511	0.91	1.22	1.05	0.506	0.91	1.22
2008	1.00	-	-	-	1.00	-	-	-	1.00	-	-	-
2009	1.53	0.000	1.26	1.86	1.50	0.000	1.24	1.82	1.50	0.000	1.24	1.82
2010	1.31	0.001	1.12	1.54	1.31	0.001	1.11	1.54	1.30	0.002	1.10	1.53
	% difference	**P**	**Lower 95% CI**	**Upper 95% CI**	**% difference**	**P**	**Lower 95% CI**	**Upper 95% CI**	**% difference**	**P**	**Lower 95% CI**	**Upper 95% CI**
2005	-0.31	0.722	-2.02	1.40	-0.75	0.367	-2.12	1.32	-0.71	0.391	-2.34	0.92
2006	0.56	0.465	-0.95	2.08	0.49	0.511	-0.97	2.09	0.50	0.506	-0.96	1.95
2008	0.00	-	-	-	0.00	-	-	-	0.00		-	-
2009	5.07	0.000	2.60	7.55	4.54	0	2.67	7.65	4.52	0.000	2.21	6.83
2010	3.04	0.001	1.17	4.91	2.86	0.002	1.32	5.13	2.79	0.002	1.01	4.56
Females												
	OR	**P**	**Lower 95% CI**	**Upper 95% CI**	**OR**	**P**	**Lower 95% CI**	**Upper 95% CI**	**OR**	**P**	**Lower 95% CI**	**Upper 95% CI**

2005	1.01	0.917	0.88	1.15	1.00	0.958	0.88	1.15	1.00	0.956	0.88	1.15
2006	0.96	0.467	0.86	1.07	0.95	0.342	0.85	1.06	0.95	0.344	0.85	1.06
2008	1.00	-	-	-	1.00	-	-	-	1.00	-	-	-
2009	1.04	0.641	0.88	1.23	1.06	0.522	0.90	1.24	1.06	0.523	0.90	1.24
2010	1.06	0.369	0.93	1.22	1.05	0.493	0.91	1.20	1.05	0.482	0.92	1.20
	% difference	**P**	**Lower 95% CI**	**Upper 95% CI**	**% difference**	**P**	**Lower 95% CI**	**Upper 95% CI**	**% difference**	**P**	**Lower 95% CI**	**Upper 95% CI**
2005	0.09	0.918	-1.69	1.88	0.05	0.959	-1.70	1.79	0.05	0.956	-1.69	1.79
2006	-0.55	0.467	-2.04	0.94	-0.70	0.341	-2.13	0.74	-0.69	0.344	-2.13	0.74
2008	0.00	-	-	-	0.00	-	-	-	0.00	-	-	-
2009	0.53	0.643	-1.70	2.76	0.70	0.526	-1.48	2.89	0.70	0.527	-1.48	2.88
2010	0.84	0.372	-1.01	2.70	0.63	0.495	-1.18	2.43	0.64	0.485	-1.16	2.44

* Reference group is 2008. Selected years around the current recession shown but analyses for all years available in the on-line appendix.
CI = Confidence Interval
OR = Odds Ratio
P = P value

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Table 3: Odds ratio and % difference for GHQ caseness by year for women

	Model 1 (age adjusted)			Model 2 (adjusted for age, education level and employment status)		
Year	**OR (95% CI)***	**P**	**% difference (95% CI)**	**OR (95% CI)***	**P**	**% difference (95% CI)**
1991	1.75 (1.40 to 2.20)	0.000	7.34 (4.40 to 10.27)	1.81 (1.39 to 2.36)	0.000	7.53 (4.30 to 10.75)
1992	1.46 (1.16 to 1.84)	0.001	5.31 (2.14 to 8.48)	1.59 (1.25 to 2.02)	0.000	6.32 (3.10 to 9.54)
1993	1.43 (1.29 to 1.57)	0.000	4.87 (3.52 to 6.22)	1.55 (1.39 to 1.73)	0.000	5.83 (4.37 to 7.30)
1994	1.61 (1.45 to 1.78)	0.000	6.32 (4.98 to 7.66)	1.77 (1.58 to 1.99)	0.000	7.33 (5.90 to 8.76)
1997	1.59 (1.38 to 1.84)	0.000	6.17 (4.27 to 8.06)	1.68 (1.43 to 1.96)	0.000	6.55 (4.62 to 8.49)
1998	1.47 (1.31 to 1.64)	0.000	4.98 (3.56 to 6.39)	1.58 (1.39 to 1.79)	0.000	5.64 (4.15 to 7.13)
1999	1.29 (1.11 to 1.50)	0.001	3.59 (1.50 to 5.67)	1.40 (1.19 to 1.65)	0.000	4.44 (2.30 to 6.59)
2000	1.47 (1.24 to 1.73)	0.000	4.63 (2.66 to 6.61)	1.61 (1.33 to 1.94)	0.000	5.22 (3.19 to 7.26)
2001	1.44 (1.28 to 1.62)	0.000	4.19 (2.85 to 5.53)	1.55 (1.37 to 1.77)	0.000	4.75 (3.38 to 6.13)
2002	1.41 (1.21 to 1.64)	0.000	4.73 (2.71 to 6.76)	1.51 (1.27 to 1.78)	0.000	5.32 (3.19 to 7.45)
2003	1.29 (1.14 to 1.45)	0.000	2.91 (1.52 to 4.29)	1.38 (1.20 to 1.58)	0.000	3.44 (1.99 to 4.88)
2004	1.35 (1.11 to 1.63)	0.002	3.37 (1.25 to 5.49)	1.40 (1.14 to 1.71)	0.001	3.51 (1.38 to 5.65)
2005	1.52 (1.29 to 1.80)	0.000	4.85 (2.97 to 6.72)	1.68 (1.40 to 2.03)	0.000	5.46 (3.57 to 7.35)
2006	1.33 (1.18 to 1.49)	0.000	3.29 (1.92 to 4.67)	1.40 (1.22 to 1.60)	0.000	3.57 (2.18 to 4.96)
2008	1.46 (1.29 to 1.65)	0.000	4.41 (3.03 to 5.79)	1.54 (1.34 to 1.76)	0.000	4.52 (3.11 to 5.94)
2009	0.99 (0.79 to 1.24)	0.927	-0.15 (-3.26 to 2.97)	1.09 (0.86 to 1.39)	0.465	1.13 (-1.89 to 4.15)
2010	1.19 (1.01 to 1.39)	0.036	2.24 (0.16 to 4.32)	1.24 (1.04 to 1.48)	0.016	2.63 (0.52 to 4.75)

* Reference group is men
CI = Confidence Interval
OR = Odds Ratio
P = P value

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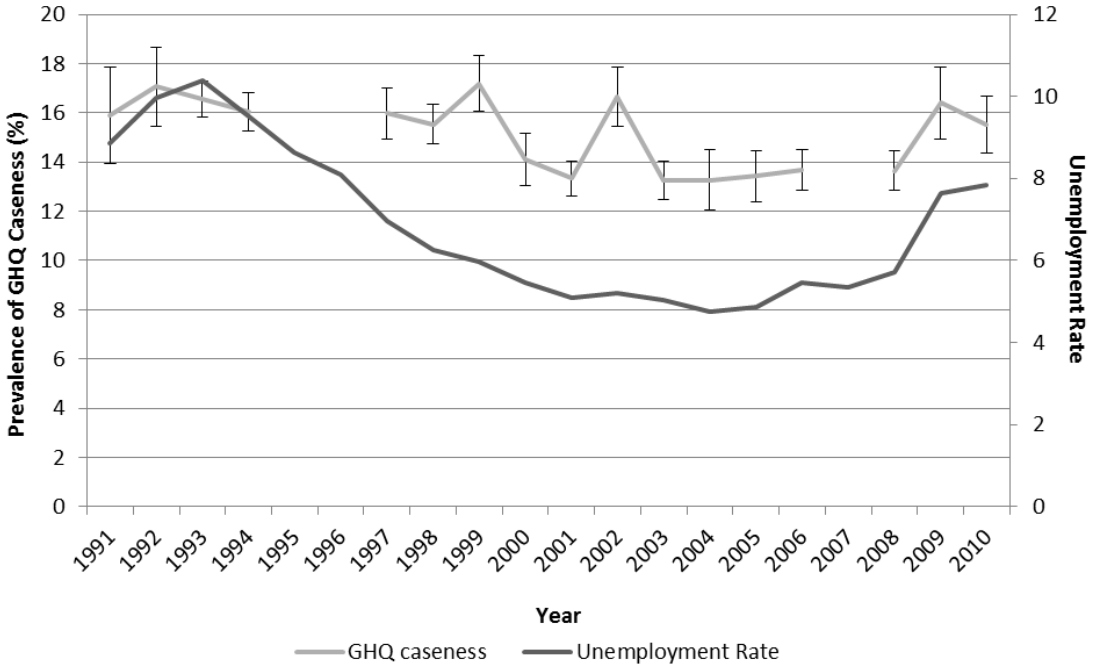

