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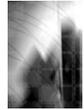
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Abstract

Occupational health and safety (OHS) is under-researched in the sociology of work and employment. This deficit is most pronounced for white-collar occupations. Despite growing awareness of the significance of psychosocial conditions – notably stress – and musculoskeletal disorders, white-collar work is considered by conventional OHS discourse to be ‘safe’. This

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study's locus is clerical processing in the UK public sector, specifically Her Majesty's Revenue and Customs, in the context of efficiency savings programmes. The key initiative was lean working, which involved redesigned workflow, task fragmentation, standardization and individual targets. Utilizing a holistic model of white-collar OHS and in-depth quantitative and qualitative data, the evidence of widespread self-reported ill-health symptoms is compelling. Statistical tests of association demonstrate that the transformed work organization that accompanied lean working contributed most to employees', particularly women's, ill-health complaints.

Keywords

clerical work, gender, HMRC, lean, occupational health and safety, public sector, stress, white-collar

Introduction

Occupational health and safety (OHS) is under-researched in the sociology of work and employment. An inventory of articles published since 2000 in *Work, Employment and Society*, the journal most receptive to research on the subject, reveals eight articles explicitly focused on OHS (e.g. Osthus, 2007) and several additional studies implicitly concerned with OHS, such as those on work intensification and job strain (e.g. Saloniemi et al., 2004). Nichols's (1997: 39) claim that in 'the vast majority of industrial sociology books, it is most exceptional to come across accounts of accidents or job-related illness' is supported by a content analysis of recent textbooks.

However, it is mistaken to regard sociological investigation into work-related injury as 'passé' (Taylor and Connelly, 2009) and to assume that 'post-industrial' society has eliminated unsafe working conditions. The Health and Safety Executive (HSE, 2012) reported 171 individuals killed at work and 200,000 injured during 2010–11. Equally significant is the number (0.7 million) of former workers suffering from illnesses caused by past work experience (HSE, 2012). In contrast to the focus on injury or safety, the neglect of work-related ill-health in the conventional OHS 'discourse' of an industrial or 'machine minding' approach to accident prevention (Johnstone and Quinlan, 1993) is striking. Such thinking permeated the Robens Report and the Health and Safety at Work Act 1974; and has influenced academic research. Studies habitually assumed that the 'normative worker' enshrined in OHS concepts was male and employed in manufacturing (Williams, 1999: 151). Gender dimensions often go unrecognized or, when acknowledged, are trivialized (Boyd, 2002; Messing, 1998), as women's employment is assumed to be 'safe'.¹

This gendered blind spot reflects the inability of established conceptual and regulatory frameworks to analyse the causes of, or to deal effectively with, newer hazards such as psychosocial and musculoskeletal disorders (MSDs) associated with service or office-based employment (James and Walters, 1999). While gendered assumptions patently disadvantage women, they also have adverse consequences for men (Wolkowitz, 2006: 106), to the extent that they are employed in traditional and emergent 'women's' occupations (e.g. retail, call centres) (Scholarios and Taylor, 2011).

UK statistics indicate the scale of the problem. Of the 1.2 million work-related ill-health cases (2010–11), 508,000 individuals were afflicted by MSDs and 400,000 by stress, depression or anxiety (SDA), the latter contributing most to the 26.4 million days lost to work-related ill-health (HSE, 2012: 4). Occupational physician reports suggest

increasing work-related mental ill-health (HSE, 2010). Yet, these statistics by themselves have limited analytical purchase, for they do not relate incidence to causal or organizational factors. Despite progress in recognizing SDA and MSDs as disabling conditions, much needs to be done to extend OHS perspectives to encompass the complex interaction between ill-health and work organization in white-collar employment. While call centres have attracted the attention of social scientists examining psychosocial conditions and MSDs (Sprigg and Jackson, 2006; Sprigg et al., 2007) and occupational ill-health generally (Baldry et al., 2007; Taylor et al., 2003), non-customer facing white-collar work by contrast has been overlooked.

This article contributes to sociological knowledge in this neglected area. The setting for the mixed methodological study is the UK Civil Service, specifically six tax processing centres in Her Majesty's Revenue and Customs (HMRC) tax processing. What imparts additional significance is that the study was consequent upon the introduction of 'lean' working, a central element in the UK Government's drive for public sector efficiencies. The Gershon Report (2004), adopted by the government, insisted that headcount reduction should be compensated for by a systemic redesign of service delivery processes 'to eliminate waste and variability and maximize flexibility [...] improve productivity, quality and reduce lead time (Radnor and Bucci, 2007: 11).

The first research question then is: 'How widespread are symptoms and complaints of occupational ill-health at HMRC's processing sites as reported by employees?' Descriptive statistics deriving from a self-administered questionnaire, combined with data from interviews with supervisors, managers and union reps, question the validity of the conventional OHS assumption that these working environments are 'low risk'. The second question relates to the redesign of work: 'To what extent has work reorganization brought about by lean working been perceived to have impacted on these reported symptoms and complaints?'

Utilizing a holistic model of office-based OHS (Taylor et al., 2003), this preliminary analysis suggests that factors integral to the organization of work contribute most to employee ill-health. This provisional conclusion is subject to further inquiry. Statistical associations between experience of work and the incidence of reported ill-health symptoms/complaints deliver a more finely grained analysis of potential causal factors, including distinctive aspects of the 'leaned' labour process. Recognizing the importance of gender, conceptually, for constructing an effective OHS framework and, empirically, for data analysis, the article controls for gender throughout. A final question asks: 'Do significant differences exist in the experience of men and women?'

