ORIGINAL ARTICLE

Occupations, work characteristics and common mental disorder

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Background. The present study aimed to assess the prevalence of common mental disorders (CMDs) by occupation in a representative sample of the English adult population. Another aim was to examine whether the increased risk of CMD in some occupations could be explained by adverse work characteristics.

Method. We derived a sample of 3425 working-age respondents from the Adult Psychiatric Morbidity Survey 2007. Occupations were classified by Standard Occupational Classification group, and CMD measured by the Revised Clinical Interview Schedule. Job characteristics were measured by questionnaire, and tested as explanatory factors in associations of occupation and CMD.

Results. After adjusting for age, gender, housing tenure and marital status, caring personal service occupations had the greatest risk of CMD compared with all occupations (odds ratio 1.73, 95% confidence interval 1.16–2.58). The prevalence of adverse psychosocial work characteristics did not follow the pattern of CMD by occupation. Work characteristics did not explain the increased risk of CMDs associated with working in personal service occupations. Contrary to our hypotheses, adding work characteristics individually to the association of occupation and CMD tended to increase rather than decrease the odds for CMD.

Conclusions. As has been found by others, psychosocial work characteristics were associated with CMD. However, we found that in our English national dataset they could not explain the high rates of CMD in particular occupations. We suggest that selection into occupations may partly explain high CMD rates in certain occupations. Also, we did not measure emotional demands, and these may be important mediators of the relationship between occupation type and CMDs.

Introduction

Rates of common mental disorders (CMDs), largely depression and anxiety, vary by occupation. The specific attributes of certain occupations may be responsible for higher rates of CMDs. There is some consistency across European and North American studies about which occupations are associated with high rates of CMD. People involved in sales, personal and protective services, teaching, clerical and secretarial, welfare workers, and kitchen and waiting staff seem to be particularly at risk (Eaton *et al.* 1990; Roberts & Lee, 1993; Jones *et al.* 1998; Sanne *et al.* 2003; Wieclaw *et al.* 2005; Marchand, 2007; Stansfeld *et al.* 2011). It is not clear whether there are common factors in the diverse range of occupations associated with a high rate of CMDs. Work characteristics have not previously been studied as an explanation of the differing rates of CMD between occupations.

There have been numerous studies of psychosocial work characteristics and mental health: two meta-analyses have linked job strain to increased risks of depression, and both job strain and effort–reward

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imbalance (ERI) to increased risk of CMDs (Stansfeld & Candy, 2006; Netterstrom *et al.* 2008), although not all reviewers are convinced of a causal association (Bonde, 2008). Karasek's model proposes that high-strain jobs, involving high demands but low control over how work is carried out, are most detrimental to health (Karasek, 1979; Karasek & Theorell, 1990). Many studies have found that this combination of work characteristics is highly associated with adverse health outcomes in comparison with low-strain work (low demands/high control) (de Lange *et al.* 2003; Stansfeld & Candy, 2006). The job strain model also incorporates social support from colleagues and managers, as this may modify the effect of high-strain work on mental health (Johnson & Hall, 1988). It may indeed be possible to thrive in high-demand situations as long as there is adequate control and support.

Another influential theory of psychosocial work characteristics suggests that adverse health may result from a mismatch between the efforts and rewards of the work (Siegrist, 1996). Such ERI occurs when the efforts of the work are high but its rewards in terms of being valued by the organization, having good promotion prospects and job security are low. Experiencing ERI can result in disappointment and feelings of not being treated fairly, which in the long term affect physical and mental health (Pikhart *et al.* 2004). An addition to the model posits that over-commitment to one's job may amplify the association between ERI and mental disorder (Siegrist, 1996; de Jonge, 2000; van Vegchel, 2005).

In an analysis of an earlier national UK survey we found higher than average rates of CMD in sales staff, personal and protective services, managers and administrators, teaching staff, and clerical and secretarial staff (Stansfeld *et al.* 2011). We speculated that high demand (in particular, emotional demands for personal and protective services and teachers), high job insecurity, low work support, and ERI might explain the higher rates in these occupations. However, in that survey there were no measures of work characteristics, and we were unable to test out these ideas. In the current paper we present data from a new representative national survey, the 2007 Adult Psychiatric Morbidity Survey (APMS 2007). This survey included the Standard Occupational Classification (SOC; Office for National Statistics, 2000) together with the Karasek Job Content Instrument (Karasek, 1979; Karasek & Theorell, 1990) and the short version of the Effort Reward Imbalance questionnaire (Siegrist *et al.* 2009). This has allowed us to test for the first time whether psychosocial work characteristics can explain the differing rates of CMD between occupations. We hypothesized that higher rates of CMD in certain occupations would be explained by high demands, low work social support, high job insecurity, and high job strain (high demands and low control) and ERI (high effort and low rewards).

Method

This paper analyses data from the APMS 2007 (McManus *et al.* 2009), a stratified probability sampling survey of those aged over 16 years living in private households in England. The survey was carried out as part of the extensive programme of national mental health surveys in Great Britain (Jenkins *et al.* 2009). The APMS 2007 used structured procedures for identifying psychiatric disorders. It also recorded data on a range of sociodemographic variables, on occupation type and, for the first time, included questions on psychosocial work characteristics. Ethical approval for the APMS 2007 was obtained from the Royal Free Hospital and Medical School Ethics Committee.

Sample

The APMS 2007 was conducted in two phases. Residential addresses were randomly sampled using the small user Postcode Address File (McManus *et al.* 2009). Interviewers from the National Centre for Social Research visited the selected locations to identify private households with at least one resident aged over 16 years. The Kish grid method (Kish, 1965) was used to select one person from those eligible in each household to take part in the survey. A total of 13 171 households were visited and 57% (7461) of the eligible participants (69% of those successfully contacted) agreed to take part in the phase one survey, which provided the data presented here. There were 4075 refusals, 499 known eligible non-contacts, 471 eligible non-contacts and 664 unable/unproductive contacts. Response rate was lower in the West Midlands, East of England, London, South East and South West, among households with entry barriers and households not owner occupied. Information was collected by professional survey interviewers, using computer-assisted personal interviews lasting approximately 90 min. Full details of the sampling procedure and the methods used have been given by McManus *et al.* (2009).