Figure 1: Overall prevalence of GHQ caseness and unemployment rate 1991 to 2010

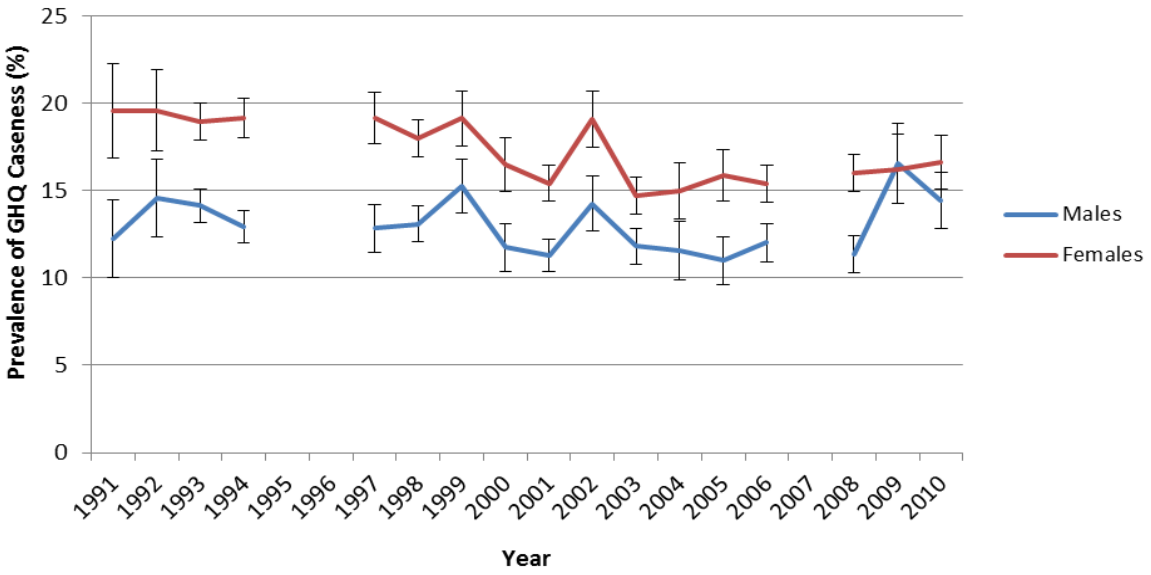

Figure 2: Prevalence of GHQ caseness by gender 1991 to 2010

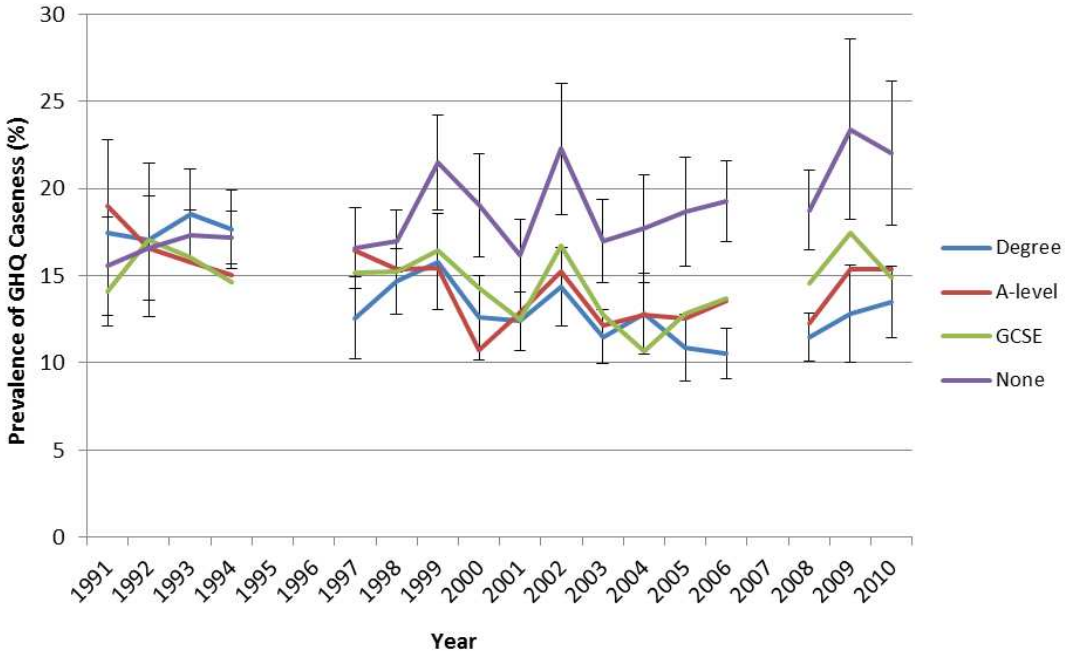

Figure 3: Prevalence of GHQ caseness by highest education level 1991 to 2010

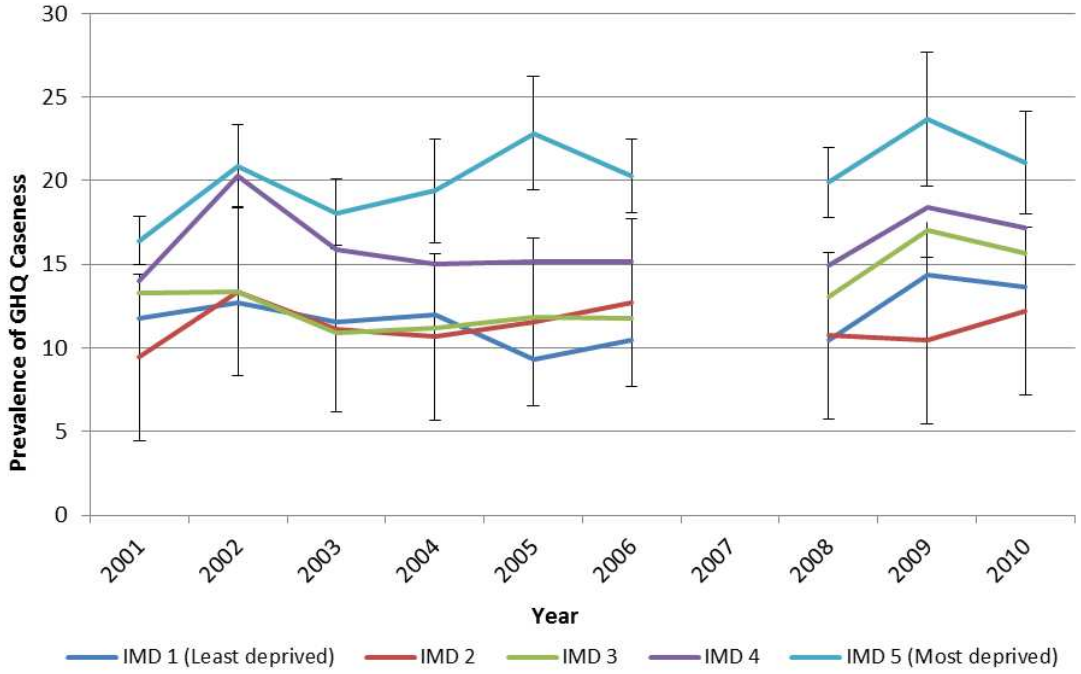

Figure 4: Prevalence of GHQ caseness by area-level deprivation (index for multiple deprivation, IMD) 2001 to 2010

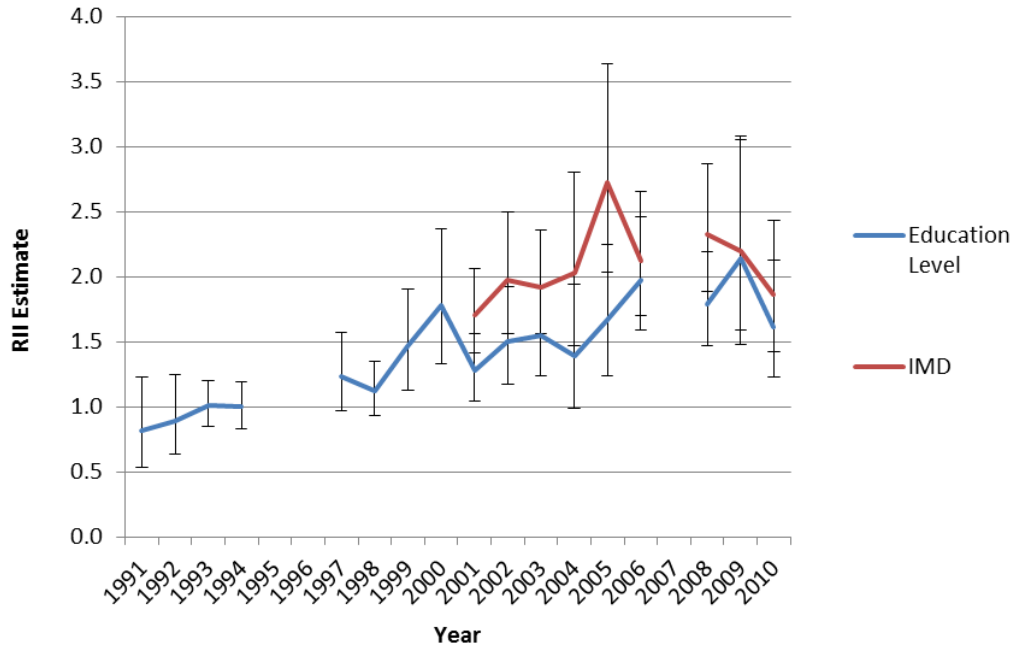

Figure 5: Relative Index of Inequality (RII) for GHQ Caseness as assessed education level and area-level deprivation (index for multiple deprivation, IMD) 1991 to 2010

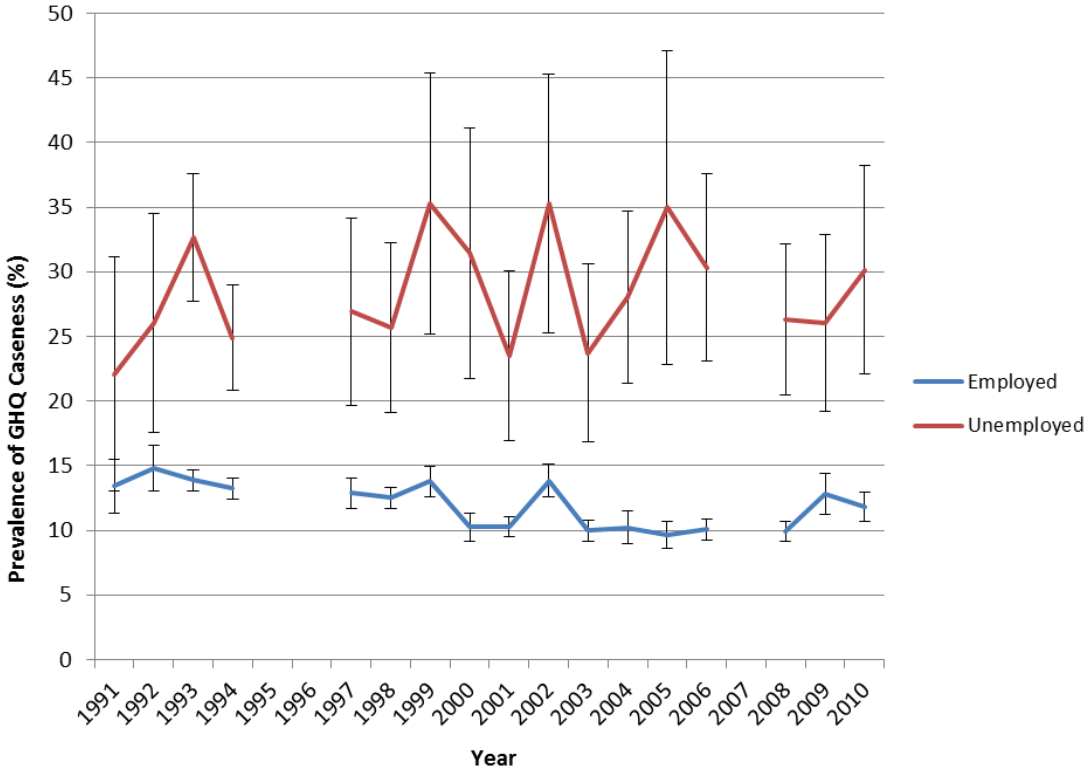

Figure 6: GHQ caseness by employment status 1991 to 2010

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Web Only Table A: Analysis of Data from 1991-2010 in Men Adjusted for Age, Employment Status and Education

Model 1: Age								
Year	**OR**	**P**	**Lower 95% CI**	**Upper 95% CI**	**% difference**	**P**	**Lower 95% CI**	**Upper 95% CI**
1991	1.09	0.484	0.86	1.36	0.85	0.492	-1.57	3.27
1992	1.30	0.013	1.06	1.59	2.91	0.018	0.50	5.31
1993	1.28	0.000	1.13	1.46	2.76	0.000	1.35	4.17
1994	1.15	0.040	1.01	1.31	1.49	0.038	0.08	2.89
1997	1.15	0.091	0.98	1.34	1.46	0.094	-0.25	3.17
1998	1.17	0.029	1.02	1.34	1.65	0.028	0.17	3.13
1999	1.40	0.000	1.20	1.64	3.89	0.000	2.03	5.75
2000	1.04	0.624	0.88	1.23	0.43	0.625	-1.31	2.17
2001	0.98	0.825	0.86	1.13	-0.16	0.825	-1.55	1.24
2002	1.29	0.003	1.09	1.52	2.79	0.004	0.91	4.68
2003	1.05	0.534	0.91	1.21	0.47	0.534	-1.00	1.94
2004	1.00	0.963	0.83	1.22	0.05	0.963	-1.88	1.97
2005	0.97	0.723	0.82	1.15	-0.31	0.722	-2.02	1.40
2006	1.06	0.465	0.91	1.22	0.56	0.465	-0.95	2.08
2008	1.00	-	-	-	0.00	-	-	-
2009	1.53	0.000	1.26	1.86	5.07	0.000	2.60	7.55
2010	1.31	0.001	1.12	1.54	3.04	0.001	1.17	4.91
Model 2: Age + Employment Status								
Year	**OR**	**P**	**Lower 95% CI**	**Upper 95% CI**	**% difference**	**P**	**Lower 95% CI**	**Upper 95% CI**
1991	1.03	0.793	0.81	1.32	0.32	0.795	-2.12	2.77
1992	1.19	0.108	0.96	1.48	1.83	0.119	-0.47	4.14
1993	1.22	0.005	1.06	1.40	2.06	0.004	0.66	3.46
1994	1.07	0.308	0.94	1.23	0.72	0.306	-0.66	2.09
1997	1.06	0.453	0.90	1.25	0.62	0.455	-1.01	2.26
1998	1.12	0.128	0.97	1.29	1.12	0.127	-0.32	2.55
1999	1.32	0.001	1.12	1.55	2.97	0.001	1.19	4.75
2000	0.95	0.549	0.80	1.13	-0.50	0.547	-2.13	1.13
2001	0.93	0.303	0.81	1.07	-0.71	0.305	-2.05	0.64
2002	1.26	0.007	1.06	1.50	2.46	0.009	0.62	4.30
2003	1.01	0.926	0.87	1.17	0.07	0.926	-1.36	1.50
2004	0.99	0.959	0.82	1.20	-0.05	0.959	-1.90	1.80
2005	0.92	0.370	0.78	1.10	-0.75	0.367	-2.39	0.88
2006	1.05	0.511	0.91	1.22	0.49	0.511	-0.98	1.96
2008	1.00	-	-	-	0.00		0.00	0.00
2009	1.50	0.000	1.24	1.82	4.54	0.000	2.23	6.86
2010	1.31	0.001	1.11	1.54	2.86	0.002	1.07	4.65
Model 3: Age + Employment Status + Education								
Year	**OR**	**P**	**Lower 95% CI**	**Upper 95% CI**	**% difference**	**P**	**Lower 95% CI**	**Upper 95% CI**
1991	1.07	0.612	0.83	1.36	0.63	0.617	-1.84	3.10
1992	1.22	0.069	0.98	1.51	2.07	0.079	-0.24	4.37
1993	1.25	0.002	1.09	1.43	2.29	0.001	0.88	3.70
1994	1.10	0.184	0.96	1.26	0.94	0.182	-0.44	2.32
1997	1.08	0.363	0.92	1.27	0.75	0.366	-0.88	2.39
1998	1.13	0.086	0.98	1.31	1.26	0.085	-0.17	2.69
1999	1.34	0.001	1.13	1.57	3.09	0.001	1.31	4.86
2000	0.96	0.607	0.81	1.13	-0.43	0.606	-2.05	1.20
2001	0.93	0.347	0.81	1.08	-0.64	0.349	-1.98	0.70
2002	1.27	0.007	1.07	1.50	2.48	0.008	0.64	4.31
2003	1.01	0.847	0.88	1.17	0.14	0.846	-1.28	1.57
2004	1.00	0.989	0.83	1.21	0.01	0.989	-1.83	1.86
2005	0.93	0.394	0.78	1.10	-0.71	0.391	-2.34	0.92