First, the article engages with pertinent themes from the diverse literatures that frame the study. This discussion precedes explication of the research approach, methods and sources and is followed by analysis of the data. Returning to the article's sociological point of departure, the conclusion reflects on Nichols's (1997) concept of 'structures of vulnerability' and its salience for clerical work at HMRC and more broadly.

Framing the study

In his explicitly sociological account, Nichols (1997) argued that the regularities of industrial injury are best understood through their institutional location within

capitalist social relations of production. Significant foci included the labour process, work intensification, the relative strengths of capital and labour, union effectiveness, managerial behaviour and the wider regulatory framework (1997: 105ff.). A major strength of this perspective lies in identifying 'structures of vulnerability', so that, for example, the rising industrial injury rates of the late 1980s onwards were explicable by reference to strengthened managerial prerogative, reduced union influence and speed-up within a political-economic context of de-regulation and sharpened market competition. Many of the questions that preoccupied Nichols are relevant to the condition of clerical workers, notably changed work organization, managerial control and labour intensification. Of course, the political-economic context has changed markedly since Nichols's seminal work, albeit that the trends he identified have progressed further in the direction of neo-liberalism, managerial authority, privatization, intensified competition and weakened trade unionism (Beynon et al., 2002).

This study also engages with concepts designed to measure the work effort demanded of employees (Green, 2006; McGovern et al., 2007). In demonstrating that intensification grew from the mid-1990s onwards (Burchell et al., 2002) and is associated with changed work organization, flexibility and the effects of IT, Green concludes that 'the detrimental impact is unambiguous' (2006: 174). McGovern et al. (2007: 186) concomitantly emphasize increased bureaucratic discipline and the deleterious effects of ICT-based monitoring. Although little consideration is given to ill-health *explicitly* as the authors prefer the non-specific term 'well-being', both studies provide valuable context and insight.

Feminist-inspired research (e.g. Messing, 1998; Williams, 1999) which critiques conventional OHS discourse for neglecting psychosocial and musculoskeletal conditions is also embraced. An important contrast is that industrial injuries, predominant among men, are visible in their occurrence and often in their immediate consequences, while health problems prevalent among women in service and clerical work are largely invisible, difficult to detect, rely on self-reporting and are resistant to remedy (Wolkowitz, 2006). Consequently, 'psychosocial' conditions are less likely to be seen as legitimate and workers' complaints more likely to be ignored. This study draws also on an analytical model for white-collar occupational ill-health (Baldry et al., 1997) that challenges the invisibility of these conditions. It recognizes the mutually reinforcing effects of three constituent elements: the *proximate* environment (e.g. workstation design), the *ambient* environment (e.g. building, lighting, air quality) and work organization or the *social* environment (e.g. job design, management control, employment relations).

These essentially sociological studies complement, rather than conflict with, dominant occupational psychological or I/O (industrial/organizational) approaches, given the latter's valuable contribution to understanding stress, ill-health and MSDs. In their classic work Karasek and Theorell (1990) argued for recognizing the importance of high demands and low decision latitude as risk factors for job strain. Stress as the most important psychosocial work-related manifestation has generated a voluminous literature (e.g. Cooper and Dewe, 2004), yet limitations in the individualistic approach to stress must be acknowledged (Cooper et al., 2001). Following Kaplan (1996: 369–401), the organizational processes accompanying stress and the sequence of events² that culminate in stressful experiences are emphasized. Given the breadth of literature on psychosocial

factors, selectivity is required. Parsimony means focusing, as below, on those OHS studies centrally concerned with lean working (e.g. Landsbergis et al., 1999; Lewchuk and Robertson, 1997; Sprigg and Jackson, 2006; Sprigg et al., 2007).

Lean and its discontents

Lean has been defined as an 'all-encompassing model' of work process reconfiguration, based on the integration of diverse Japanese production management techniques. It seeks to remove impediments to the smooth flow of production through continuous improvement (*kaizen*) in quality and productivity and also uses 'just-in-time' (JIT) inventory systems (*kanban*) to eliminate 'wasted' time and motion (*muda*). In lean's classic text, Womack et al. (1990) argued that those organizations which succeeded in stripping out wasteful processes would secure the most significant gains in quality and efficiency. These advantages would be achieved through job rotation and by multi-skilled team-based workers solving problems at source. Womack et al.'s depiction of the new work system was optimistic, notably in their contentions that 'the freedom to control one's work' replaced the 'mind-numbing stress' of Taylorist mass production and that 'creative tension' now made work 'humanly fulfilling'.

Surely as Landsbergis et al. (1999: 109) suggested, if claims of increased skills and decision-making authority (the two components of job decision latitude in Karasek's job strain model) were true, then lean would be associated with a reduction in job strain and stress-related illness. Emerging studies of manufacturing were not supportive. In the automotive industry, research revealed tighter supervision and management control, narrow tasking, reduced involvement in decision making and greater job strain (Delbridge, 1998; Lewchuk and Robertson, 1997). Harmful physical and psychological effects, including repetitive and soft tissue injuries, MSDs, burnout and stress were identified (Landsbergis et al., 1999; Stewart et al., 2007). Disregarding evidence from manufacturing, though, Womack and Jones (2003) insisted that lean could be non-problematically applied to service work. Their perspective influenced business school consultants keen to propagate lean as delivering public-sector efficiencies (Radnor and Bucci, 2007).