The analysis in this paper uses the subsample of 3425 respondents who were of working age (16–64 years), had engaged in paid work in the previous week, were not self-employed, and had answered all questions relevant to this analysis.

Measures

CMD

The Revised Clinical Interview Schedule (Lewis *et al.* 1992), a standardized clinical psychiatric interview, was used to establish the presence of non-psychotic symptoms of CMD in the past week. Algorithms were then used to derive International Classification of Diseases, Tenth Revision (ICD-10) diagnoses of six specific disorders (generalized anxiety disorder, mixed anxiety and depressive disorder, depressive episode, panic disorder, phobia and obsessive–compulsive disorder). A dichotomous measure of presence or absence of any CMD was derived from the individual diagnoses.

Occupation

Respondents were asked about the nature of their job: whether it was full or part time, their job title, a description of their role, and whether they had a management or supervisory position. Occupations were classified as one of 371 occupations or 'units', in accordance with the SOC schedule 2000 (Office for National Statistics, 2000). Units are grouped into nine major SOC groups, which broadly classify occupations similar in terms of qualifications, training, skills and experience. Units are further subgrouped into 25 sub-major SOC groups (see Table 1 for the complete classifications).

Work characteristics

Siegrist's ERI model was measured by the short version of the ERI questionnaire (Siegrist *et al.* 2009). This involved asking respondents whether they agreed or disagreed on a four- or five-point Likert scale to statements describing the characteristics of their work such as: 'I have constant time pressure due to a heavy work load' and 'people say I sacrifice too much for my job'. Effort was measured by three questions on efforts/demands at work (Cronbach's $\alpha = 0.787$). Rewards were measured by two questions on job prospects, and four questions measured esteem from colleagues, clients, customers and managers. There were also two questions on job security, and six questions measured over-commitment (Cronbach's $\alpha = 0.805$). More information on the work characteristic items can be found in an unpublished paper by Harris *et al.* (J. Harris *et al.* unpublished observations).

A total of six questions, based on the Karasek job strain model, adapted from the Whitehall II study questionnaire (Karasek, 1979; North *et al.* 1996), assessed the respondents' perceived level of control (two items) (Cronbach's $\alpha = 0.731$) and support at work (four items) (Cronbach's $\alpha = 0.792$). The same questions were used to measure both effort and 'demands' for the Karasek job strain model to make up the two orthogonal dimensions of demands and control. Items concerning control consisted of two questions asking respondents to rate on a four-point Likert scale how often they have a choice over how they do their work and what they work on (often/sometimes/seldom/never–almost never). Support questions asked respondents to rate the frequency of support offered by line managers and colleagues on an equivalent scale.

Scores for each item were summed to produce a total score for each individual work characteristic, and respondents were then placed into tertiles representing whether they had high, medium or low scores on each characteristic. Measures of job strain and ERI were derived using these tertiles.

Respondents reporting high efforts and low rewards were assigned to the 'ERI' category, those reporting high demands and low control to the 'job strain' category. Respondents experiencing low effort/demands and low control were assigned to the 'passive' job category, while those reporting high effort/demands and high control were allocated to the 'active' job category. People with the most favourable work characteristics, i.e. low effort/demands and high control, formed the 'low strain' category (see Table 2). The job strain and ERI models were shown to have acceptable factorial validity [root mean square error of approximation (RMSEA) < 0.08] when tested using confirmatory factor analysis on this dataset (J. Harris *et al.* unpublished observations).

Alcohol problems

Alcohol-use disorders were measured by the 10-item Alcohol Use Disorders Identification Test (AUDIT), a widely used indicator of hazardous drinking, scored from 0 to 40 (Saunders *et al.* 1993). Scores were grouped 0–7 (73.1%), 8–15 (hazardous use of alcohol, 23.2%) and 16–40 (hazardous and harmful to health, 3.7%).

Analysis

The first step in the analysis was to establish the associations between the major and sub-major SOC groups and CMD, using logistic regression analyses adjusted for age, gender, housing tenure and marital status. Associations between major SOC group and CMD were then tested for interactions with gender, and analyses were re-run stratified by gender if the interaction was significant. The relationship between sub-major SOC group and CMD was not tested for gender interactions because of small group sizes.

Table 1. *Risk for CMD by major SOC groups, unadjusted and adjusted for age, gender, housing tenure and marital status*