2006	1.05	0.506	0.91	1.22	0.50	0.506	-0.96	1.95
2008	1.00	-	-	-	0.00	-	-	-
2009	1.50	0.000	1.24	1.82	4.52	0.000	2.21	6.83
2010	1.30	0.002	1.10	1.53	2.79	0.002	1.01	4.56

* Reference group is 2008
CI = Confidence Interval
OR = Odds Ratio
P = P value

Web Only Table B: Analysis of Data from 1991-2010 in Women Adjusted for Age, Employment Status and Education

Model 1: Age								
Year	**OR**	**P**	**Lower 95% CI**	**Upper 95% CI**	**% difference**	**P**	**Lower 95% CI**	**Upper 95% CI**
1991	1.30	0.006	1.08	1.56	3.76	0.009	0.93	6.59
1992	1.30	0.001	1.11	1.53	3.80	0.002	1.35	6.26
1993	1.25	0.000	1.12	1.39	3.19	0.000	1.69	4.68
1994	1.26	0.000	1.14	1.40	3.36	0.000	1.84	4.88
1997	1.25	0.000	1.10	1.41	3.17	0.001	1.39	4.96
1998	1.17	0.005	1.05	1.30	2.17	0.005	0.67	3.67
1999	1.24	0.001	1.09	1.41	3.09	0.001	1.24	4.94
2000	1.05	0.521	0.91	1.20	0.60	0.523	-1.24	2.45
2001	0.97	0.642	0.87	1.09	-0.35	0.642	-1.82	1.12
2002	1.24	0.001	1.09	1.41	3.10	0.001	1.22	4.98
2003	0.92	0.171	0.82	1.04	-1.04	0.170	-2.53	0.45
2004	0.93	0.313	0.80	1.08	-1.00	0.308	-2.91	0.92
2005	1.01	0.917	0.88	1.15	0.09	0.918	-1.69	1.88
2006	0.96	0.467	0.86	1.07	-0.55	0.467	-2.04	0.94
2008	1.00	-	-	-	0.00	-	-	-
2009	1.04	0.641	0.88	1.23	0.53	0.643	-1.70	2.76
2010	1.06	0.369	0.93	1.22	0.84	0.372	-1.01	2.70
Model 2: Age + Employment Status								
Year	**OR**	**P**	**Lower 95% CI**	**Upper 95% CI**	**% difference**	**P**	**Lower 95% CI**	**Upper 95% CI**
1991	1.29	0.007	1.07	1.55	3.57	0.010	0.86	6.28
1992	1.31	0.002	1.11	1.55	3.77	0.003	1.29	6.25
1993	1.24	0.000	1.11	1.38	2.95	0.000	1.49	4.42
1994	1.26	0.000	1.13	1.41	3.25	0.000	1.76	4.73
1997	1.20	0.003	1.06	1.36	2.54	0.004	0.81	4.27
1998	1.15	0.014	1.03	1.28	1.83	0.013	0.38	3.29
1999	1.21	0.003	1.07	1.38	2.63	0.004	0.85	4.41
2000	1.02	0.766	0.89	1.17	0.27	0.766	-1.49	2.02
2001	0.94	0.308	0.84	1.06	-0.74	0.308	-2.17	0.69
2002	1.22	0.002	1.07	1.39	2.73	0.003	0.93	4.52
2003	0.92	0.170	0.82	1.04	-1.02	0.170	-2.47	0.44
2004	0.92	0.261	0.79	1.07	-1.09	0.254	-2.97	0.79
2005	1.00	0.958	0.88	1.15	0.05	0.959	-1.70	1.79
2006	0.95	0.342	0.85	1.06	-0.70	0.341	-2.13	0.74
2008	1.00	-	-	-	0.00	-	-	-
2009	1.06	0.522	0.90	1.24	0.70	0.526	-1.48	2.89
2010	1.05	0.493	0.91	1.20	0.63	0.495	-1.18	2.43
Model 3: Age + Employment Status + Education								
Year	**OR**	**P**	**Lower 95% CI**	**Upper 95% CI**	**% difference**	**P**	**Lower 95% CI**	**Upper 95% CI**

1991	1.29	0.007	1.07	1.55	3.56	0.011	0.83	6.28
1992	1.31	0.002	1.11	1.55	3.79	0.003	1.31	6.26
1993	1.24	0.000	1.11	1.38	2.96	0.000	1.48	4.44
1994	1.26	0.000	1.14	1.41	3.26	0.000	1.77	4.76
1997	1.20	0.004	1.06	1.36	2.54	0.004	0.81	4.27
1998	1.15	0.013	1.03	1.28	1.85	0.013	0.39	3.30
1999	1.21	0.003	1.07	1.38	2.64	0.004	0.85	4.42
2000	1.02	0.752	0.89	1.17	0.28	0.753	-1.47	2.04
2001	0.94	0.319	0.84	1.06	-0.72	0.319	-2.15	0.70
2002	1.22	0.002	1.07	1.39	2.75	0.003	0.96	4.55
2003	0.92	0.179	0.82	1.04	-1.00	0.178	-2.45	0.46
2004	0.92	0.263	0.79	1.07	-1.09	0.257	-2.97	0.79
2005	1.00	0.956	0.88	1.15	0.05	0.956	-1.69	1.79
2006	0.95	0.344	0.85	1.06	-0.69	0.344	-2.13	0.74
2008	1.00	-	-	-	0.00	-	-	-
2009	1.06	0.523	0.90	1.24	0.70	0.527	-1.48	2.88
2010	1.05	0.482	0.92	1.20	0.64	0.485	-1.16	2.44

* Reference group is 2008
CI = Confidence Interval
OR = Odds Ratio
P = P value

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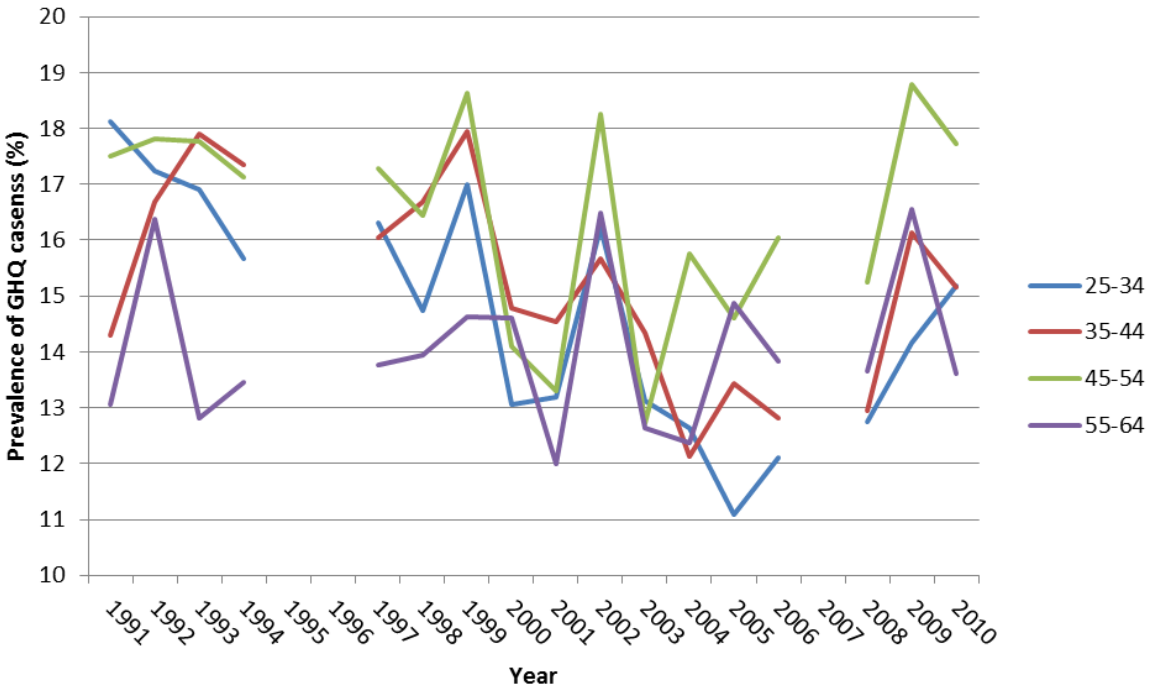
Web Table C: Analysis of Data from 2000-2010 in Men Adjusted for Age, Employment Status and Income

	Age				Age, Household Income				Age, Employment Status				Age, Employment Status, Income			
	OR	**P**	**Lower 95% CI**	**Upper 95% CI**	**OR**	**P**	**Lower 95% CI**	**Upper 95% CI**	**OR**	**P**	**Lower 95% CI**	**Upper 95% CI**	**OR**	**P**	**Lower 95% CI**	**Upper 95% CI**
2000	1.07	0.461	0.90	1.27	1.15	0.119	0.96	1.37	0.94	0.523	0.78	1.13	0.96	0.689	0.80	1.16
2001	1.00	0.949	0.86	1.15	0.99	0.922	0.85	1.15	0.91	0.239	0.78	1.06	0.91	0.245	0.78	1.07
2002	1.32	0.002	1.11	1.58	1.35	0.001	1.13	1.62	1.28	0.009	1.06	1.54	1.28	0.008	1.07	1.55
2003	1.04	0.656	0.89	1.21	1.04	0.623	0.89	1.21	0.97	0.725	0.83	1.14	0.97	0.748	0.83	1.14
2005	1.00	0.990	0.83	1.20	0.98	0.791	0.81	1.17	0.92	0.419	0.76	1.12	0.92	0.404	0.76	1.12
2006	1.04	0.601	0.89	1.22	1.05	0.568	0.89	1.23	1.03	0.679	0.88	1.22	1.03	0.682	0.88	1.22
2008	1.00	-	-	-	1.00	-	-	-	1.00	-	-	-	1.00	-	-	-
2009	1.57	0.000	1.27	1.94	1.55	0.000	1.25	1.92	1.53	0.000	1.23	1.90	1.53	0.000	1.23	1.90
2010	1.26	0.010	1.06	1.49	1.24	0.015	1.04	1.48	1.25	0.017	1.04	1.49	1.25	0.017	1.04	1.49
	% Difference	**P**	**Lower 95% CI**	**Upper 95% CI**	**% Difference**	**P**	**Lower 95% CI**	**Upper 95% CI**	**% Difference**	**P**	**Lower 95% CI**	**Upper 95% CI**	**% Difference**	**P**	**Lower 95% CI**	**Upper 95% CI**
2000	0.68	0.463	-1.14	2.49	1.43	0.124	-0.39	3.26	-0.55	0.521	-2.23	1.13	-0.35	0.688	-2.04	1.35
2001	-0.05	0.949	-1.53	1.43	-0.07	0.922	-1.52	1.37	-0.85	0.240	-2.27	0.57	-0.84	0.246	-2.26	0.58
2002	3.12	0.002	1.12	5.13	3.27	0.001	1.30	5.24	2.51	0.011	0.58	4.44	2.55	0.010	0.62	4.48
2003	0.35	0.656	-1.19	1.89	0.38	0.623	-1.13	1.89	-0.27	0.725	-1.75	1.22	-0.24	0.748	-1.73	1.24
2005	0.01	0.990	-1.82	1.85	-0.24	0.791	-2.00	1.52	-0.72	0.416	-2.47	1.02	-0.74	0.401	-2.47	0.99
2006	0.43	0.601	-1.18	2.03	0.46	0.568	-1.11	2.03	0.33	0.679	-1.22	1.87	0.32	0.682	-1.22	1.86
2008	0.00	-	-	-	0.00	-	-	-	0.00	-	-	-	0.00	-	-	-
2009	5.35	0.000	2.64	8.05	4.95	0.000	2.33	7.58	4.58	0.000	2.07	7.09	4.58	0.000	2.07	7.09
2010	2.48	0.012	0.54	4.42	2.29	0.018	0.40	4.18	2.22	0.019	0.36	4.08	2.21	0.020	0.35	4.06

* Reference group is 2008
CI = Confidence Interval
OR = Odds Ratio
P = P value



Web figure: Prevalence of GHQ caseness by age group 1991 to 2010

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STROBE Statement—checklist of items that should be included in reports of observational studies

The Effects of the Recession on Population Mental Health: A Repeat Cross-Sectional Analysis of the Health Surveys of England

	Item No	Recommendation
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract **Title**
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found **Abstract**
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported **Introduction, Paragraph 2**
Objectives	3	State specific objectives, including any prespecified hypotheses **Introduction, Paragraph 3**
Methods		
Study design	4	Present key elements of study design early in the paper **Methods, Paragraph 2**
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection **Methods, Paragraph 1**
Participants	6	(*a*) *Cohort study*—Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up *Case-control study*—Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls *Cross-sectional study*—Give the eligibility criteria, and the sources and methods of selection of participants **Methods, Paragraph 3 and cited references therein**
		(*b*) *Cohort study*—For matched studies, give matching criteria and number of exposed and unexposed *Case-control study*—For matched studies, give matching criteria and the number of controls per case
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable **Methods, Paragraphs 3-5**
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group **Methods, Paragraphs 3-5**
Bias	9	Describe any efforts to address potential sources of bias **Methods, Paragraph 4 of Statistical Analysis**
Study size	10	Explain how the study size was arrived at **Existing data analysis. Methods, Paragraph 3and Table 1.**