In the context of white-collar work, Sprigg and Jackson (2006) and Sprigg et al. (2007) defined the call centre as essentially a lean system. Process simplification, short cycle times and machine-paced workflow integration were notable features, but dialogue scripting (extreme standardization) and intense performance monitoring were defining characteristics and, they found, directly related to job-related strain (Sprigg and Jackson, 2006: 105). Regarding MSDs, increases have been found in the reporting of discomfort in the neck, shoulders and wrists/arms. Sprigg et al. (2007) argued for including biomechanical factors (workload and repetitive movement) and psychosocial strain (low decision latitude) to understand MSDs. Indeed, they concluded that strain appears to be a mechanism between workload and upper body and lower back MSDs, while the relationship of workload with MSDs is explained by both the direct effect of biomechanical factors and the partial mediating effects of strain (2007: 1462). Sprigg and Jackson's (2006) pithy verdict was, 'the leaner the call centre, the meaner it will be'.

For all the pertinent questions and valuable insights these studies of lean generated, it should be remembered that the call centre is a distinctive hybrid of clerical work and

interactive service work (Boreham et al., 2007). The study of HMRC presented here breaks new ground by focusing on lean and OHS in a wholly clerical, non-customer facing environment.

Lean at HMRC

Lean was implemented in HMRC in the post-Gershon (2004) context of 10,500 job cuts, a drive to increase productivity by 30 per cent and the transplantation of private sector management cultures and cost centre disciplines (Carter et al., 2011). Not without union opposition (Carter et al., 2012), lean was introduced initially in the Lothians region of Scotland in 2005 and then rolled out across processing sites during 2006–7. Its architecture was designed by consultants McKinsey, PA and Unipart. Execution commenced with a detailed time-and-motion study, the data used to deconstruct the work routines of variable skills into narrow tasks in classic Taylorist fashion. ‘Value streaming’, a key element in the lean toolkit (Womack and Jones, 2003), resulted in each tax officer taking responsibility for only a single task, as prescribed by standard operating procedures (SOP).

A labour process that hitherto had involved the exercise of tacit knowledge by skilled clerical workers engaged on whole case working, including the application of tax regulations and the search for discrepancies, had that knowledge appropriated, codified and transformed by management into fragmented measurable tasks (Carter et al., 2011). The outcome was a production environment dominated by hourly targets for each task, ranging from six items an hour for tax letters to 80 for opening cases. Compounding the loss of professional judgement was the prominent display on whiteboards of team and individual progress against hourly targets, with demonstrative underperformance likely to lead to corrective and even disciplinary action in cases of recidivism. A thoroughgoing spatial re-configuration, in which desks were re-arranged in ‘U’ shapes, facilitated the seamless ‘flow’ of documents between adjacent workstations and minimized ‘wasted’ time and bodily movement.

Potential OHS consequences were not considered by HMRC’s academic/consultant reviewers, Radnor and Bucci (2007), who portrayed lean as benign, claiming that it was welcomed by employees. That employee experiences were scarcely canvassed in these ‘independent’ reviews is part justification for this study’s emphasis on self-reporting.

Research approach, sources and methods

The project was supported by the Public and Commercial Services (PCS) union, which required data on the impact of lean on members’ working conditions. The original aim was to access HMRC processing establishments and employees through management, whose own experiences could form a complementary data set. However, requests for access at two locations were rejected by management on grounds of data sensitivity and an unwillingness to compromise ‘the lean mission’, in the words of one senior manager. Consequently, the researchers were compelled to liaise with the PCS for access and the study shifted to a greater emphasis on worker’s self-reported experiences. Manager accounts were nevertheless incorporated. Such an approach is not inherently problematical, for it complements the

'scientific-technicist' understanding of epidemiology and biomedical views of the body (Williams, 1999). Workers' evaluations of their conditions are a key diagnostic resource (Watterson, 1994) and include 'lay representations' of stress (Kinman and Jones, 2005). Inquiry into work-related symptoms/complaints was thus constructed not as a discrete and technical process, but integrated into a broader sociological investigation.

The mixed methodological study involved semi-structured interviews, a workforce questionnaire and documentation from HMRC, PCS and consultants. Six lean sites (Lothians, East Kilbride, Newcastle, Salford, Leicester and Cardiff) were identified for the fieldwork, undertaken in 2008–9. Thirty-six semi-structured interviews averaging two hours were conducted on-site with staff across grades and functions from the processing 'front line', including 12 supervisors. Manager interviews were arranged by PCS following requests for interviewees who could provide a supervisory perspective. Separate question schedules were used for employee and manager interviewees and the latter focused on respondents' experiences as supervisors.

The survey encompassed diverse question types. Those explicitly on OHS included several from studies of white-collar ill-health (Baldry et al., 1997) and office work (Raw, 1992). Respondents were asked to report on the frequency (five-point scale: daily/several times a week; several times a month; several times a year; occasionally; never) with which they experienced 14 symptoms/complaints related to the three constituent elements of the OHS model. For example, 'blocked nose', 'sinus problems' and 'hearing problems' might be associated with the ambient environment and relate to problematic air quality, temperature and noise. 'Stiff neck or shoulders', 'backache' and 'pains/numbness in arms/wrists' are similar to those used by Sprigg et al. (2007) and relate to MSDs, associated with the proximate environment of the workstation.