	Sample n (%)	With CMD n (%)	Risk for CMD, unadjusted OR[a] (95% CI)	Risk for CMD, adjusted OR (95% CI)
Major SOC groups				
Males and females				
Managers and senior officials	558 (16.3)	63 (11.3)	0.75 (0.54–1.03)	0.81 (0.58–1.13)
Professional occupations	450 (13.1)	53 (11.7)	0.79 (0.56–1.10)	0.83 (0.59–1.16)
Associate professional and technical occupations	560 (16.4)	82 (14.7)	1.06 (0.79–1.43)	1.01 (0.74–1.37)
Administrative and secretarial occupations	372 (10.9)	57 (15.4)	1.13 (0.81–1.56)	0.92 (0.65–1.31)
Skilled trades occupations	312 (9.1)	31 (9.8)	0.64 (0.43–0.96)	0.91 (0.60–1.38)
Personal service occupations	282 (8.2)	67 (23.9)	2.07 (1.43–2.98)*	1.62 (1.11–2.37)*
Sales and customer service occupations	273 (8.0)	47 (17.4)	1.31 (0.87–1.98)	1.13 (0.73–1.73)
Process, plant and machine operatives	243 (7.1)	18 (7.5)	0.48 (0.28–0.81)*	0.62 (0.36–1.06)
Elementary occupations	374 (10.9)	63 (16.8)	1.27 (0.88–1.82)	1.28 (0.87–1.87)
Total	3425	482 (14.1)		
Male				
Managers and senior officials	354 (19.3)	28 (7.9)	0.73 (0.46–1.18)	0.75 (0.46–1.20)
Professional occupations	265 (14.4)	27 (10.2)	1.04 (0.64–1.68)	1.07 (0.66–1.75)
Associate professional and technical occupations	265 (14.4)	30 (11.2)	1.16 (0.69–1.96)	1.18 (0.70–2.00)
Administrative and secretarial occupations	97 (5.3)	15 (15.9)	1.77 (0.91–3.46)	1.81 (0.91–3.58)
Skilled trades occupations	289 (15.7)	23 (7.8)	0.73 (0.48–1.13)	0.74 (0.48–1.13)
Personal service occupations	57 (3.1)	10 (18.3)	2.09 (0.81–5.33)	2.02 (0.81–5.00)
Sales and customer service occupations	94 (5.1)	15 (15.9)	1.77 (0.88–3.56)	1.68 (0.82–3.43)
Process, plant and machine operatives	207 (11.3)	12 (5.6)	0.51 (0.27–0.94)*	0.52 (0.28–0.99)*
Elementary occupations	209 (11.4)	24 (11.3)	1.17 (0.66–2.09)	1.06 (0.58–1.95)
Total	1834	183 (10.0)		
Female				
Managers and senior officials	204 (12.8)	35 (17.3)	0.89 (0.64–1.32)	0.88 (0.59–1.30)
Professional occupations	186 (11.7)	26 (13.8)	0.66 (0.44–0.99)*	0.66 (0.44–0.99)*
Associate professional and technical occupations	295 (18.6)	53 (17.9)	0.93 (0.67–1.28)	0.92 (0.66–1.27)
Administrative and secretarial occupations	275 (17.3)	42 (15.2)	0.74 (0.52–1.06)	0.75 (0.52–1.07)
Skilled trades occupations	23 (1.5)	8 (34.3)	2.29 (0.96–5.45)	2.35 (0.97–5.68)
Personal service occupations	226 (14.2)	57 (25.3)	1.57 (1.04–2.37)*	1.55 (1.02–2.36)*
Sales and customer service occupations	179 (11.2)	33 (18.2)	0.95 (0.57–1.60)	0.95 (0.57–1.60)
Process, plant and machine operatives	36 (2.3)	7 (18.5)	0.98 (0.40–2.38)	0.97 (0.40–2.36)
Elementary occupations	165 (10.4)	126 (23.8)	1.40 (0.90–2.16)	1.45 (0.92–2.28)
Total	1591	299 (18.8)		

Sub-major SOC groups

Males and females

Corporate managers	471 (13.8)	56 (11.9)	0.80 (0.58–1.12)	0.88 (0.63–1.23)
Managers and proprietors in agriculture and service	87 (2.5)	7 (8.1)	0.53 (0.24–1.19)	0.55 (0.25–1.22)
Science and technology professionals	137 (4.0)	13 (9.6)	0.64 (0.36–1.14)	0.79 (0.43–1.46)
Health professionals	23 (0.7)	4 (17.9)	1.33 (0.42–4.20)	1.55 (0.49–4.93)
Teaching and research professionals	186 (5.4)	28 (14.8)	1.06 (0.68–1.66)	0.96 (0.61–1.53)
Business and public service professionals	104 (3.0)	8 (7.7)	0.50 (0.23–1.07)	0.54 (0.25–1.17)
Science and technology associate professionals	55 (1.6)	10 (18.3)	1.38 (0.59–3.21)	1.53 (0.67–3.50)
Health and social welfare associate professionals	169 (4.9)	24 (14.1)	1.00 (0.65–1.56)	0.81 (0.51–1.26)
Protective service occupations	50 (1.5)	9 (18.0)	1.34 (0.66–2.74)	1.61 (0.78–3.32)
Culture media sports occupations	58 (1.7)	9 (15.6)	1.13 (0.49–2.61)	1.21 (0.51–2.86)
Business and public service associate professionals	228 (6.6)	30 (13.3)	0.93 (0.58–1.51)	0.91 (0.56–1.49)
Administrative occupations	279 (8.1)	43 (15.5)	1.13 (0.77–1.66)	1.00 (0.67–1.49)
Secretarial and related occupations	93 (2.7)	14 (15.1)	1.09 (0.59–2.03)	0.78 (0.41–1.48)
Skilled agricultural trades	15 (0.5)	2 (13.3)	0.70 (0.15–3.39)	0.99 (0.23–4.34)
Skilled metal and electrical trades	145 (4.2)	13 (9.0)	0.59 (0.34–1.02)	0.91 (0.52–1.57)
Skilled construction and building trades	74 (2.2)	7 (9.3)	0.62 (0.22–1.73)	0.93 (0.34–2.57)
Textiles printing and other skilled trades	78 (2.3)	9 (11.7)	0.80 (0.38–1.70)	0.90 (0.43–1.89)
Caring personal service occupations	234 (6.8)	60 (25.8)	2.28 (1.55–3.35)*	1.73 (1.16–2.58)*
Leisure and other personal service occupations	48 (1.4)	7 (14.8)	1.06 (0.36–3.12)	1.01 (0.33–3.05)
Sales occupations	219 (6.4)	38 (17.5)	1.45 (0.97–2.16)	1.36 (0.90–2.08)
Customer service occupations	54 (1.6)	9 (16.7)	1.23 (0.52–2.90)	1.06 (0.45–2.51)
Process plant and machine operatives	132 (3.8)	12 (9.3)	0.60 (0.32–1.12)	0.73 (0.39–1.38)
Transport and mobile machine drivers and operatives	112 (3.3)	6 (5.4)	0.34 (0.13–0.90)*	0.47 (0.18–1.23)
Elementary trades, plant and storage-related occupations	94 (2.7)	10 (11.1)	0.76 (0.34–1.71)	0.95 (0.42–2.15)
Elementary administration and service occupations	281 (8.2)	52 (18.7)	1.45 (0.97–2.16)	1.36 (0.90–2.08)
Total	3425	482 (14.1)		

CMD, Common mental disorder; SOC, Standard Occupational Classification; OR, odds ratio; CI, confidence interval.