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Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why **Methods, Paragraphs 3-5**
Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding **Methods, Statistical Analysis section**
		(*b*) Describe any methods used to examine subgroups and interactions **Methods, Statistical Analysis section**
		(*c*) Explain how missing data were addressed **Methods, Paragraph 3 (Population)**
		(*d*) *Cohort study*—If applicable, explain how loss to follow-up was addressed *Case-control study*—If applicable, explain how matching of cases and controls was addressed *Cross-sectional study*—If applicable, describe analytical methods taking account of sampling strategy **Methods, Paragraph 4 of Statistical Analysis section**
		(*e*) Describe any sensitivity analyses **Methods, Paragraph 3**

Continued on next page

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Results		
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed **Table 1 and Methods, Paragraph 3 and cited references**
		(b) Give reasons for non-participation at each stage **Methods, Paragraph 3 and cited references**
		(c) Consider use of a flow diagram **Table 1**
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders **Table 1**
		(b) Indicate number of participants with missing data for each variable of interest **Methods, Paragraph 3**
		(c) *Cohort study*—Summarise follow-up time (eg, average and total amount)
Outcome data	15*	*Cohort study*—Report numbers of outcome events or summary measures over time
		Case-control study—Report numbers in each exposure category, or summary measures of exposure
		Cross-sectional study—Report numbers of outcome events or summary measures **Table 1 and Figures provided**
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included **Tables 1-3**
		(*b*) Report category boundaries when continuous variables were categorized **Methods, Paragraph 5**
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period **Reported in Tables 2-3 and main text.**
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses **Provided in on-line appendix**
Discussion		
Key results	18	Summarise key results with reference to study objectives **Discussion, Paragraph 1**
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias **Discussion, Paragraph 2**
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence **Discussion, Paragraph 3**
Generalisability	21	Discuss the generalisability (external validity) of the study results **Discussion, Paragraph 4**
Other information		
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based

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Funding statement provided

*Give information separately for cases and controls in case-control studies and, if applicable, for exposed and unexposed groups in cohort and cross-sectional studies.

Note: An Explanation and Elaboration article discusses each checklist item and gives methodological background and published examples of transparent reporting. The STROBE checklist is best used in conjunction with this article (freely available on the Web sites of PLoS Medicine at http://www.plosmedicine.org/, Annals of Internal Medicine at http://www.annals.org/, and Epidemiology at http://www.epidem.com/). Information on the STROBE Initiative is available at www.strobe-statement.org.

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% GHQ caseness by agegroup

	25-34			35-44		
Year	**Mean**	**Lower 95 % CI**	**Upper 95% CI**	**Mean**	**Lower 95 % CI**	**Upper 95% CI**
1991	18.12	14.45	21.78	14.29	11.15	17.44
1992	17.23	13.91	20.54	16.68	13.78	19.57
1993	16.91	15.51	18.31	17.89	16.36	19.42
1994	15.67	14.36	16.97	17.35	15.88	18.82
1995						
1996						
1997	16.31	14.31	18.31	16.05	14.08	18.02
1998	14.74	13.36	16.11	16.69	15.24	18.14
1999	16.99	14.84	19.14	17.96	15.94	19.97
2000	13.06	11.17	14.94	14.77	12.96	16.58
2001	13.20	11.84	14.56	14.54	13.22	15.86
2002	16.23	14.00	18.46	15.67	13.76	17.58
2003	13.13	11.52	14.74	14.34	12.91	15.77
2004	12.64	10.37	14.90	12.13	10.11	14.15
2005	11.10	9.04	13.16	13.42	11.58	15.27
2006	12.11	10.51	13.72	12.81	11.38	14.24
2007						
2008	12.75	11.17	14.32	12.95	11.61	14.29
2009	14.16	11.16	17.15	16.14	13.49	18.80
2010	15.19	12.86	17.51	15.17	12.98	17.35

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45-54			55-64		
Mean	Lower 95 % CI	Upper 95% CI	Mean	Lower 95 % CI	Upper 95% CI
17.51	13.74	21.28	13.05	9.58	16.53
17.81	14.37	21.25	16.38	12.96	19.79
17.77	16.30	19.23	12.82	11.29	14.36
17.13	15.49	18.78	13.45	11.88	15.02
17.28	15.22	19.33	13.77	11.65	15.90
16.44	14.95	17.93	13.94	12.27	15.60
18.63	16.26	21.00	14.62	12.39	16.85
14.10	12.11	16.08	14.60	12.25	16.96
13.29	11.91	14.67	11.99	10.41	13.56
18.25	15.78	20.72	16.48	13.90	19.05
12.73	11.28	14.19	12.64	11.09	14.19
15.76	13.29	18.23	12.36	10.13	14.60
14.61	12.51	16.70	14.88	12.73	17.02
16.05	14.39	17.71	13.83	12.24	15.42
15.25	13.72	16.78	13.66	12.14	15.18
18.78	15.85	21.70	16.55	13.58	19.53
17.73	15.59	19.88	13.61	11.47	15.75

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~~The Effects of the Recession on~~Trends in Population Mental Health Before and After the 2008 Recession: A Repeat Cross-Sectional Analysis of the 1991-2010 Health Surveys of England

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SVK acts as guarantor for this article.

Data sharing: Additional results are available as a supplemental file from the BMJ website. The Health Surveys for England are available from the UK Data Archive.

Ethic~~sal~~ approval: This study is an analysis of previously collected data and therefore ethical approval was not required for this study. Ethical approval for each survey was obtained by the Health Survey for England team.

Word count (of main manuscript): 2,77~~53~~1

Competing Interest Statement
All authors have completed the Unified Competing Interest form at www.icmje.org/coi_disclosure.pdf (available on request from the corresponding author) and declare that they have no conflicts of interest.

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Abstract

Objective: To assess ~~the~~ short-term ~~impact of the 2008 recession on~~~~changes~~differences in population mental health before and after ~~following~~ the 2008 recession and explore how and why ~~its~~ these changes~~impact may~~ differ by gender, age and socio-economic position.
Design: Repeat cross-sectional analysis of survey data
Setting: England
Participants: Representative samples of the working age (25-64 years) general population participating in the Health Survey for England between 1991 and 2010 inclusive.
Main Outcome Measures: Prevalence of poor mental health (caseness) as measured by the General Health Questionnaire-12 (GHQ)
Results: Age-sex standardised prevalence of GHQ caseness increased from 13.7% (95% CI 12.9-14.5%) in 2008 to 16.4% (95% CI 14.9-17.9%) in 2009 and 15.5% (95% CI 14.4-16.7%) in 2010. Women had a consistently greater prevalence since 1991 until the current recession. However, compared to 2008, men experienced an increase in age-adjusted caseness of 5.1% (95% CI 2.6-7.6%, p<0.001) in 2009 and 3.0% (95% CI 1.2-4.9%, p=0.001) in 2010, while no statistically significant changes were seen in women. Adjustment for differences in employment status and education level did not account for the observed increase in men nor did they explain the differential gender patterning. Over the last decade, socio-economic inequalities showed a tendency to increase but no clear evidence for an increase in inequalities associated with the recession was found. Similarly, no evidence was found for a differential effect between age groups.
Conclusions: Population mental health in men has ~~been adversely affected~~deteriorated within two years of the onset of the current recession. These changes, and their patterning by gender, could not be accounted for by differences in employment status. Further work is needed to monitor recessionary impacts on health inequalities in response to ongoing labour market and social policy changes.

Words: 2757

What is already known on this subject?

Previous studies have found differing impacts of recession on mental health, with some outcomes, such as suicide, increasing in men more than women. However, as the labour market changes and employment among women becomes increasingly important, it has been suggested that this gender difference may no longer exist. Few studies have investigated mental health morbidity and its patterning by population subgroups over prolonged periods of time.

What this study adds

~~The current recession is associated with~~There has been an increase in the prevalence of poor mental health among men in England in the two years after the start of the current recession. These changes, and their patterning by gender, cannot be accounted for by differences in employment status over time.

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Article Focus

- Previous studies have found differing impacts of recession on mental health, with some deteriorations in health outcomes (such as suicide) being worse in men than women.
- Few studies have investigated mental health morbidity and its patterning by population subgroups over prolonged periods of time.
- We assess short-term changes in population mental health and inequalities (by gender, age and socio-economic position) following the recent recession, by placing it in a longer historical context.

Key Messages

- Population mental health in men has deteriorated within two years of the onset of the current recession.
- These changes in population mental health, and their patterning by gender, cannot be accounted for by differences in employment status over time.

Strengths & Limitations

- Our study uses a large nationally representative dataset to assess trends over a long length of time and an outcome likely to be sensitive to changes in the macro-economic environment.
- We assess trends across a number of dimensions (and measures) of inequality, helping to address an important gap in the current literature.
- Establishing causality from this research is difficult given the cross-sectional (rather than longitudinal) nature of the surveys and lack of available data for some time periods.

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Introduction

Macro-economic factors are known to influence population health and health inequalities[1]. The onset of the global economic downturn heralded by the collapse of Lehman Brothers in September 2008 can therefore be considered a potential threat to public health [2-4]. In the UK, national gross domestic product (GDP) has fallen in real terms (with a 5.5% fall per head of population between 2008 and 2009) and unemployment rates have increased since the recession began [5]. Neither indicator has yet recovered to pre-recession levels at the time of writing [6]. Unemployment is associated with a number of adverse health impacts including poor mental health, short-term increases in adverse health behaviours and increased mortality risk [7-9]. However, the effects of recession appear to be more complex than would be expected from the impact of increases in unemployment alone. For example, there is a growing body of research suggesting that at least in the short term, recessions are associated with a faster decline in mortality although some specific causes of death, such as suicide, may rise [10]. Thus, mortality impacts of recessions may be more complex than intuition suggests and likely vary by outcome and context [4 7].

Less empirical analysis has focused on the effect of recession on trends in population mental health. Macro-economic change could potentially have a more rapid effect on mental health compared to mortality, particularly for those of working age. Historically, both periods of recession and unemployment appear to have had a greater impact on men compared to women [7]. However, it has been suggested that this differential impact may no longer be present as growing female labour market participation may increase their susceptibility to macro-economic changes [11 12]. In addition, it is not clear to what extent changes in health status associated with recessionary periods are mediated purely through changes in labour market status. The UK experienced its first recession since 1991 (defined as two quarters of negative growth in gross domestic product) in late 2008 [13]. Unemployment (which is commonly used as a marker of recession that has a more direct effect on health) showed marked increases between 1991-3 and 2008-10.

In this paper, we aim to assess ~~the~~ short-term ~~impact of the recent recession on~~ changes in population mental health and inequalities (by gender, age and socio-economic position) following the onset of the recent recession by placing it in a longer historical context. We further aim to investigate to what extent any observed ~~recessionary impacts~~associations and their patterning by subgroups can be accounted for by differences in employment status and~~or~~ education level.

Methods

Data sources

We used data from the Health Survey for England, a nationally representative cross-sectional survey of the community dwelling population, conducted annually from 1991 onwards. Survey methodology has been described elsewhere [14-16]. Household response rates for the period studied varied from 85% in 1991 to 64% in 2008.

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Unemployment rates (available for the whole period) and gross GDP per head (comparable data available for 1991-2009) for the UK were retrieved to provide context for the interpretation of trends [5 17]. In addition, unemployment data for England (available for 1993 onwards) were retrieved and showed similar trends to the UK data [18]. These macro-economic indicators all show marked deterioration between 2008 and 2009; hence we use 2008 as the reference year for comparison.

Population

The general population samples from the Health Surveys for England were used for all analyses. The study population was restricted to participants of a working age, between 25 years and 64 years inclusive. Those aged under 25 years were excluded to minimise misclassification of education level. Participants missing any data on age, sex, highest education level, employment status and outcome were excluded from the analysis (5.15% of total sample excluded). We excluded 2918 participants (2.59% of the sample) with foreign/other qualifications as we were unable to categorise their highest educational attainment accurately. We excluded 847 individuals (0.75%) who defined themselves as doing unpaid work for their family, waiting to take up employment or undertaking government training schemes. Results of overall prevalence estimates were similar when those with missing data (apart from the 1.60% missing outcome data) were included. Similar results were also obtained when the population was limited to those aged 25-59 years, to investigate the potential for gender differentials arising from a younger age of retirement among women.

Exposures

Socio-economic position was assessed using highest education level (self-reported) and area-level deprivation. Comparable information on education level was available for every survey year except 1995 and 1996 and area-level deprivation was available from 2001 onwards. Educational level was coded into four categories: degree-level or equivalent qualifications, A-level or equivalent, GCSE or equivalent and no qualifications, while the index off~~or~~ multiple deprivation (IMD) was coded into quintiles. Participants were asked to self-identify their employment status based on their activity in the previous week before the survey interview. Employment status was coded into six categories: employed, unemployed, unable to work due to ill health, looking after family/maternity care, retired and in full-time education. Equivalised household income (coded into quintiles and in a sensitivity analysis as a continuous variable) was analysed for the years 2000 onwards in an exploratory analysis.