While an association between a specific complaint/symptom and factors relating to a particular 'environment' seems straightforward, it is important to understand how a symptom might be compounded through interaction with factors from other environments. The *social or organizational* environment might exacerbate symptoms/complaints associated with the ambient and proximate environments. MSDs can be aggravated by weakened control over tasks, workload and pace and intensity of work. Psychosocial conditions, notably stress, result from the interaction of multiple factors. Other multi-causal complaints – 'headaches', 'mental fatigue', 'physical tiredness' – are included. Stress can be regarded as the extreme manifestation of increased work pressures (Green, 2006).

The association of symptoms/complaints with perceived changes in work intensity and control was examined (see Table 3). Six variables were identified: changes in variety of work, personal control over work and volume, pace, intensity and pressure of work, with responses on a five-point scale ('decreased a lot', 'decreased a little', 'no change', 'increased a lot', 'increased a little'). For ill-health variables, 'daily/several times per week' was coded as '1', the remaining scale coded as '0'. For work-intensity variables, 'increased a lot' was coded as '1', the remaining scale coded as '0'. For the two variables 'variety of work' and 'personal control over work', 'decreased a lot' was coded '1', the remaining scale coded '0'. Only those nine health variables where more than 20 per cent reported the effect daily or several times a week are presented. Each was transformed into a dichotomous variable.

Questions on work pressure were adapted from previous research on interactive service work (Taylor et al., 2003) and made context sensitive through data gathered in preliminary interviews. They also drew on standard questions on control, employee influence over decision making, workload and variety (Warr et al., 1979). The outcome was a 19-item list: 'individual targets', 'whiteboards', 'having to keep to standardized operations', 'supervisory monitoring', 'quality checks', 'monotony', 'lack of variety', 'team targets', 'continuous workflow', 'not enough time between calls', 'backlog of tasks', 'fragmented tasks', 'insufficient breaks', 'insufficient time to talk to colleagues', 'competing with others', 'insufficient time to do the job', 'supervisory pressure', 'job insecurity' and 'physical discomfort'. Many items refer *specifically* to lean initiatives (e.g. whiteboards, continuous workflow). Lest bias be perceived, it should be noted that respondents answered this question *only* if they positively reported being pressurized at work 'on a normal day'. Responses were on a five-point scale ('a great deal', 'to some extent', 'a little', 'not much', 'none').

The relationship between work organization and symptoms/complaints is examined using Pearson's correlation coefficient tests (Cronbach's Alpha = 0.90). Each measure was transformed into a dichotomous variable: 'a great deal' was coded as '1' and the remainder of the scale coded as '0'. The composite sickness variable was computed by aggregating all the dichotomized items listed in Table 2 (scale of 0–14). The results are presented in Table 5.

While a longitudinal study in which employees were surveyed prior to and following lean might have been methodologically preferable, it was not possible to administer time-series questionnaires, the research having commenced after lean's implementation. Consequently, the survey asks respondents to compare pre-lean and current experiences. Relying on respondents' retrospective recall of work intensity and ill-health symptoms does carry some potential for inaccuracy resulting from inappropriate post-hoc rationalization, over-simplification or, more simply, memory loss (Golden, 1992; Huber and Power, 1985). However, Miller et al. (1997) maintain that retrospective recall can be reliable if, for example, 'multiple knowledge informants' are used and informants are not asked to recall distant events. In the present study respondents might have understated past symptoms but the very recency of organizational change might act as a countervailing influence. Furthermore, the evidence that lean contributed to worsened employee ill-health is so overwhelming as to reduce the influence of potential bias.

Two potential issues of bias are finally considered. Firstly, that respondents were union members does not mean they were unrepresentative of the workforce, given the high union densities. Percentage figures were Lothians (97), Leicester (96), East Kilbride (95), Cardiff (90), Newcastle (89) and Salford (86). The overwhelmingly typical experience is of union membership. Second, if workforce size had reduced significantly after lean's introduction then the reported effects (e.g. increased workload, incidence of symptoms) might be attributable to changed demographics rather than lean *sui generis*. Workforce size actually remained generally similar across lean's implementation: Newcastle (4000), East Kilbride (2300), Lothians (2000), Cardiff (1000), Salford (900) and Leicester (800). Reductions in headcount due to attrition were compensated for by inflows of roughly equivalent numbers following site rationalization and HMRC's closure of nearby smaller centres, itself part of the lean project. These incomers themselves had similar pre-lean working experience.

Reflecting on the data analytic approach, the study is not driven by multivariate analysis. Descriptive statistics were supplemented by bivariate analysis comprising several chi-square tests of association on the relationship between work organization and ill-health. Further, gender, length of service, grade and age were controlled for. The chosen 15 per cent sample size gave a total of 1650 questionnaires distributed. The overall response rate was 51 per cent and the number of completed returns is given in Table 1. The most common grade was Administrative Officer (AO) followed by Administrative Assistants (AA) and supervisory Officer (O) grades. The work undertaken was proportionately consistent with the overall HMRC workforce profile. The mean age was 44 years with the 40–59 year category the most densely populated. The sample had more women than men in each grade. A clear majority had full-time, permanent contracts.

Self-reported symptoms/complaints

Table 2 displays notable contrasts. First, greater proportions of administrative grades report symptoms/complaints with a frequency of daily/several times a week post-lean, than do supervisors. At least 20 percentage points separate the numbers of administrative grades from supervisors experiencing mental fatigue, physical tiredness, stiff shoulders and necks. Second, more marked are the overall pre- and post-lean differences. The numbers of administrative workers reporting mental fatigue increased by more than 50 per

Table 1. Respondents' attributes.