Data are given as number of participants (percentage) and as odds ratio (95% CI).

[a] Odds are given for the major SOC group *versus* all the other major SOC groups combined.

* $p \leqslant 0.05$.

Table 2. *The prevalence of adverse psychosocial work characteristics by major SOC groups and the odds[a] for adverse psychosocial work characteristics by major SOC groups*

	Job strain[b]		ERI[c]		High job effort/demands		Low job security		Low social support at work	
	n (%)	OR[a] (95% CI)	n (%)	OR[a] (95% CI)	n (%)	OR[a] (95% CI)	n (%)	OR[a] (95% CI)	n (%)	OR[a] (95% CI)
Major SOC groups										
Males and females										
Managers and senior officials	41 (8.5)	0.63 (0.44–0.91)*	75 (14.9)	1.24 (0.92–1.66)	314 (64.3)	2.58 (2.10–3.18)***	136 (27.9)	0.84 (0.66–1.07)	134 (29.4)	1.21 (0.95–1.56)
Professional occupations	38 (8.3)	0.62 (0.42–0.92)*	53 (10.3)	0.75 (0.54–1.04)	242 (53.7)	1.50 (1.21–1.87)***	112 (25.0)	0.71 (0.55–0.92)**	91 (20.3)	0.69 (0.52–0.92)*
Associate professional and technical occupations	73 (14.0)	1.22 (0.91–1.63)	85 (16.4)	1.41 (1.04–1.91)*	288 (57.0)	1.79 (1.45–2.21)***	159 (32.2)	1.07 (0.84–1.37)	23.9 (125)	0.87 (0.68–1.09)
Administrative and secretarial occupations	43 (12.6)	0.96 (0.65–1.40)	53 (13.4)	0.94 (0.68–1.30)	151 (42.0)	1.14 (0.90–1.45)	115 (30.9)	0.99 (0.77–1.28)	90 (25.1)	1.06 (0.81–1.38)
Skilled trades occupations	39 (16.7)	1.51 (1.05–2.18)*	38 (15.0)	1.21 (0.80–1.83)	105 (43.1)	0.92 (0.70–1.21)	92 (35.6)	1.27 (0.95–1.68)	66 (24.6)	0.91 (0.67–1.23)
Personal service occupations	33 (11.8)	0.97 (0.64–1.46)	28 (10.0)	0.74 (0.47–1.16)	82 (32.1)	0.56 (0.42–0.73)***	66 (23.8)	0.68 (0.50–0.93)*	50 (19.0)	0.64 (0.46–0.89)**
Sales and customer service occupations	24 (9.4)	0.73 (0.45–1.20)	18 (7.7)	0.54 (0.31–0.96)*	53 (22.3)	0.32 (0.22–0.47)***	57 (28.3)	0.88 (0.62–1.24)	54 (28.0)	1.10 (0.75–1.61)
Process, plant and machine operatives	37 (18.1)	1.67 (1.11–2.52)*	24 (12.1)	0.93 (0.53–1.64)	64 (32.1)	0.56 (0.38–0.81)**	80 (41.2)	1.63 (1.18–2.25)**	72 (36.3)	1.67 (1.21–2.33)**
Elementary occupations	38 (13.4)	1.14 (0.78–1.66)	34 (11.4)	0.86 (0.58–1.28)	78 (25.9)	0.39 (0.29–0.52)***	103 (36.9)	1.36 (1.03–1.78)*	93 (31.3)	1.33 (1.01–1.76)*
All major SOC groups[d]	415 (12.1)		440 (12.8)		1537 (44.9)		1058 (30.9)		895 (26.1)	

SOC, Standard Occupational Classification; ERI, effort–reward imbalance; OR, odds ratio; CI, confidence interval.

Data are given as number of participants (percentage) and as odds ratio (95% CI).

[a] Odds are given for the major SOC group *versus* all the other major SOC groups combined. The OR give the odds for the category (e.g. high job strain); ERI (high effort/low rewards); high effort/demands; low job security; and low social support *versus* all other response options combined (e.g. passive/active/low-strain jobs; low effort–low rewards/high effort–high rewards/low effort–high rewards jobs; low- and mid-level of efforts/demands; high and mid-level of job security; high- and mid-level social support).

[b] Karasek Job Content Instrument (Karasek, 1979; Karasek & Theorell, 1990).

[c] Effort Reward Imbalance questionnaire (Siegrist *et al.* 2009).

[d] Prevalence of the work characteristic in the complete working sample.

* $p \leqslant 0.05$, ** $p \leqslant 0.01$, *** $p \leqslant 0.001$.

In the next step the prevalence of work characteristics in various SOC groups was examined and the odds of whether each occupation had different levels of adverse work characteristics relative to all occupations was tested. In the third, final step, the associations between the major and sub-major SOC groups and CMD were further adjusted, individually, for job strain, ERI, job demands, job security and social support at work in turn.

Factors confounding the associations between sociodemographic characteristics, work characteristics and CMD were identified by using bivariate logistic regression; sociodemographic characteristics that predicted both adverse work characteristics and independently CMD were adjusted for in the subsequent analyses. Throughout the analysis the overall working sample was used as a reference. All odds ratios (ORs) represent an increase in odds of CMD compared with the overall working sample for models using major and sub-major groups.

Associations between CMD, work characteristics and SOC groups were analysed using SPSS version 16.0 (SPSS, Inc., USA). The complex samples function was used to take account of the weighting procedures. Weights were applied to represent the structure of the national population, and to account for the probability of selection and non-response. Unweighted figures represent the number of interviews conducted, while weighted figures show the relative size of each group in the population. A full description of weighting procedures can be found in McManus *et al.* (2009).

Results

Sociodemographic factors and CMD

Of the sample, 46.4% was female, and the mean age was 38.4 years. The prevalence of CMD in the last week was 14.1% (female 18.8%, male 10.0%) (Table 1). In comparison, the prevalence of CMD was 13.0% (female 17.0%, male 11.0%) in the working sample from the APMS 2000 (Stansfeld *et al.* 2011).