Outcome Measures

Mental health was assessed in every survey year except 1996 and 2007 through the general health questionnaire (GHQ-12). GHQ-12 is a screening tool for anxiety and depression, validated for use in epidemiological studies [19]. Respondents scoring 4 or more have a high likelihood of poor mental health and are considered a 'case' [20].

Statistical Analysis

For the first stage of analysis, we analysed data for each year separately. Prevalence estimates for GHQ caseness (age-sex standardisation to the WHO European standard

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population) were calculated for each year, stratified by age, sex, education level and employment status.

In the second stage of analysis, logistic regression analysis was conducted for each year separately to explore any differential patterning in recession years between men and women. To measure the extent of socio-economic inequality in prevalence on a relative scale we calculated the relative index of inequality using a Poisson modelling approach [15].

We directly tested the impact of the recent recession in the final stage of the analysis by creating a combined dataset for all years and creating a logistic regression model adjusting for year, age, education level and employment status. Men and women were analysed separately given the effect modification observed between genders and year. A final stage of analysis investigated if equivalised household income helped explain differences in GHQ prevalence before and after the recession.

All analyses were carried out using Stata v11.2. Weights for non-response (available from 2003 onwards) were used for all analyses. These were scaled to a mean of 1 for each year to allow analysis of the combined dataset. Robust standard errors were used to adjust for survey clustering at the area level. Adjusted prevalence differences were derived from the logistic regression models as well as odds ratios in order to allow comparisons across models to be made on the absolute scale [21].

Results

A total of 106,985 participants were included in the main analysis of trends in GHQ caseness (Table 1). The sample response rate declined gradually over time, but they were broadly comparable over the most recent years with no marked changes in response rates during the onset of the current recession. There was also socio-economic change with a decline in the percentage of people with no qualifications and an increase in participants with a degree.

GHQ caseness was relatively high during the time of the early 1990s recession (Figure 1). Since then, there has been an indication of a general downward trend with some variability, until a more recent increase in prevalence that occurs after 2008. Caseness increased from 13.7% (95% CI 12.9-14.5%) in 2008 to 16.4% (95% CI 14.9-17.9%) in 2009.

Impact by Subgroups

A gender differential in GHQ caseness is apparent; women have a consistently higher prevalence over most of the time period (Figure 2). However, during the early 1990s recession, men had a larger increase in prevalence of GHQ caseness from 12.3% in 1991 to 14.5% in 1992. A similar trend is seen following the 2008 recession with an increase from 11.3% to 16.6% in men, compared to 16.0% to 16.2% in women between 2008 and 2009.

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Stratified analysis by age shows that changes in mental health during recessionary periods are not confined to any specific age groups (see on-line appendix). Sensitivity analysis including those aged 16-24 years showed no clear difference in trends.

In the early 1990s, stratification by education level reveals an initial reverse education gradient in GHQ caseness (Figure 3). Over time, a growing disparity in GHQ caseness between those most and least educated is apparent, with the highest levels of inequality in poor mental health observed in 2005. A similar pattern is seen when assessing caseness by area-level deprivation (Figure 4). The greatest levels of relative indices of inequality are also seen since 2005 when assessed by either measure of socio-economic position (Figure 5). No significant differences before and after ~~impact of~~ the recession by area-level deprivation are~~is~~ observed.

Changes in population mental health do not appear to be entirely mediated by changes in employment status. For example, the prevalence of GHQ caseness amongst those in employment increased during both recessionary periods: from 13.4% (95% CI 11.4-15.5%) to 14.8% (95% CI 13.1-16.6%) in 1991-2 and from 9.9% (95% CI 9.2-10.7%) to 12.9% (11.3-14.4%) between 2008 and 2009 (Figure 6).

Exploration of the Differential Trends by Gender

A combined dataset for all years was analysed separately for men and women, given the effect modification observed. Compared to a baseline of 2008, age-adjusted caseness increased by 5.1% (95% 2.6-7.6%, p<0.001) in 2009 and 3.0% (95% 1.2-4.9%, p=0.001) in 2010 amongst men but no statistically significant changes are seen in women (Table 2 and Web Tables A-B). Adding employment status to the model suggests that changes in employment status do not explain this increase in poor mental health. Similarly, adjustment for changes in employment status and education level does not account for this increase in prevalence. Finally, adjustment for equivalised household income in a post-hoc exploratory analysis also did not explain changes in prevalence (see Web Table C).

We attempted to explore the reasons for the ~~increased~~ adverse ~~effect of~~changes in the years following the recession among men. When analysing data from each year separately, adjustment for differences in education level and employment status between genders did not account for the larger increase~~s~~ in prevalence amongst men (see Table 3). Therefore, the differing trend in mental health in men ~~cannot~~ appears not to be explained by differing changes in labour market status.

Discussion

In this large repeat cross-sectional study of representative samples of the English population, we have found evidence to suggest population mental health ~~-~~has deteriorated in men following the start of the 2008 recession. Notably, this change does not appear to arise only as a result of an increase in unemployment, but mental health appears to have declined among those in employment. Household income also does not account for the observed trend in mental health. While some commentators have recently suggested that the current recession may affect both genders in a similar

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manner, we find that the deterioration in mental health appears only~~greatest~~ amongst men. Furthermore, this differential ~~impact~~ association cannot be adequately accounted for by changes in employment status (such as greater unemployment) amongst men. We also find evidence to suggest that socio-economic inequalities (assessed by both highest education level and area-level deprivation) have increased over the course of the last decade, but the recession hads not been associated with a widening of ~~had a clear impact on~~ socio-economic inequalities in mental health ~~to date~~by the year 2010.

Our study has a number of strengths. We used a large nationally representative dataset which used a validated screening test for anxiety and depression. Importantly, we assessed trends over a long length of time with annual measures available for most of the period and an outcome likely to be sensitive to changes in the macro-economic environment. This allows greater certainty in attribution compared to studies limited to comparisons of single before and after surveys. ~~However, a~~

As our study makes use of available data, a number of important limitations exist. First, data was not available for every year, with the omission of GHQ in 2007 potentially problematic as this represents the last full pre-recessionary year. Second, ~~our outcome measure does not equate to a clinically defined mental health condition. It cannot therefore be assumed that changes in GHQ caseness correlate with clinically diagnosed illness. Third,~~ we have been limited to repeat cross-sectional analysis. Longitudinal analysis of individuals would allow greater scope for relating changes in individual employment status to health. Third, while we have chosen a validated outcome measure, it is possible that framing effects could account for some of the observed changes. In particular, GHQ items were asked first in the self-completion questionnaire in 1999, 2002 and 2009, all years with a high prevalence. However, the ~~sustained~~ higher prevalence following 2008 among~~for~~ men remains in 20~~0~~10~~striking~~. Fourth, defining recessionary periods and exploring their effects are notoriously difficult. We have studied changes over time period but did not directly incorporate macro-economic measures into our analysis. In addition, we have only been able to investigate a few of the potential pathways between recession and mental health. Further work is needed to explore other pathways such as temporary employment and increased job insecurity. Lastly, ~~while~~ although our study has ~~attempted to~~ investigated ~~the impact of~~ changes in population mental health associated with the recession, we cannot establish whether this is a causal relationship, as other temporal changes could account for the observed trends. However, many factors that could potentially account for our findings, such as changes in health or social care provision, could also be considered mediating factors rather than confounders.

Much previous research has focussed on mortality, and in particular suicide, associated with recession. In an analysis of cause-specific mortality and its association with recession in European countries, Stuckler et al. found that the most consistently observed relationship was an increase in suicide amongst young men [22]. More recently, they found that increases in suicide rates have been observed across European countries following the onset of the current recession [23]. Consistent increases in male suicide rates have been noted in many other studies [24]. The relationships between morbidity in mental health, health inequalities and recessions are less well understood and findings differ between studies [7 25]. A recent before and after comparison of patients attending primary care services in Spain found a marked increase in the prevalence of mental health disorders following the onset of the

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current global recession [26]. Household unemployment and mortgage difficulties were particularly associated with these attendances. However, not all studies have found a~~n~~ negative association between~~effect of~~ economic recession ~~on~~ and mental health. For example, Vinamaki et al found no statistically significant increase in poor mental health (assessed using GHQ) following the economic recession in Finland between 1993 to 1995 in repeated general population samples [27].

While our study finds men's mental health ~~has been affected~~ has declined while ~~more adversely than~~ women's has not~~-~~, it should be noted that important indirect effects of the recession, including changes in the public sector workforce and changes in government assistance for children, had yet to be implemented during the time of this study. Our analysis does not yet show any indication of worsening mental health inequalities associated with the current recession. However, there is a general trend towards a greater level of inequality more recently and there is no evidence to suggest narrowing. Further research will be required to assess ongoing impacts of the recession by gender and socio-economic position. As our analysis was restricted to a working-age population, research focussing on retired individuals is also needed to investigate the potential impact in older age groups. The existing evidence suggests that the relationship between mental health and recessions differs, at least in part, by social welfare system [10 22 28-31]. There is therefore a need for cross-national comparisons of trends in population health and health inequalities to better identify social policy responses that protect from ~~the~~ any adverse health impacts of recession.

The finding that mental health across the general population has ~~been adversely impacted by~~deteriorated following the recession's onset, and this association does not appear to be limited to those out of employment nor those whose household income has declined, has important implications. Previous research has highlighted the importance of job insecurity, rather than solely employment status, as potentially resulting in adverse effects on mental health [32]. One potential explanation for our results would be that job insecurity during the current recession is responsible for the deterioration in mental health with men's psychological health remaining more affected by economic fluctuations despite greater female labour market participation. This paper highlights the continuing importance of addressing mental health issues using population-wide approaches by both policymakers and health professionals and not limiting such efforts to those directly affected by unemployment.

Acknowledgements

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Table 1: characteristics of study participants

	Sex (%)		Age group (%)				Highest education level (%)				Employment status in last week (%)							
Year	M	F	25-34	35-44	45-54	55-64	Degree	A-level	GCSE	None	Employed	Unemployed	Not working due to ill health	Retired	Looking after home	In education	Sample	Response rate (%)
1991	46.7	53.3	29.8	27.5	21.8	20.8	11.8	18.7	33.4	36.0	71.9	5.5	4.5	4.5	13.1	0.5	2,001	85
1992	47.3	52.7	29.2	28.4	22.6	19.8	11.8	22.0	35.6	30.6	69.3	6.1	4.4	6.1	13.0	1.1	2,484	82
1993	47.5	52.5	29.7	26.6	24.3	19.4	12.8	21.7	33.3	32.2	70.9	6.3	4.3	5.5	12.4	0.6	10,502	81
1994	46.7	53.3	30.2	27.3	23.1	19.5	13.0	21.9	34.4	30.7	70.9	5.5	4.5	5.8	12.4	1.0	9,981	77
1997	47.2	52.8	29.1	27.4	25.0	18.5	16.4	24.8	31.2	27.6	71.7	3.3	6.4	4.8	12.8	1.1	5,377	76
1998	46.6	53.4	28.4	27.5	25.2	18.9	16.6	24.1	33.0	26.3	73.4	2.0	6.1	5.4	11.6	1.4	9,748	74
1999	46.9	53.1	26.5	29.0	25.6	18.9	18.0	25.0	31.1	26.0	72.3	2.3	6.6	5.1	12.3	1.4	4,750	76
2000	45.8	54.2	26.8	30.3	23.3	19.6	18.9	27.3	31.0	22.8	72.3	2.1	6.6	5.8	11.6	1.6	4,982	75
2001	45.7	54.3	24.9	29.6	25.3	20.2	19.6	26.1	32.6	21.6	73.3	2.0	6.4	6.2	10.3	1.7	9,457	74
2002	43.4	56.6	25.7	31.8	22.7	19.8	21.0	27.9	32.7	18.5	71.4	2.1	5.6	6.0	13.6	1.4	4,619	74
2003	45.4	54.6	23.3	29.7	23.8	23.2	21.8	25.8	32.5	19.8	74.6	1.6	6.1	6.3	10.2	1.4	8,982	73
2004	43.4	56.6	22.5	29.2	23.6	24.8	23.0	25.7	29.8	21.5	73.0	1.4	5.9	7.4	10.7	1.6	4,076	72
2005	44.8	55.2	22.5	26.6	26.5	24.4	23.6	25.9	30.1	20.5	73.8	1.7	6.3	6.2	10.6	1.4	4,590	74
2006	44.7	55.3	21.2	28.8	24.9	25.2	25.5	26.8	29.2	18.5	73.9	1.8	5.9	6.8	10.3	1.3	8,605	68
2008	44.7	55.3	22.0	27.5	25.2	25.3	25.6	28.0	28.7	17.7	74.0	2.1	5.4	7.4	9.6	1.6	9,228	64
2009	45.6	54.4	21.7	28.8	25.0	24.6	26.4	25.6	30.9	17.0	73.4	3.1	5.5	7.4	9.0	1.7	2,773	68
2010	43.5	56.5	21.3	26.5	27.6	24.6	28.2	28.3	29.7	13.9	73.1	3.1	5.8	7.4	9.0	1.6	4,830	66