Worksite (<i>n</i> = 840)	(N)	(%)	Age (<i>n</i> = 668)	(N)	(%)
East Kilbride	235	28	20–29	67	10
Lothians	169	20	30–39	130	20
Newcastle	191	23	40–49	262	39
Salford	57	7	50–59	188	28
Leicester	51	6	60–65	21	3
Cardiff	137	16	Gender (<i>n</i> =678)		
Grade (<i>n</i> =835)			Men	294	43
Grade O (<i>m</i> =48%; <i>f</i> =52%)	83	10	Women	384	57
Grade AO (<i>m</i> =42%; <i>f</i> =58%)	627	75	Contractual status (<i>n</i> =674)		
Grade AA (<i>m</i> =43%; <i>f</i> =57%)	125	15	Full-time	514	76
Normal work (<i>n</i> =840)			Part-time	155	23
Public post	621	74	Other	5	1
Tax return examinations	267	32	Contracted hours (<i>n</i> =836)		
End year assessments	230	27	Up to 19hrs/week	33	4
Target review forms	184	22	20–34 hrs/week	177	21
Other	193	23	35–37 hrs/week	575	69
			38–48 hrs/week	51	6

Table 2. Frequency of symptoms/complaints: daily/several times a week – pre-and post-lean.

	Pre-lean		M%	F%	Post-lean		M%	F%
	Admin%	Supervisors%			Admin%	Supervisors%		
Mental fatigue	3.8	4.0	2.5	5.0	55	29	39	60
Physical tiredness	5.0	1.3	4.7	6.3	51	29	38	59
Stiff shoulders	5.3	4.9	1.7	7.3	41	17	29	48
Stiff neck	5.2	1.3	1.7	8.1	40	18	31	49
Stress	2.4	1.3	2.9	2.4	38	21	33	41
Backache	6.7	2.7	2.9	9.6	32	12	22	40
Headaches	4.4	0.0	2.1	6.8	28	18	19	35
Pain/numb arms/wrists	4.7	1.3	2.6	5.5	26	12	12	18
Eyesight problems	5.5	3.9	4.2	6.7	23	11	19	25
Blocked nose	3.8	1.4	1.7	5.4	16	8.2	12	18
Sinus problems	5.2	2.6	3.8	7.2	15	6.8	12	17
Sore throat	0.4	0.0	0.0	0.9	9.2	5.5	8.5	9.1
Hearing problems	2.9	0.0	1.3	4.6	8.7	4.1	9.4	7.3
Nausea	1.1	1.3	0.0	2.2	5.8	5.5	6.8	4.3

cent, followed by those reporting physical tiredness (46%). MSD symptoms/complaints were much more widely reported post-lean; stiff shoulders (41%), stiff neck (40%), backache (32%), pains/numbness in arms/wrists (26%); and 38 per cent reported suffering from stress at this frequency. The inescapable conclusion is the prevalence of ill-health symptoms as perceived by HMRC's workforce following lean's introduction. Sizeable minorities of supervisors were similarly afflicted. Third, women were more likely than men to report symptoms/complaints and often to a considerable extent. What is revealed here – lean's apparent gendered impact – resonates with the feminist-inspired literature that asserts women's experiences are neglected or marginalized in conventional OHS discourse (Messing, 1998; Wolkowitz, 2006). Controlling for age, no significant differences exist, except for stress, backache and eye problems, which were experienced more frequently by those aged 50 and above.

A heuristic separation of the symptoms/complaints related to constituent elements of the holistic model of ill-health (Baldry et al., 2007) provides insight into patterns. Those most associated with the ambient environment (hearing problems, sore throat, sinus, nausea) were experienced less widely than musculoskeletal complaints associated with the proximate environment. However, the more general complaints, (mental fatigue, physical tiredness), caused by multiple factors including work organization, were most widely experienced. These general complaints can result from workers straining to scan an indistinct PC screen, sitting at a badly positioned chair in a sealed building with poor air quality and undertaking high volumes of repetitive tasks with little control. The high incidence of self-reported stress indicates the interaction of diverse factors. Stress was mentioned more than any condition in questionnaire comments. These are typical.

Table 3. Pearson's correlation coefficients for ill-health symptoms (daily/several times a week) correlated with work intensity and control variables.

	Variety (Decreased a lot)	Personal control (Decreased a lot)	Volume (Increased a lot)	Pace (Increased a lot)	Intensity (Increased a lot)	Pressure (Increased a lot)
Mental fatigue						
(Men)	.198*	.215*	.189	.232*	.249*	.280*
(Women)	.191*	.228*	.138	.174*	.174*	.254*
Physical tiredness						
(Men)	.176	.158	.224*	.225*	.216*	.237*
(Women)	.194*	.174*	.145	.222*	.173*	.240*
Stiff shoulders						
(Men)	.125	.184	.153	.210*	.144	.152
(Women)	.212*	.166*	.204*	.230*	.171*	.204*
Stiff neck						
(Men)	.129	.131	.146	.210*	.144	.126
(Women)	.207*	.172*	.177*	.200*	.210*	.203*
Stress						
(Men)	.212*	.124	.186	.191*	.258*	.315*
(Women)	.169*	.167*	.101	.101	.124	.249*
Backache						
(Men)	.104	.158	.115	.124	.095	.187
(Women)	.209*	.145	.137	.115	.086	.140
Headaches						
(Men)	.087	.089	.241*	.151	.132	.208*
(Women)	.083	.143	.076	.094	.055	.147
Pains/numb arms/wrists						
(Men)	.089	.104	.168	.189	.158	.200*
(Women)	.221*	.117	.082	.105	.127	.200*
Eyesight problems						
(Men)	.070	.100	.181	.133	.096	.172
(Women)	.098	.150	.065	.044	.054	.176*

*Correlation significant at the 0.001 level (2-tailed).