Logistic regression analysis revealed no significant associations between the sociodemographic variables of age, marital status, housing tenure, income, government region, education and CMD. However, women showed over twice the odds of CMD compared with men [OR 2.10, 95% confidence interval (CI) 1.67–2.64]. Perceived support at work was associated with gender and age; effort/demand was associated with marital status and housing tenure. All subsequent analyses were therefore adjusted for age, gender, marital status and housing tenure. We did not adjust for education and income, as these are strongly

related to SOC group and might thus be an over-adjustment.

Major SOC groups and CMD

Of the major SOC groups, personal service occupations had the highest prevalence of CMD (23.9%, Table 1). The lowest prevalence was for process, plant and machine operatives (7.5%). The ORs for CMD were raised significantly for personal service occupations relative to all other occupations, and this remained significant after adjustment for age, gender, housing tenure and marital status (OR 1.62, 95% CI 1.11–2.37). Process, plant and machine operatives had a significantly reduced risk of CMD, but this became non-significant after adjustment for age, gender, housing tenure and marital status (Table 1). Further adjustment for alcohol-use disorders measured by the AUDIT did not change these ORs. After stratification by gender, the ORs for process, plant and machine operatives remained significantly reduced for men (OR 0.52, 95% CI 0.28–0.99), but not for women. Female professional occupations also had a reduced risk of CMD (OR 0.66, 95% CI 0.44–0.99). Personal service occupations had an increased risk among women that was maintained after full adjustment (OR 1.55, 95% CI 1.02–2.36). Although the OR was also increased in men, this was not statistically significant.

Sub-major SOC groups and CMD

The prevalence and ORs for CMD for the sub-major SOC groups are shown in Table 1. In sub-major groups, the risk of CMD was increased in caring personal service occupations, maintained after full adjustment (OR 1.73, 95% CI 1.16–2.58). There was no increased risk in leisure and other personal service occupations. Transport and machine drivers and operatives had a reduced risk of CMD relative to all other occupations (OR 0.34, 95% CI 0.13–0.90), but this became non-significant after full adjustment.

Major SOC groups and work characteristics

Adverse work characteristics varied between major SOC groups (Table 2). Of the sample, 12.1% reported job strain, with rates ranging from 8.3% in professional occupations to 16.7% in skilled trade occupations. There was a linear relationship between effort/demands and major SOC group: those in the managerial and professional groups were most likely to report high effort/demands (64.3% in managers and senior officials), and those in the largely manual occupations least likely to (22.3% in sales and customer service occupations) and this was associated with statistically significant differences in risk.

Managers and senior officials and professional occupations had a significantly lower risk of job strain but a higher risk of demands than all occupations together. Of the sample, 12.8% reported ERI. This ranged from 7.7% in sales and customer service occupations to 16.4% in associate professional and technical occupations. Low job security was reported by 30.9% of the sample, ranging from 41.2% in process plant and machine operatives to 23.8% in personal service occupations. Process, plant and machine operatives and elementary occupations had, as might be expected, a significantly higher risk of job insecurity compared with all occupations. No clear pattern emerged for levels of support between major SOC groups. Low support at work was reported by 26.1% of the sample, ranging from 36.3% in process, plant and machine operatives to 19.0% in personal service occupations. Personal service occupations had a lower risk of high demands, job insecurity and low social support compared with all other occupations.

Do work characteristics explain major SOC group differences in CMD?

We then examined whether work characteristics could explain the distribution of rates of CMD across the major SOC groups. Job strain, ERI, effort/demands, job security and social support at work were entered individually into models examining risks for CMD by SOC group (Table 3). After adjustment for job strain, in addition to age, gender, housing tenure and marital status the ORs for CMD related to personal service occupations actually increased by 11%, remaining a significant predictor of CMD (OR 1.80, 95% CI 1.22–2.66). Adjustment for ERI and effort/demands showed a similar increase in the OR for CMD in personal service occupations, but adjustment for low job security and low social support showed less increase in risk.

Men in personal service occupations showed an increase in the odds of CMD (OR 2.42, 95% CI 1.00–5.87) when adjusted for job strain. The reduced odds for CMD among male process, plant and machine operatives was further reduced after adjustment for low job security and low social support at work.

The odds of CMD were also slightly raised in women in personal service occupations after adjustment for job strain (OR 1.68, 95% CI 1.08–2.59). The effects of adjusting for the other work characteristics followed a fairly similar pattern in both men and women. Women in professional occupations showed a slightly greater reduction in risk of CMD (OR 0.65, 95% CI 0.44–0.97) after adjustment for job strain. Similar effects were seen in relation to ERI and to effort/demands. This protective effect diminished and

became non-significant after adjustment for low social support at work.

In analyses stratified by gender, women in skilled trades showed a small diminution in the odds for CMD after adjusting for job strain, ERI, low job security and low social support but increased odds for CMD after adjustment for effort/demands (OR 2.60, 95% CI 1.03–6.53). Women in elementary occupations (OR 1.79, 95% CI 1.12–2.86) showed an increase in odds of CMD compared with all other occupations after adjustment for job strain, ERI, effort/demands and low job security.

Sub-major groups

Analysis of sub-major occupation groups showed that those in caring personal service occupations had an increased likelihood of suffering a CMD compared with all occupations. The magnitude of the odds increased slightly after adjustment for job strain, ERI, demands, job security and support at work (ORs ranged from 1.86 to 1.92). There were also increased odds of CMD in elementary administration and service occupations (OR 1.67, 95% CI 1.08–2.58) and in sales occupations (OR 1.67, 95% CI 1.08–2.58) after adjustment for effort/demands.