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Table 2: Analysis of Data from 1991-2010 in Men and Women Adjusted for Age, Employment Status and Education (Selected Years Shown)

	Model 1: Age				Model 2: Age + Employment Status				Model 3: Age + Employment Status + Education			
Males												
Year	**OR**	**P**	**Lower 95% CI**	**Upper 95% CI**	**OR**	**P**	**Lower 95% CI**	**Upper 95% CI**	**OR**	**P**	**Lower 95% CI**	**Upper 95% CI**
2005	0.97	0.723	0.82	1.15	0.92	0.370	0.78	1.10	0.93	0.394	0.78	1.10
2006	1.06	0.465	0.91	1.22	1.05	0.511	0.91	1.22	1.05	0.506	0.91	1.22
2008	1.00	-	-	-	1.00	-	-	-	1.00	-	-	-
2009	1.53	0.000	1.26	1.86	1.50	0.000	1.24	1.82	1.50	0.000	1.24	1.82
2010	1.31	0.001	1.12	1.54	1.31	0.001	1.11	1.54	1.30	0.002	1.10	1.53
	% difference	**P**	**Lower 95% CI**	**Upper 95% CI**	**% difference**	**P**	**Lower 95% CI**	**Upper 95% CI**	**% difference**	**P**	**Lower 95% CI**	**Upper 95% CI**
2005	-0.31	0.722	-2.02	1.40	-0.75	0.367	-2.12	1.32	-0.71	0.391	-2.34	0.92
2006	0.56	0.465	-0.95	2.08	0.49	0.511	-0.97	2.09	0.50	0.506	-0.96	1.95
2008	0.00	-	-	-	0.00	-	-	-	0.00		-	-
2009	5.07	0.000	2.60	7.55	4.54	0	2.67	7.65	4.52	0.000	2.21	6.83
2010	3.04	0.001	1.17	4.91	2.86	0.002	1.32	5.13	2.79	0.002	1.01	4.56
Females												
	OR	**P**	**Lower 95% CI**	**Upper 95% CI**	**OR**	**P**	**Lower 95% CI**	**Upper 95% CI**	**OR**	**P**	**Lower 95% CI**	**Upper 95% CI**

2005	1.01	0.917	0.88	1.15	1.00	0.958	0.88	1.15	1.00	0.956	0.88	1.15
2006	0.96	0.467	0.86	1.07	0.95	0.342	0.85	1.06	0.95	0.344	0.85	1.06
2008	1.00	-	-	-	1.00	-	-	-	1.00	-	-	-
2009	1.04	0.641	0.88	1.23	1.06	0.522	0.90	1.24	1.06	0.523	0.90	1.24
2010	1.06	0.369	0.93	1.22	1.05	0.493	0.91	1.20	1.05	0.482	0.92	1.20
	% difference	**P**	**Lower 95% CI**	**Upper 95% CI**	**% difference**	**P**	**Lower 95% CI**	**Upper 95% CI**	**% difference**	**P**	**Lower 95% CI**	**Upper 95% CI**
2005	0.09	0.918	-1.69	1.88	0.05	0.959	-1.70	1.79	0.05	0.956	-1.69	1.79
2006	-0.55	0.467	-2.04	0.94	-0.70	0.341	-2.13	0.74	-0.69	0.344	-2.13	0.74
2008	0.00	-	-	-	0.00	-	-	-	0.00	-	-	-
2009	0.53	0.643	-1.70	2.76	0.70	0.526	-1.48	2.89	0.70	0.527	-1.48	2.88
2010	0.84	0.372	-1.01	2.70	0.63	0.495	-1.18	2.43	0.64	0.485	-1.16	2.44

* Reference group is 2008. Selected years around the current recession shown but analyses for all years available in the on-line appendix.
CI = Confidence Interval
OR = Odds Ratio
P = P value

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Table 3: Odds ratio and % difference for GHQ caseness by year for women

	Model 1 (age adjusted)			Model 2 (adjusted for age, education level and employment status)		
Year	**OR (95% CI)***	**P**	**% difference (95% CI)**	**OR (95% CI)***	**P**	**% difference (95% CI)**
1991	1.75 (1.40 to 2.20)	0.000	7.34 (4.40 to 10.27)	1.81 (1.39 to 2.36)	0.000	7.53 (4.30 to 10.75)
1992	1.46 (1.16 to 1.84)	0.001	5.31 (2.14 to 8.48)	1.59 (1.25 to 2.02)	0.000	6.32 (3.10 to 9.54)
1993	1.43 (1.29 to 1.57)	0.000	4.87 (3.52 to 6.22)	1.55 (1.39 to 1.73)	0.000	5.83 (4.37 to 7.30)
1994	1.61 (1.45 to 1.78)	0.000	6.32 (4.98 to 7.66)	1.77 (1.58 to 1.99)	0.000	7.33 (5.90 to 8.76)
1997	1.59 (1.38 to 1.84)	0.000	6.17 (4.27 to 8.06)	1.68 (1.43 to 1.96)	0.000	6.55 (4.62 to 8.49)
1998	1.47 (1.31 to 1.64)	0.000	4.98 (3.56 to 6.39)	1.58 (1.39 to 1.79)	0.000	5.64 (4.15 to 7.13)
1999	1.29 (1.11 to 1.50)	0.001	3.59 (1.50 to 5.67)	1.40 (1.19 to 1.65)	0.000	4.44 (2.30 to 6.59)
2000	1.47 (1.24 to 1.73)	0.000	4.63 (2.66 to 6.61)	1.61 (1.33 to 1.94)	0.000	5.22 (3.19 to 7.26)
2001	1.44 (1.28 to 1.62)	0.000	4.19 (2.85 to 5.53)	1.55 (1.37 to 1.77)	0.000	4.75 (3.38 to 6.13)
2002	1.41 (1.21 to 1.64)	0.000	4.73 (2.71 to 6.76)	1.51 (1.27 to 1.78)	0.000	5.32 (3.19 to 7.45)
2003	1.29 (1.14 to 1.45)	0.000	2.91 (1.52 to 4.29)	1.38 (1.20 to 1.58)	0.000	3.44 (1.99 to 4.88)
2004	1.35 (1.11 to 1.63)	0.002	3.37 (1.25 to 5.49)	1.40 (1.14 to 1.71)	0.001	3.51 (1.38 to 5.65)
2005	1.52 (1.29 to 1.80)	0.000	4.85 (2.97 to 6.72)	1.68 (1.40 to 2.03)	0.000	5.46 (3.57 to 7.35)
2006	1.33 (1.18 to 1.49)	0.000	3.29 (1.92 to 4.67)	1.40 (1.22 to 1.60)	0.000	3.57 (2.18 to 4.96)
2008	1.46 (1.29 to 1.65)	0.000	4.41 (3.03 to 5.79)	1.54 (1.34 to 1.76)	0.000	4.52 (3.11 to 5.94)
2009	0.99 (0.79 to 1.24)	0.927	-0.15 (-3.26 to 2.97)	1.09 (0.86 to 1.39)	0.465	1.13 (-1.89 to 4.15)
2010	1.19 (1.01 to 1.39)	0.036	2.24 (0.16 to 4.32)	1.24 (1.04 to 1.48)	0.016	2.63 (0.52 to 4.75)

* Reference group is men
CI = Confidence Interval
OR = Odds Ratio
P = P value

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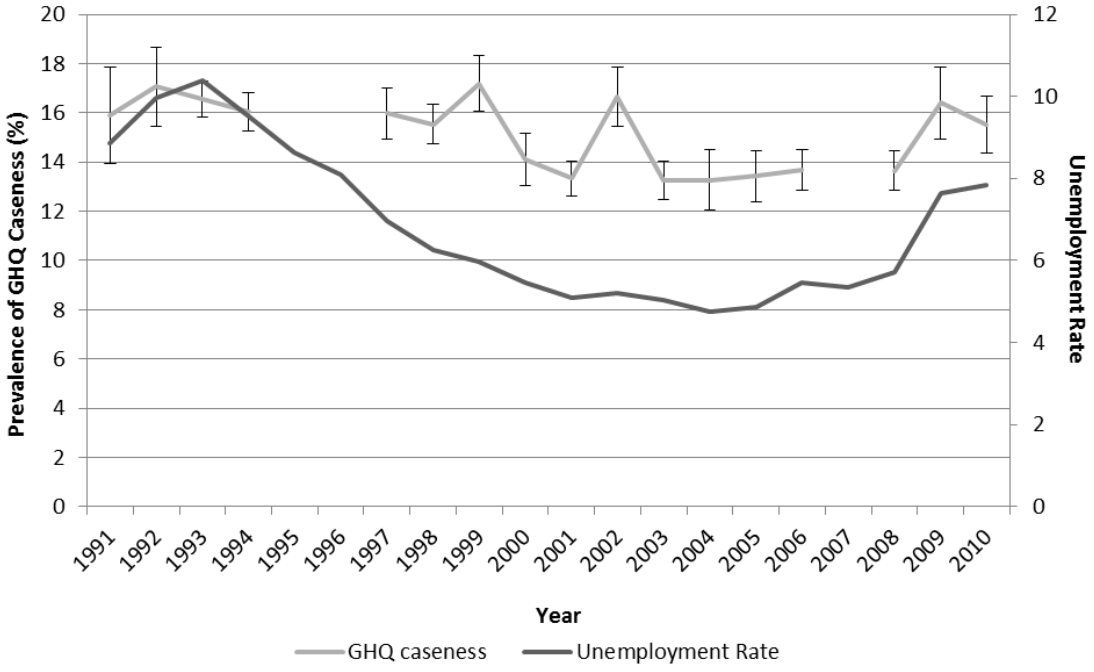