Individuality [was] their mantra but this has been pushed aside by HMC senior management to create a battery-hen environment which makes for a very unhappy and very, very stressed workforce. (Lothians, Administrative Officer, male)

The lean process has led to more illness – especially more and more stress – and has encouraged bullying. (Salford, Administrative Assistant, female)

However, the ambient or proximate environments are not unimportant. Health problems associated with the built environment were widely reported.

We've got major health problems because of the open-plan office. It's supposed to be naturally ventilated but huge amounts of the windows don't open because they are broken. So there are problems with air quality. Since opening [1994] it has been an absolutely appalling white elephant. (Interview, PCS Branch Officer, 26 October 2008)

Although extreme, the following was not the only reported case of lean having directly generated MSDs.

I feel more pressurized than ever before and am witness to the continued low morale of the staff. I was off sick for a year ... which my doctor/physio attributed to the static position I have been sitting in on the lean 'production line'. Problems arose as I was stretching to put returns into buffers for my colleagues to work on and because of repetitive movements. I've been on crutches ... unable to have surgery. (Lothians, Administrative Officer, male)

The extent of the symptoms/complaints associated with MSDs (Table 2) and the written testimony provided compelling evidence of lean's deleterious consequences. Such findings challenge the claims of lean's advocates that spatial reconfiguration of the workstation is ergonomically neutral. *Prima facie* grounds exist for suggesting that factors associated with the *social organization of work* contributed most to post-lean ill-health symptoms, including self-reported stress, particularly among women admin grades. However, the effects of a transformed labour process, including task fragmentation and standardization (Radnor and Bucci, 2007), were inseparable from ergonomic consequences.

Social organization of work and ill-health

Workers unequivocally reported intensification. Work volumes were thought to have 'increased a lot' by 56 per cent of admin grade respondents, while 64 per cent and 65 per cent respectively believed this to be so for pace and intensity. Most compelling was the 77 per cent who perceived work pressure to have 'increased a lot'. Concurrently, 49 per cent and 68 per cent respectively thought that the variety of, and personal control over, work had 'decreased a lot'. These findings contest the validity of lean's 'working smarter not harder' mantra and the non-evidenced claims of empowerment, increased discretion and control over work (Womack and Jones, 2003).

The association of symptoms/complaints with perceived changes in work intensity and control were examined. The results (Table 3) confirm Karasek and Theorell's model of low levels of control and high workload interacting to produce negative health outcomes. Although some correlations followed a similar pattern for women and men (e.g. mental fatigue), the data suggest that for women intensity and control variables have a more significant relationship with ill-health symptoms (stiff shoulders, stiff neck, physical tiredness). In other words, many women found the lean changes to be more physically arduous. Also, for women there was a more obvious pattern of significant correlations between a

decline in the variety of work (task fragmentation and standardization) and MSD symptoms (stiff shoulders, stiff neck, backache, pains/numbness in wrists/arms). The data suggest that a decrease in personal control has impacted to a greater extent on women.

An additional means of exploring the interaction between work organization and the incidence of symptoms/complaints utilizes what can be termed *work-time density*, based on the length of time admin grades spent at workstations. Three categories were employed: less than 85 per cent of time at workstation (14% of respondents); 85 per cent to less than 95 per cent of time (38%); and 95 per cent or more time (48%). Thus, employees spent extremely lengthy periods at the workstation.

Increased work-time density is not identical to the reduced porosity of work identified as a major contributor to intensification (Green, 2006; Nichols, 1997). It is theoretically possible for workers to be at their workstations, but not continuously engaged in task performance and/or to enjoy a pace of work and discretion that enables them to recover body and mind after each task's completion. In the concrete conditions of HMRC, though, high work-time density was indeed closely related to intensification as the gaps between tasks had been progressively reduced and employees profoundly affected by increases in pace, volume and pressure of work.

The greater the work-time density, the more frequently workers experienced symptoms/complaints (Table 4). The numbers experiencing all conditions (except nausea) was greatest for those spending 95 per cent or more of their time at the workstation. Chi-square tests revealed statistical significance in the association between higher work-time density and general conditions (mental fatigue, physical tiredness, headaches) and also for stress. Significant associations, though not as strong, were evident for the MSD-related symptoms of stiff neck and pains and numbness in wrists. Other significant work-time density associations were with blocked nose, eyesight problems and sore throats. Gender differences were revealed for several symptoms/complaints. In HMRC, the much vaunted elimination of 'wasted' time (Womack et al., 1990) was associated not with 'creative tension' and 'humanly fulfilling' work but with staggeringly long periods spent at the workstation engaged in the mind-numbing repetitive tasks that lean was supposed to replace.

Sources of pressure and ill-health

Respondents were asked to consider the extent to which they felt pressurized as a result of work on a normal day pre- and post-lean. Less than 1 per cent reported being 'very pressurized' pre-lean and a further 14 per cent 'quite pressurized'. Post-lean, 65 per cent reported being 'very pressurized', 31 per cent 'quite pressurized', only 3.4 per cent 'not very pressurized' and 1.4 per cent 'not at all'. Respondents indicated the extent to which aspects of work contributed to feeling pressurized. These sources of pressure are ranked in descending order of importance (Table 5) and are correlated with a composite sickness scale.