Discussion

Strengths and limitations

The APMS 2007 is a large and representative sample of the English adult population. Nevertheless, our study was faced with several limitations. Even in this relatively large sample, it was not possible to examine occupational groups in detail, particularly in some cases the breakdown of SOC groups by gender. Major SOC groups have adequate numbers, but are very broad, containing a variety of occupations whose work characteristics and work tasks will differ. This may make generalization to specific occupations difficult. The survey aimed to fulfil many purposes, so relatively few questions could be included on work characteristics. It did not measure duration of occupation, or whether participants had changed jobs recently. Finally, the cross-sectional design meant that directions of association are uncertain. Nevertheless, this is the first study to investigate whether adverse work characteristics can explain occupational differences in CMD in a nationally representative sample.

Findings

Personal service occupations stood out as having the greatest risk of CMD for both men and women. Among sub-major SOC groups the increased risk was

confined to caring personal service occupations rather than leisure and other personal occupations. By contrast, male process plant and machine operatives had lower rates of disorder, as did women in professional occupations. In sub-major SOC groups lower rates were found in transport and mobile machine drivers and operatives.

There were fewer 'at-risk' occupations in the APMS 2007 than in the 2000 survey (J. Harris *et al.* unpublished observations). It may be that UK working conditions had improved during this period, which was prior to the current recession (Chandola, 2010). On the other hand, high-risk groups may be less represented, as numbers were somewhat smaller and the response rate lower in the APMS 2007. It also may be that many of the 'at-risk' jobs are now carried out in the 'black' or 'grey' economy and are not counted here.

Personal service occupations had high rates, both in the current, and in the 2000 survey. In the earlier survey there were also higher rates in clerical and secretarial and sales occupations, neither of which groups had significantly increased risk in the current survey, although male administrative and secretarial occupations had a higher risk of CMD, as did male sales and customer service occupations. Female rates were not raised for either of these two occupations. Plant and machine operatives in both surveys had a lower prevalence of CMD. The high rates of CMD in personal service occupations are also in keeping with other studies such as the SWI95 Study and the Danish Workforce Study (Jones *et al.* 1998; Wieclaw *et al.* 2005).

However, the prevalence of adverse psychosocial work characteristics did not follow the pattern of CMD by occupation. Process, plant and machine operatives had the lowest prevalence of disorder, but also the highest job strain, the lowest job security and the lowest social support at work. Likewise, despite low rates of CMDs, associate professional and technical occupations had the highest ERI, and managers and senior officials the highest demands. Neither did work characteristics explain the increased risk of CMDs associated with working in personal service occupations. Finally, again contrary to our hypothesis, adding job strain, ERI, demands, job security and social support at work individually to the analysis of occupational and CMD generally tended to increase the ORs rather than decrease them. It is possible that these changes simply represent random variation, but they did show a degree of consistency.

It should be noted that work characteristics have explained high rates of CMD in specific occupations in the French decennial health survey (Cohidon *et al.* 2010). So why was this not the case in the current study? There are several possible explanations, not necessarily mutually exclusive: our measures may not have been sufficiently sensitive, and findings may have been distorted by selection into and out of particular occupations. Moreover, it is possible that employees in different occupations interpret and rate the psychosocial work questions differently in relation to their occupational context, the views of their peers and the expectations and occupational culture. Individual attributes that might influence selection into occupations might also influence reporting of work characteristics.

Our job strain measures were necessarily brief, and work characteristics may not be evaluated in the same way by persons in different occupations. However, our use of these measures allowed us to corroborate the hypothesis that work characteristics are associated with CMD (Clark *et al.* 2012), so it seems likely that their inability to account for the association of occupation with CMD requires a different explanation. These analyses also demonstrated that work characteristics had effects on CMD that were independent of non-work stressors and levels of personal social support (Clark *et al.* 2012).

It should be noted that our questions on demand did not cover emotional demands. This may be particularly relevant for occupations such as caring personal service occupations. Many studies suggest that personal service occupations and other caring and teaching occupations are especially stressful (Jones *et al.* 1998; Cropley *et al.* 1999; Bultmann *et al.* 2001; Wieclaw *et al.* 2005). The high emotional demands, characteristic of these jobs, have been shown to be a risk factor for CMD (Hochschild, 1983; Wilhelm *et al.* 2004; Wieclaw *et al.* 2005). Caring personal service occupations include a range of occupations involved in caring for children, animals, the sick and the disabled (nursing auxiliaries, care assistants, residential wardens, nursery nurses, childminders, educational assistants and veterinary nurses). Nearly all include contact with the public as a prominent part of their jobs. Our high-risk jobs may therefore represent occupations with high levels of public contact that are stressful and a drain on emotional resources (Cherry *et al.* 2006; Hilton & Whiteford, 2010). In contrast, jobs such as process plant and machine operatives typically involve restricted contact with the public outside the workforce. It is also possible that some jobs have inherently protective factors that we have not identified. It may be that we need more sophisticated measures of work characteristics to capture the complexity of how the work environment differs across occupations.

While some people may drift into a particular occupation, for most both the original decision to take a

Table 3. *Odds ratios for CMD by major SOC groups, additionally adjusted for work characteristics (job strain, effort–reward imbalance, job effort/demands, job security, social support at work)*[a]