Figure 1: Overall prevalence of GHQ caseness and unemployment rate 1991 to 2010

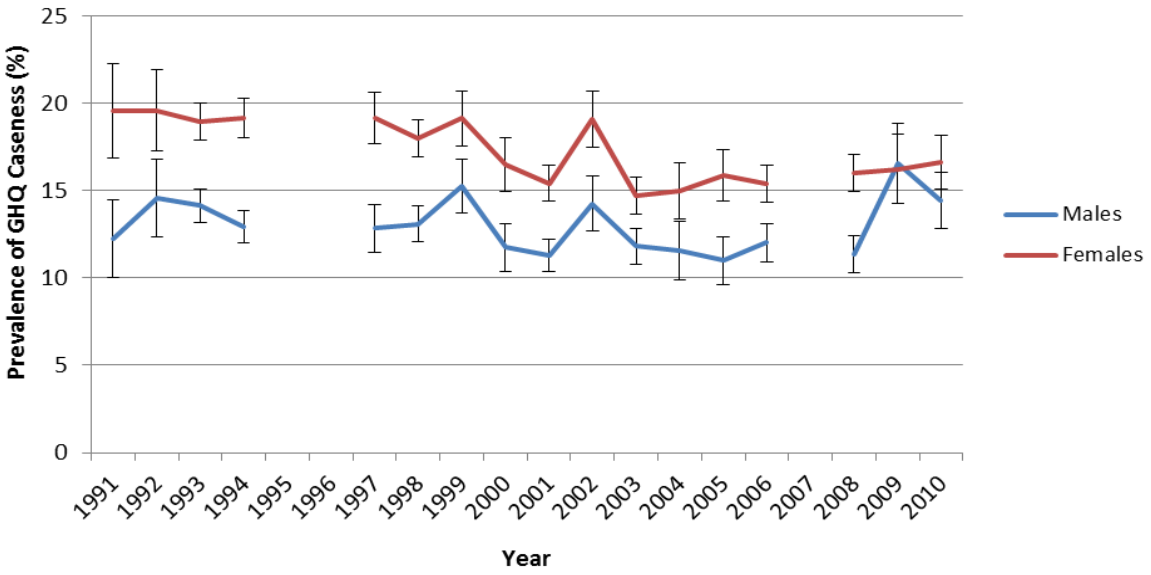

Figure 2: Prevalence of GHQ caseness by gender 1991 to 2010

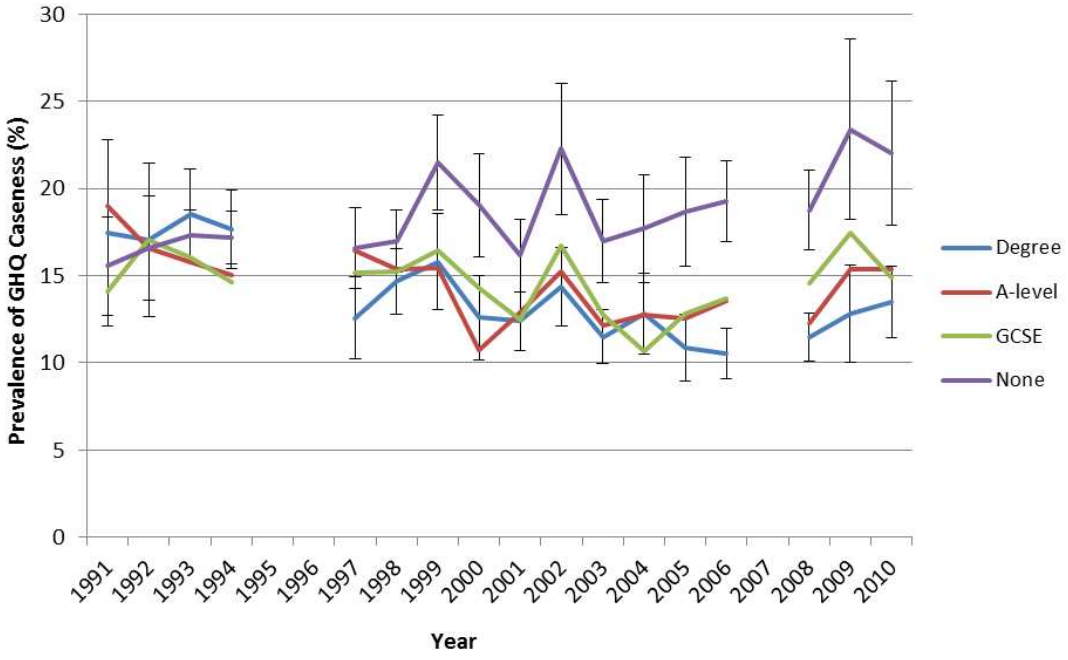

Figure 3: Prevalence of GHQ caseness by highest education level 1991 to 2010

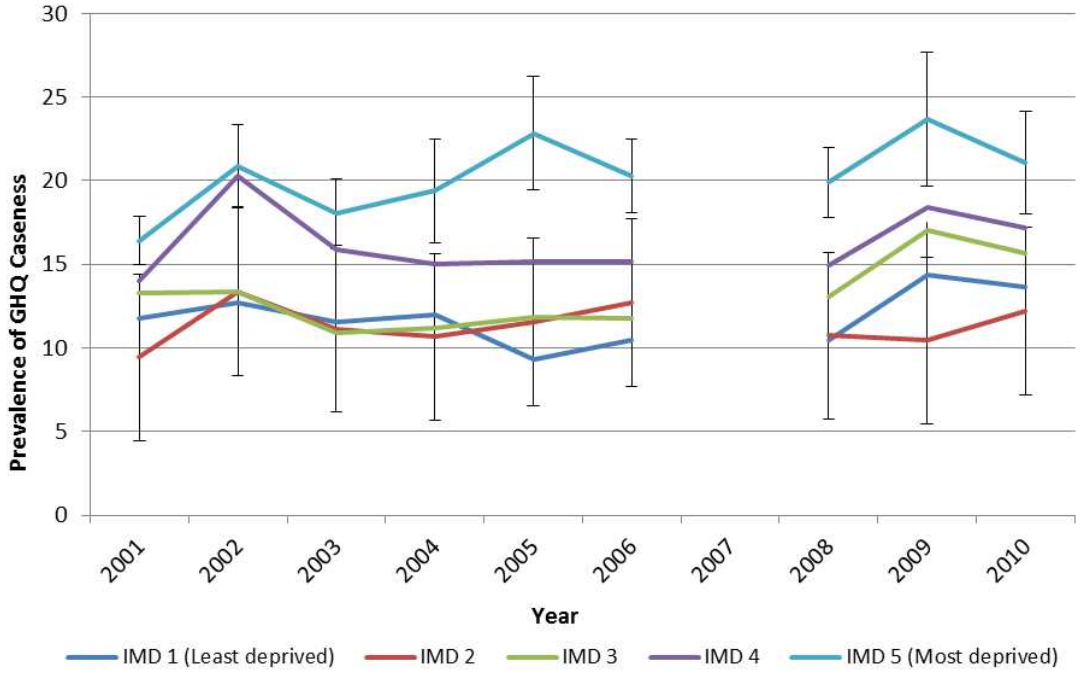

Figure 4: Prevalence of GHQ caseness by area-level deprivation (index for multiple deprivation, IMD) 2001 to 2010

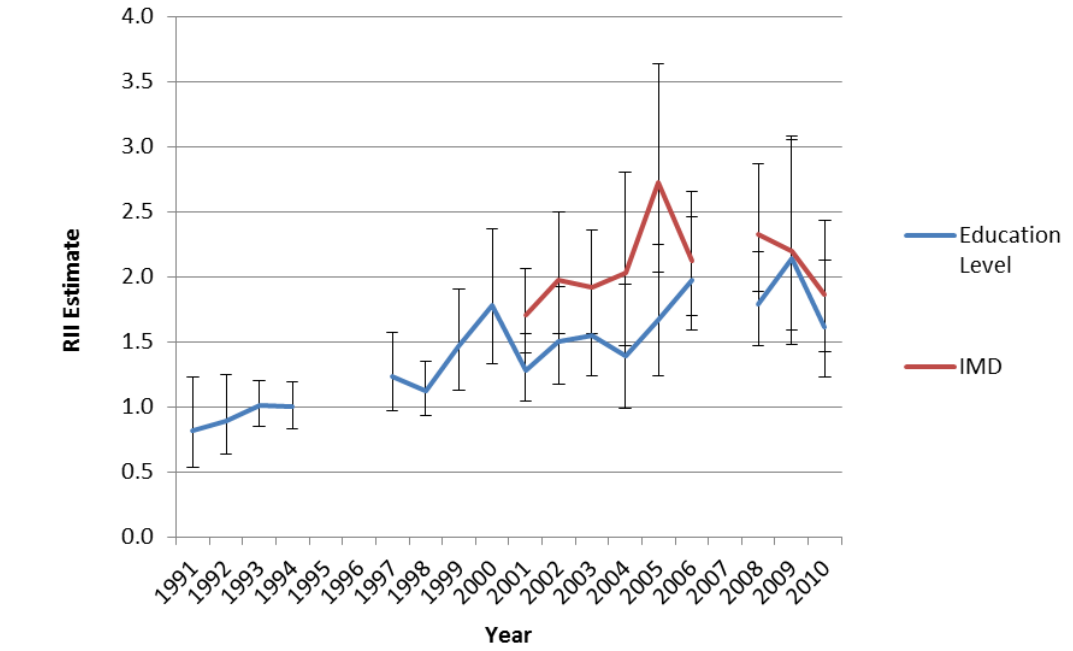

Figure 5: Relative Index of Inequality (RII) for GHQ Caseness as assessed education level and area-level deprivation (index for multiple deprivation, IMD) 1991 to 2010

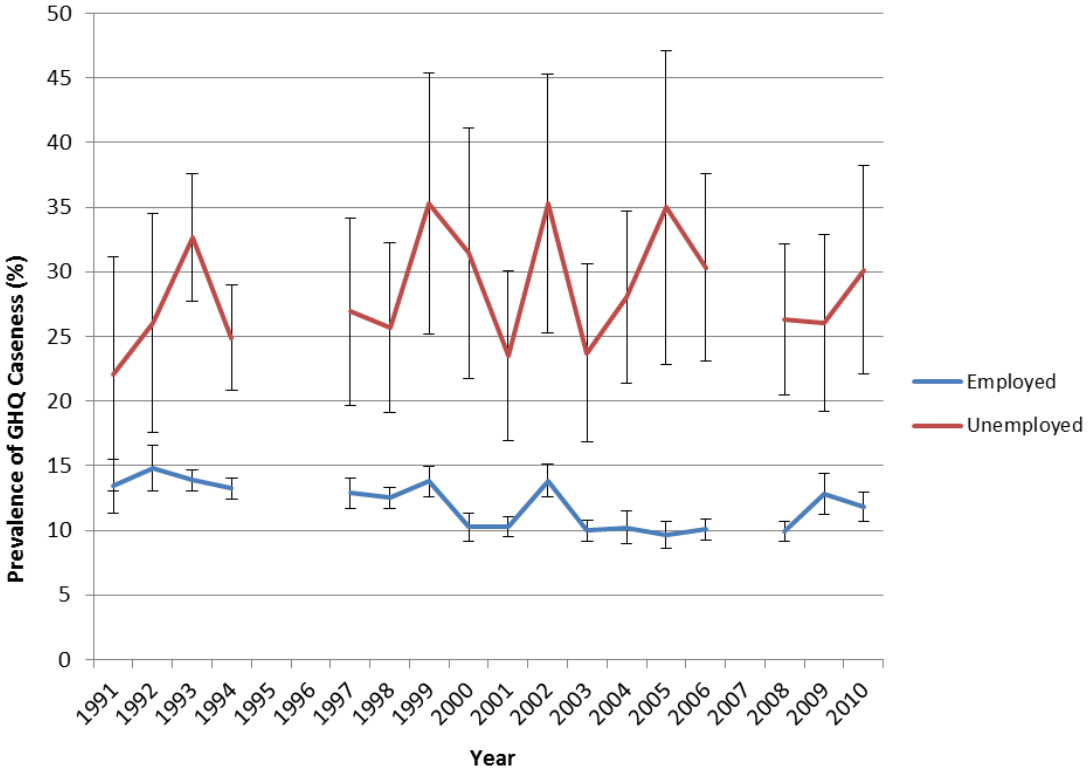

Figure 6: GHQ caseness by employment status 1991 to 2010

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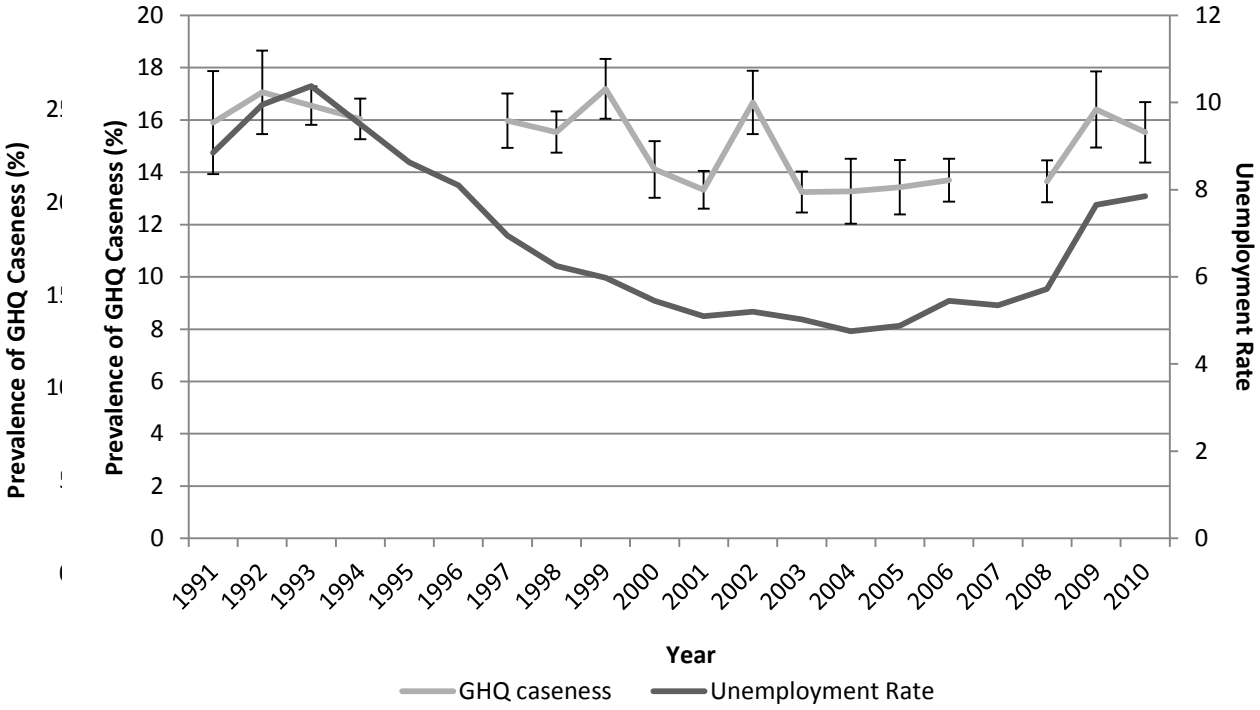