Sources of pressure relating to 'leaned' work organization were identified as the most important. Individual targets (56 per cent reporting 'a great deal') was complained of most by tax processors.

Table 4. Association between the frequency of symptoms/complaints and percentage of time spent at workstation, by gender.

Symptom/complaint		Percentage of time at workstation		
		<85 per cent	85–<95 per cent	≥95 per cent
		Daily/several times a week (%)		
Mental fatigue	(Men)**	20	24	56
	(Women)***	15	30	55
Physical tiredness	(Men)*	22	25	53
	(Women)**	13	31	36
Stiff shoulders	(Men)*	17	31	52
	(Women)**	14	30	56
Stiff neck	(Men)*	19	31	50
	(Women)**	12	29	59
Stress	(Men)**	16	29	55
	(Women)	18	26	56
Backache	(Men)	20	35	45
	(Women)*	13	30	58
Headaches	(Men)*	19	23	58
	(Women)**	9	35	56
Pain/numbness in arms/wrists	(Men)	18	34	48
	(Women)***	8	26	67
Eyesight problems	(Men)*	13	29	58
	(Women)*	18	21	62
Blocked nose	(Men)	14	34	52
	(Women)*	11	25	64
Sore throat	(Men)	19	25	56
	(Women)*	0	33	67
Hearing problems	(Men)	16	42	42
	(Women)	10	32	58

Pearson Chi-Square tests: * significance level $\leq .050$, **significance level $\leq .010$, ***significance level $\leq .001$.

Table 5. Pearson's correlation coefficients for sources of pressure correlated with composite sickness scale.

Source of pressure	Correlation coefficient
Individual targets	.320*
Whiteboards	.274*
Having to keep to standardized operations	.259*
Supervisory monitoring	.303*
Quality checks	.289*
Monotony	.270*
Lack of variety	.282*
Team targets	.263*
Continuous workflow	.319*
Insufficient time between tasks	.329*
Backlog of tasks	.291*
Fragmented tasks	.275*
Insufficient breaks	.316*
Insufficient time to talk to colleagues	.299*
Competing with others	.267*
Insufficient information to do job	.228*
Supervisory pressure	.320*
Job insecurity	.264*
Physical discomfort at workstation	.394*

*Correlation is significant at the 0.001 level (2-tailed).

All this place is interested in is stats, stats, stats and even more stats. Why should we bust our guts when nothing is ever good enough? We are always expected to do more when we reach one target, they just put it up and up to the point that it's just ridiculous ... You just come in, sit at our desks all day with the same mundane tasks.... (East Kilbride, Administrative Assistant, male)

Given the obsessive micro-measurement and management of individuals' work central to HMRC's version of lean (Radnor and Bucci, 2007), it is unsurprising that onerous targets were hugely problematic. However, targets were only one element in the battery of performance management measures contributing to pressure. Closely related were having to conform to new standardized operating procedures (54%), which depended upon close monitoring (including the euphemistically named *Go and See*), the imposition of quality checks (50%) and the use of white boards (54%) displaying hourly scores against targets (*In Flight Checks*), all reporting 'a great deal'. Large numbers reported monotony (50%), lack of variety (49%) and fragmented tasks (41%) as contributing 'a great deal'.

Sources related to the reduced porosity of work resonate with the findings on work-time density and intensification. Continuous workflow and insufficient time between tasks were regarded by 45 per cent as pressure sources, and so were task backlogs by 43 per cent. Similarly, 35 per cent believed that insufficient breaks and time to talk to colleagues contributed 'a great deal'.

Qualitative data reveal how intimate was the perceived relationship between transformed work organization and the ill-health problems it was generating.

After 27 years in the Inland Revenue following the introduction of lean, I am now deskilled, de-motivated, stressed out most days, afraid to be sick, feel unappreciated, provide a poor service for customers, am not allowed to voice my opinion, looking forward to the day I can leave for good. (Cardiff, Administrative Officer, female)

The pressures applied by managers are now affecting the health and welfare of a great many staff members. Management pay scant regard to H&S laws and have never shown any willingness to listen to concerns. Indeed, senior management have actually told staff that they are lucky to have a job or if they don't go along with lean they will be under threat of closure. The excessive monitoring has caused huge health issues. (Lothians, Supervisor, male)

The correlations in Table 5 further indicate that lean's transformation of work bears most responsibility for the increased ill-health. The following insight illustrates management's resistance to accepting the legitimacy of workers' complaints about stress. This testimony also suggests under-reporting, where employees feel too vulnerable to reveal that they are affected by stress.

People are going off through work-related stress but management don't accept that. The current statistic for 800 staff in processing is 61 stress cases, but only 11 have cited workplace stress, so management say 11 out of 800 is not bad. The medical certificate doesn't say workplace stress, it just says stress. It's a big area of contestation. There are huge tranches of coughs, colds, sneezes, sickness, diarrhoea, symptomatic of stress but people are not confident in their own position or relationship with their manager and do not feel they can say, 'Actually, I'm just stressed out of my box, because that place is a hell hole.' (Interview, PCS rep, 26 October 2009)

Discussion and conclusions

In the 'new model office' of lean – to use HMRC management's term – the new model workforce was experiencing unprecedented levels of work-related ill-health. Many staff reported suffering from psycho-social complaints, evidenced by the frequency of mental fatigue, stress and headaches and MSD-associated conditions. The first contribution this article makes is to present detailed workplace-level evidence of a significant social malaise that national-level statistics merely gesture towards. Although all grades and both genders were affected, women administrative workers were most susceptible to ill-health symptoms.