	Adjusted for age, gender, housing tenure, marital status and job strain[b]	Adjusted for age, gender, housing tenure, marital status and ERI[c]	Adjusted for age, gender, housing tenure, marital status and job effort/demands	Adjusted for age, gender, housing tenure, marital status and job security	Adjusted for age, gender, housing tenure, marital status and social support at work
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Major SOC groups					
Males and females (n = 3425)					
Managers and senior officials	0.75 (0.53–1.06)	0.74 (0.52–1.05)	0.68 (0.48–0.96)	0.83 (0.59–1.16)	0.78 (0.56–1.09)
Professional occupations	0.82 (0.59–1.16)	0.86 (0.61–1.21)	0.76 (0.54–1.06)	0.87 (0.62–1.22)	0.88 (0.63–1.23)
Associate professional and technical occupations	0.92 (0.67–1.27)	0.90 (0.65–1.25)	0.90 (0.66–1.23)	0.98 (0.71–1.35)	1.03 (0.76–1.39)
Administrative and secretarial occupations	0.95 (0.67–1.35)	0.93 (0.66–1.33)	0.95 (0.67–1.35)	0.92 (0.65–1.30)	0.92 (0.65–1.30)
Skilled trades occupations	0.87 (0.57–1.33)	0.85 (0.57–1.27)	0.92 (0.61–1.40)	0.86 (0.57–1.30)	0.94 (0.61–1.43)
Personal service occupations	1.80 (1.22–2.66)*	1.89 (1.27–2.81)*	1.82 (1.24–2.68)*	1.75 (1.18–2.60)*	1.73 (1.18–2.54)*
Sales and customer service occupations	1.25 (0.81–1.95)	1.26 (0.82–1.94)	1.36 (0.88–2.11)	1.14 (0.74–1.75)	1.09 (0.71–1.67)
Process, plant and machine operatives	0.61 (0.35–1.08)	0.65 (0.37–1.14)	0.71 (0.41–1.24)	0.57 (0.33–0.98)	0.57 (0.33–0.98)
Elementary occupations	1.36 (0.91–2.04)	1.34 (0.90–1.99)	1.52 (1.03–2.24)*	1.25 (0.85–1.83)	1.23 (0.84–1.79)
Males (n = 1834)					
Managers and senior officials	0.65 (0.39–1.10)	0.65 (0.39–1.10)	0.62 (0.37–1.04)	0.76 (0.47–1.23)	0.72 (0.45–1.16)
Professional occupations	1.10 (0.66–1.82)	1.25 (0.75–2.07)	1.05 (0.64–1.72)	1.21 (0.74–1.98)	1.16 (0.71–1.89)
Associate professional and technical occupations	1.14 (0.67–1.93)	1.20 (0.70–2.04)	1.12 (0.66–1.90)	1.22 (0.71–2.10)	1.23 (0.74–2.06)
Administrative and secretarial occupations	1.74 (0.87–3.46)	1.74 (0.87–3.48)	1.75 (0.88–3.48)	1.82 (0.90–3.66)	1.83 (0.93–3.60)
Skilled trades occupations	0.72 (0.47–1.11)	0.69 (0.46–1.03)	0.74 (0.48–1.13)	0.71 (0.47–1.08)	0.76 (0.50–1.17)
Personal service occupations	2.42 (1.00–5.87)*	2.52 (1.03–6.14)*	2.37 (0.98–5.72)	2.49 (0.99–6.26)	2.17 (0.89–5.28)
Sales and customer service occupations	1.84 (0.90–3.79)	1.69 (0.80–3.55)	1.93 (0.93–4.01)	1.73 (0.84–3.54)	1.53 (0.74–3.18)
Process, plant and machine operatives	0.54 (0.27–1.05)	0.53 (0.27–1.03)	0.60 (0.31–1.15)	0.46 (0.24–0.89)*	0.48 (0.26–0.92)*
Elementary occupations	1.18 (0.63–2.23)	1.08 (0.57–2.05)	1.23 (0.67–2.26)	0.94 (0.51–1.76)	1.01 (0.55–1.85)
Females (n = 1591)					
Managers and senior officials	0.84 (0.56–1.25)	0.83 (0.56–1.25)	0.73 (0.49–1.10)	0.90 (0.61–1.35)	0.85 (0.56–1.28)
Professional occupations	0.65 (0.44–0.97)*	0.64 (0.43–0.96)*	0.59 (0.40–0.87)*	0.67 (0.45–1.00)	0.68 (0.45–1.03)
Associate professional and technical occupations	0.82 (0.59–1.15)	0.77 (0.55–1.10)	0.80 (0.57–1.11)	0.87 (0.62–1.22)	0.91 (0.65–1.26)
Administrative and secretarial occupations	0.78 (0.54–1.12)	0.75 (0.52–1.08)	0.77 (0.54–1.10)	0.73 (0.51–1.05)	0.74 (0.52–1.06)
Skilled trades occupations	2.16 (0.85–5.48)	2.03 (0.80–5.11)	2.60 (1.03–6.53)*	2.02 (0.82–4.95)	2.24 (0.88–5.68)
Personal service occupations	1.68 (1.08–2.59)*	1.77 (1.14–2.73)*	1.71 (1.12–2.63)*	1.64 (1.07–2.52)*	1.68 (1.09–2.57)*