Figure 1: Overall prevalence of GHQ caseness and unemployment rate 1991 to 2010

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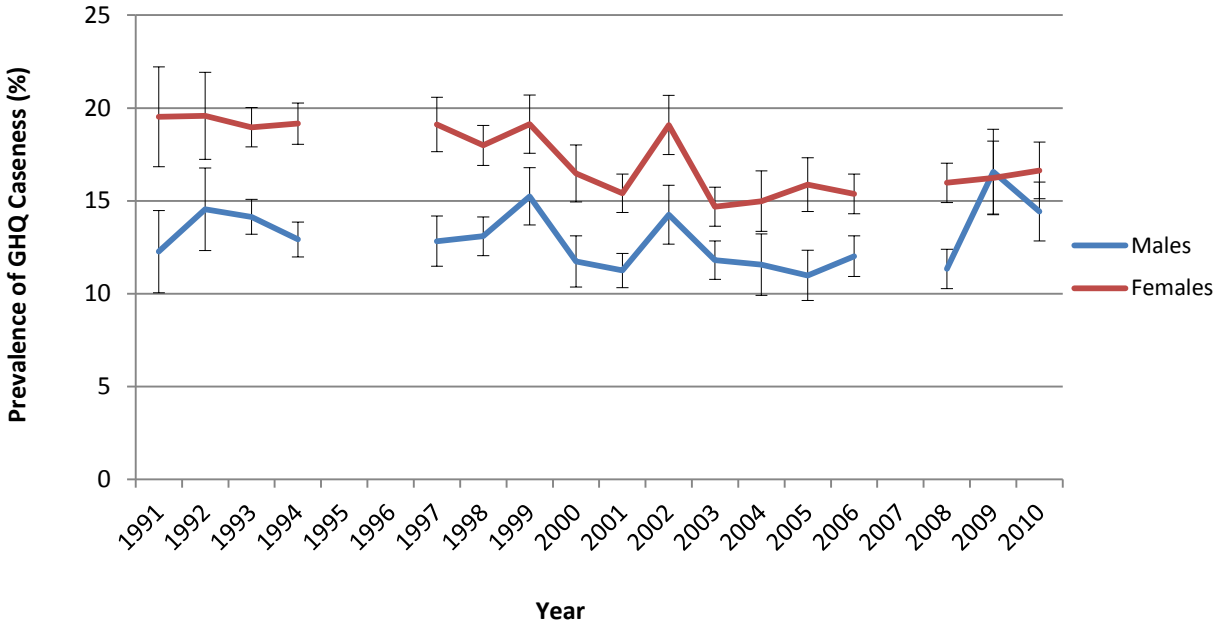
Figure 2: Prevalence of GHQ caseness by gender 1991 to 2010



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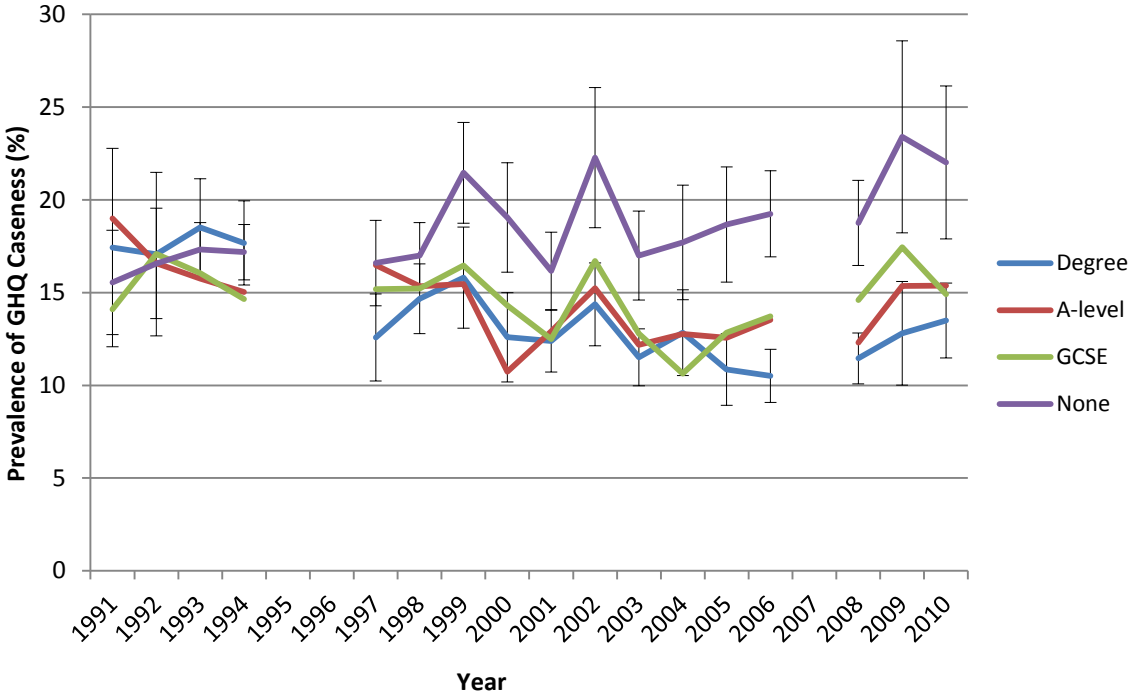

Figure 3: Prevalence of GHQ caseness by highest education level 1991 to 2010

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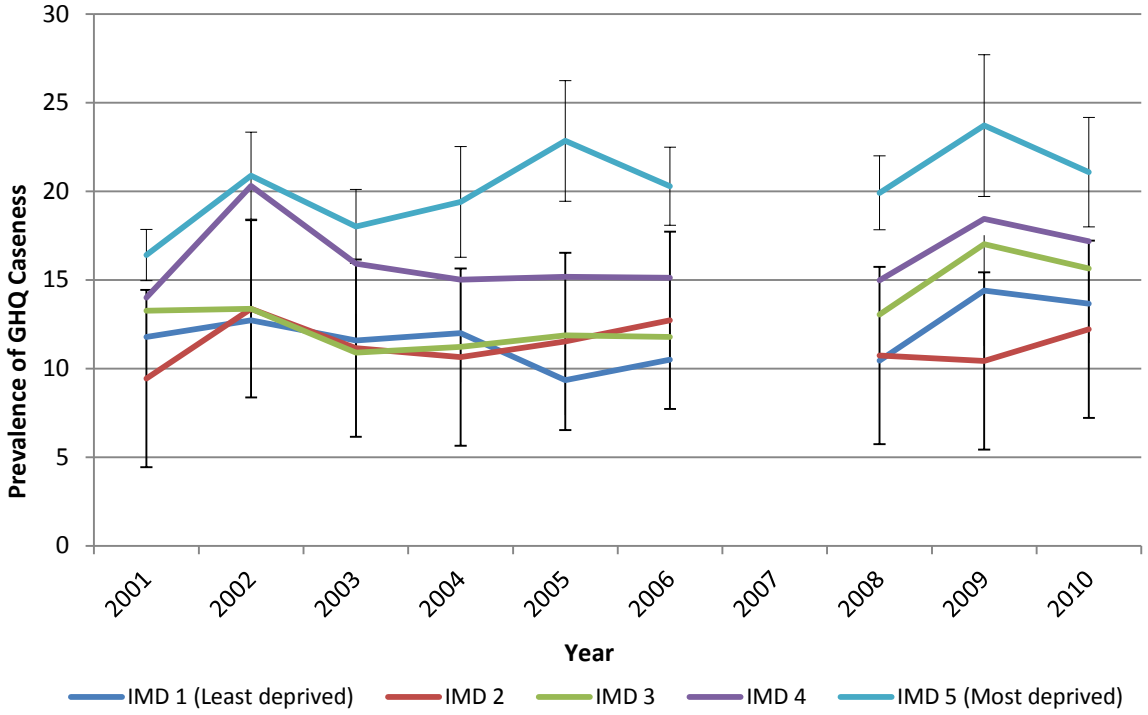

Figure 4: Prevalence of GHQ caseness by area-level deprivation (index for multiple deprivation, IMD) 2001 to 2010

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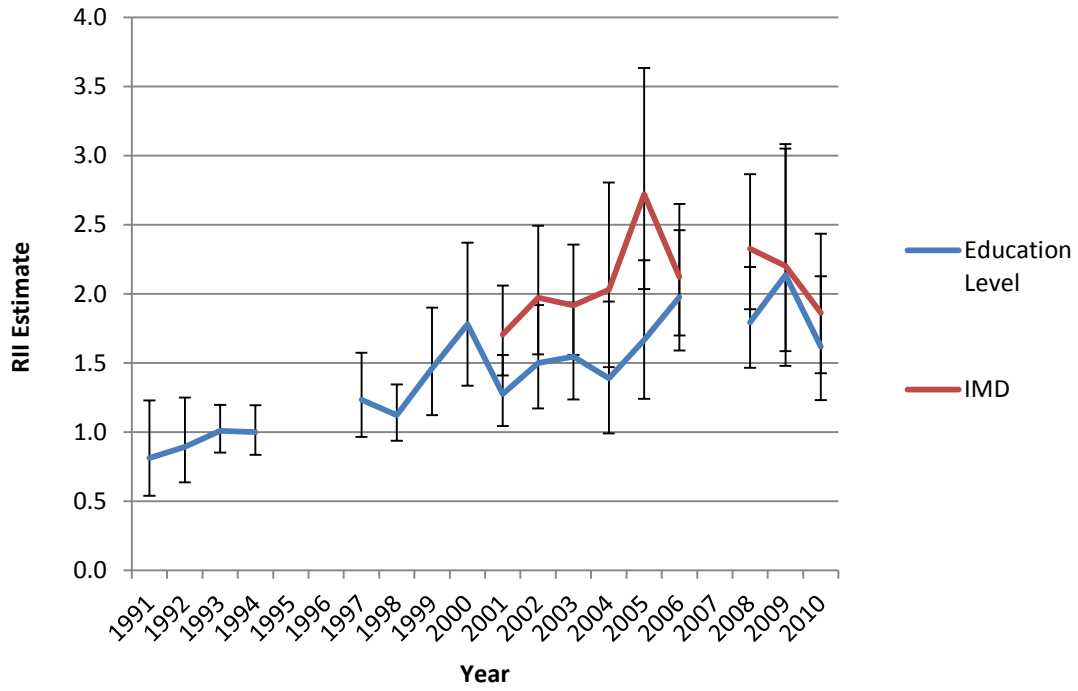

Figure 5: Relative Index of Inequality (RII) for GHQ Caseness as assessed education level and area-level deprivation (index for multiple deprivation, IMD) 1991 to 2010

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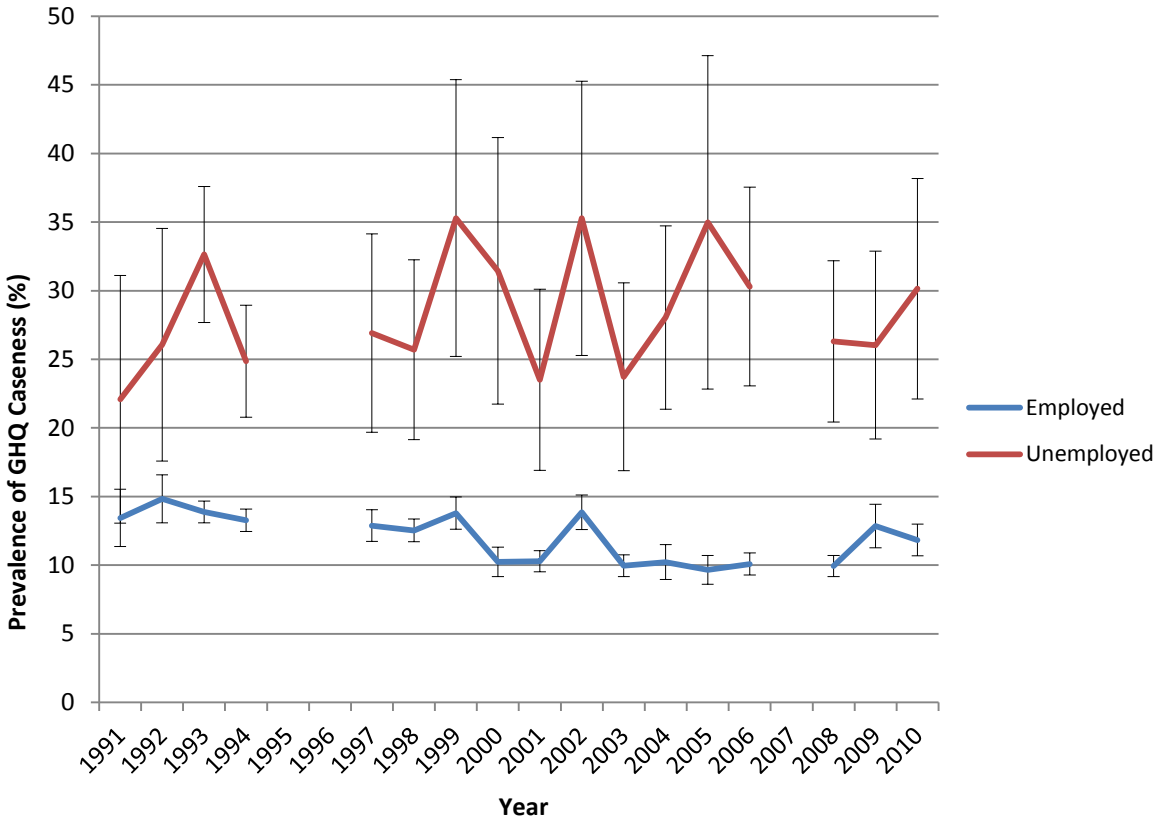
Figure 6: GHQ caseness by employment status 1991 to 2010



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