This uneven distribution reinforces the argument that, despite growing recognition of MSDs and SDA (Wolkowitz, 2006), there was a gendered dimension to conditions partly related to women's disproportionate participation in clerical work. Further, the imbalance between clerical workers and supervisors reflected the fact that the latter were less tied to their workstations and undertook more varied tasks. These findings resonate with the longitudinal Whitehall II studies which have established relationships between grade and ill-health. Lower grades are more likely to experience job insecurity and overload and, especially when these conditions are near permanent features of work, suffer from

diverse conditions including stress, exhaustion, depression and coronary disease (Ferrie et al., 2002; Kuper and Marmot, 2003).

The incidence of fatality and injury helped to identify problematic industries (Nichols, 1997). If Nichols's 'structure of vulnerability' concept is extended to include the frequency of self-reported symptoms of ill-health, then HMRC processing work manifestly constituted an organizational structure of vulnerability. The regularity of symptoms/complaints relating to the ambient and, more so, the proximate environmental factors of the OHS model (Baldry et al., 1997, 2007; Taylor et al., 2003) indicate this vulnerability. However, this article's major contribution is to demonstrate the intimate connection between lean as a distinctive organization of clerical work and widespread occupational ill-health symptoms.

This relationship was demonstrated statistically through several associations between perceived post-lean changes (increases in volume, pace, intensity and pressure; and decreases in variety and control over work) *and* the frequency of symptoms/complaints. The latter were also positively associated with work-time density, intensification and the reduced porosity of work. The findings solidly confirm Osthus's (2007) suggestion that workplace change, in the form of internal re-organization, leads to inferior job quality and work-related ill-health. Drilling deeper into the effects of work organization, correlations were established between all identifiable sources and a composite scale of sickness/complaints. However, those pertaining to the post-lean labour process (targets, supervisory monitoring, repetition, monotony, few breaks) were manifestly the strongest.

It is suggested that a certain methodological limitation arises from the fact that the study was not longitudinal. Although time-series comparisons are acknowledged as the preferred method for evaluating attitudinal change over defined periods, the employee population was not surveyed before and after lean's introduction, for the simple reason that the PCS requested the research after its introduction. Comparisons perforce were based upon employees' recollection of pre-lean experiences as set against their current experiences. However, this method does not invalidate the study. Support is found in the research methodology literature for the use of retrospective recall (e.g. Miller et al., 1997), particularly in conditions, such as those of the present study, where multiple informants are utilized and the events recalled are not distant in time. Statistical tests were carried out to evaluate potential associations between key variables and the lack of consequent regression analysis might be regarded as an additional limitation. However, robust regression analysis relies on a near normal distribution of data (Osborne and Waters, 2002) and in the present case the experience of HMRC staff was so overwhelmingly negative that regression modelling was not appropriate.

Evidence from government and employer sources triangulates the study. Annual HMRC engagement surveys demonstrate the deteriorating quality of working life that has accompanied lean. To take but one comparison: in 2006, 28 per cent of respondents agreed and 46 per cent disagreed with the statement, 'I would recommend the Department as a good place to work' (HMRC, 2006). By 2010, the figures were 10 per cent and 63 per cent (HMRC, 2010). A mere 12 per cent agreed that 'change had been managed well' (HMRC, 2010). By 2009, HMRC was ranked the poorest of 11 government departments on 30 out of 67 criteria and second lowest on a further 22 criteria (HMRC, 2009).

This article complements occupational psychology and biomedical OHS models. Assimilating the concepts of work strain, overload and work intensification (Green, 2006), the relationship between work organization and ill-health was made explicit, not merely through statistical association, but importantly through worker accounts. Reflecting on their conditions, workers did not erect a Chinese wall between perceptions of the lean labour process and the consequences for health and well-being. The experiences of post-lean work and occupational ill-health were seamlessly entwined in their narratives.

No amount of cultural or normative cladding can conceal lean's true intent from its worker objects. One Newcastle respondent stated that 'lean is a smokescreen for cuts' and another from Salford declared that HMRC had 'jumped on a buzzword bandwagon in a cynical attempt to hide understaffing'. These comments exemplify the underlying importance of political economy to the sociology of ill-health (Nichols, 1997), in this case government cuts, budget deficits and efficiency savings, and raise the question of this study's generalizability. Given that lean is permeating central government, local government, the NHS and higher education (Melo et al., 2010; Radnor, 2010) in the context of austerity budgets, the work intensification and ill-health consequences evident at HMRC portend widespread employee experience.

Wainwright and Calnan (2002) insist that the work-stress discourse should not depict afflicted workers, particularly women, simply as victims. Where workers are organized into unions, as in HMRC, the collective capacity exists to challenge deteriorating working conditions and occupationally related ill-health. To date, though, union initiatives to combat lean's deleterious effects have been limited (Carter et al., 2012). Minor adjustments to job design can hardly cure a malaise rooted in a transformed work organization, itself driven by profound political-economic imperatives. More effective contestation will be required to humanize work conditions, particularly in the context of health and safety de-regulation (HM Government, 2010), the HSE's downsizing and the potentially harmful categorization of white-collar workplaces as low-risk (Lofstedt, 2011).

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Notes

- 1 The Young Report designated offices, classrooms and shops as 'low hazard workplaces' (HM Government, 2010: 16).
- 2 Such an event sequence might include the introduction of a new works system such as lean.

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