Sales and customer service occupations	1.02 (0.60–1.73)	1.07 (0.65–1.78)	1.14 (0.67–1.92)	0.95 (0.57–1.60)	0.94 (0.57–1.57)
Process, plant and machine operatives	1.01 (0.40–2.55)	1.13 (0.45–2.83)	1.17 (0.47–2.89)	0.96 (0.40–2.33)	0.90 (0.38–2.18)
Elementary occupations	1.48 (0.93–2.38)	1.57 (0.98–2.49)	1.79 (1.12–2.86)*	1.48 (0.94–2.32)*	1.41 (0.89–2.21)
Sub-major SOC groups					
Males and females ($n = 3425$)					
Corporate managers	0.83 (0.58–1.17)	0.81 (0.57–1.15)	0.74 (0.52–1.05)	0.89 (0.63–1.26)	0.85 (0.61–1.20)
Managers and proprietors in agriculture and service	0.49 (0.22–1.10)	0.51 (0.21–1.21)	0.48 (0.22–1.08)	0.58 (0.26–1.30)	0.51 (0.23–1.15)
Science and technology professionals	0.82 (0.45–1.50)	0.82 (0.43–1.56)	0.78 (0.42–1.45)	0.81 (0.44–1.50)	0.88 (0.47–1.62)
Health professionals	1.58 (0.48–5.19)	1.50 (0.45–5.00)	1.45 (0.44–4.74)	1.45 (0.44–4.75)	1.49 (0.47–4.71)
Teaching and research professionals	0.92 (0.57–1.47)	0.99 (0.61–1.58)	0.84 (0.52–1.34)	1.05 (0.66–1.67)	1.01 (0.64–1.62)
Business and public service professionals	0.57 (0.26–1.23)	0.58 (0.26–1.26)	0.52 (0.24–1.13)	0.55 (0.25–1.21)	0.56 (0.26–1.20)
Science and technology associate professionals	1.44 (0.61–3.37)	1.58 (0.68–3.69)	1.45 (0.63–3.32)	1.67 (0.71–3.91)	1.65 (0.71–3.79)
Health and social welfare associate professionals	0.69 (0.43–1.10)	0.60 (0.38–0.96)	0.67 (0.42–1.07)	0.70 (0.44–1.12)	0.83 (0.53–1.29)
Protective service occupations	1.48 (0.71–3.05)	1.61 (0.78–3.33)	1.52 (0.74–3.11)	1.69 (0.81–3.55)	1.82 (0.88–3.75)
Culture media sports occupations	1.20 (0.49–2.94)	1.11 (0.45–2.76)	1.13 (0.46–2.76)	1.25 (0.51–3.07)	1.14 (0.48–2.71)
Business and public service associate professionals	0.89 (0.55–1.44)	0.92 (0.55–1.54)	0.86 (0.53–1.39)	0.92 (0.55–1.56)	0.90 (0.56–1.47)
Administrative occupations	0.99 (0.66–1.47)	0.93 (0.63–1.39)	0.98 (0.66–1.47)	0.97 (0.65–1.44)	1.00 (0.67–1.49)
Secretarial and related occupations	0.88 (0.45–1.70)	0.95 (0.48–1.87)	0.88 (0.46–1.71)	0.82 (0.42–1.58)	0.76 (0.39–1.47)
Skilled agricultural trades	1.31 (0.28–6.20)	1.32 (0.28–6.17)	1.29 (0.27–6.23)	0.94 (0.21–4.17)	0.94 (0.23–3.78)
Skilled metal and electrical trades	0.82 (0.48–1.42)	0.80 (0.47–1.35)	0.87 (0.51–1.49)	0.88 (0.51–1.50)	0.95 (0.55–1.66)
Skilled construction and building trades	1.01 (0.37–2.79)	0.95 (0.37–2.42)	1.03 (0.38–2.80)	0.92 (0.35–2.45)	0.96 (0.34–2.71)
Textiles printing and other skilled trades	0.83 (0.39–1.75)	0.84 (0.41–1.73)	0.91 (0.43–1.90)	0.83 (0.40–1.73)	0.91 (0.43–1.94)
Caring personal service occupations	1.92 (1.27–2.91)*	1.99 (1.31–3.02)*	1.92 (1.28–2.88)*	1.86 (1.24–2.81)*	1.86 (1.25–2.77)*
Leisure and other personal service occupations	1.11 (0.38–3.24)	1.26 (0.41–3.87)	1.18 (0.39–3.59)	1.12 (0.36–3.48)	1.04 (0.35–3.16)
Sales occupations	1.50 (0.96–2.34)	1.50 (0.97–2.33)	1.67 (1.08–2.58)	1.34 (0.88–2.04)	1.31 (0.87–1.99)
Customer service occupations	1.03 (0.45–2.36)	0.93 (0.43–2.01)	1.10 (0.48–2.54)	1.01 (0.41–2.46)	0.98 (0.41–2.34)
Process plant and machine operatives	0.72 (0.37–1.39)	0.77 (0.40–1.51)	0.84 (0.44–1.62)	0.66 (0.35–1.25)	0.70 (0.37–1.30)
Transport and mobile machine drivers and operatives	0.48 (0.19–1.26)	0.49 (0.19–1.27)	0.55 (0.21–1.42)	0.46 (0.18–1.18)	0.42 (0.16–1.09)
Elementary trades, plant and storage-related occupations	0.90 (0.38–2.12)	0.85 (0.36–2.01)	0.99 (0.43–2.28)	0.92 (0.40–2.09)	0.91 (0.40–2.08)
Elementary administration and service occupations	1.50 (0.96–2.34)	1.50 (0.97–2.33)	1.67 (1.08–2.58)*	1.34 (0.88–2.04)	1.31 (0.87–1.99)

CMD, Common mental disorder; SOC, Standard Occupational Classification; ERI, effort–reward imbalance; OR, odds ratio; CI, confidence interval.

Data are given OR (95% CI).

[a] Adjusted analysis is adjusted for age, gender, housing tenure and marital status. Dependent variable CMD, reference group is no CMD; independent variable SOC group, reference group is all other occupations.

[b] Karasek Job Content Instrument (Karasek, 1979; Karasek & Theorell, 1990).

[c] Effort Reward Imbalance questionnaire (Siegrist et al. 2009).

* $p \leqslant 0.05$.

job, and the subsequent commitment to it are active. Thus, another interpretation of our results is that high rates of CMD represent selection into occupations for people with a high risk of CMD. Kohn & Schooler (1982) have shown both that personality has an important effect on the choice of a particular occupation (see also Firth-Cozens *et al.* 1999), and that job conditions influence personality. Similarly, Ezoe *et al.* (1994) found that schizotypal and avoidant traits were more frequent in computer engineers than clerical workers in the same firm, irrespective of length of service, suggesting that people with these personality traits may preferentially select occupations requiring little contact with people. Selection may also apply to the domestic sphere and the risks associated with selection at work may be linked to similar risks of CMD at home. The effect of decisions to move out of particular occupations is likely to be complex. People who remain in the job over a long period may do so because they have a high tolerance of stress and are therefore less likely to suffer adverse effects. However, there may also be differential selection out of high-stress occupations by people who are most able to move away to jobs with more desirable characteristics. As a result, some of those left behind because they are less able to move may be more at risk of CMD. Because of this complexity, it seems unlikely that selection according to personality is a complete explanation for the higher rates of CMD in these occupations.

For further scientific advance in this field, the importance of this study is trying to match self-report of adverse psychosocial working conditions with the rates of CMDs within occupations. As these do not match in this study the findings suggest that current accounts of psychosocial stressors at work are incomplete and need to be further developed. Despite our inability to explain the occupational differences in CMD in terms of work characteristics, the latter were clearly associated overall with CMD (Clark *et al.* 2012). There is thus a particular need for replication of the results presented here before definitive conclusions can be drawn.

Acknowledgements

Declaration of Interest

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