with the ACQ (PAQLQ r = −0.77, standardised PAQLQ r = −0.79, MiniPAQLQ r = −0.72; all p<0.001). There were only poor correlations between the three questionnaires and the HUI (r = 0.0, 0.13 and 0.06, respectively; all p = ns).

In summary, the new standardised PAQLQ and MiniPAQLQ are valid and reliable instruments for measuring QoL in children. The fact that they are easier to adminisister and complete should facilitate their use in practice.

Occupational lung disease

S6 THE ROLE OF FLOUR SPECIFIC IgG4 ANTIBODIES IN BAKER'S ASTHMA

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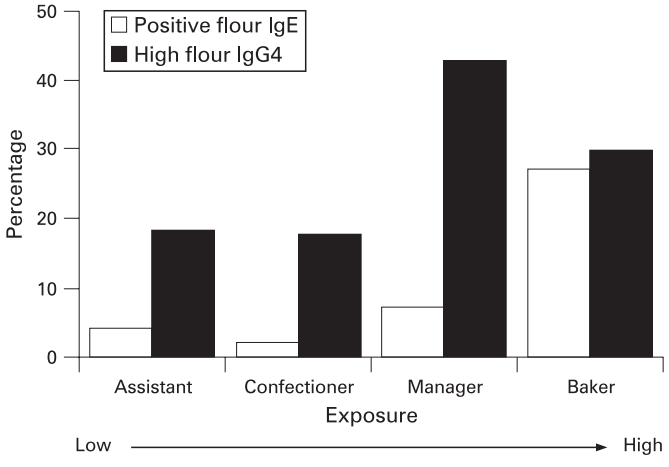
Introduction: There is a considerable body of evidence relating the incidence of occupational asthma to the intensity of allergen exposure in the workplace. For most allergens the exposure response for specific sensitisation and symptoms is linear but for some it is more complex. For example, at highest exposure to rat urinary allergens, there is an attenuation in sensitisation and symptoms with an associated increase in specific IgG_4 antibodies, which has been described as a modified Th2 response. These specific IgG_4 antibodies have previously been shown to be functionally protective. In bakery workers, exposed to varying concentrations of flour allergen, we have demonstrated a linear exposure response for sensitisation and symptoms but the role of specific IgG_4 antibodies are unknown.

Aims: To measure levels of flour-specific IgG_4 antibodies in 211 bakery workers and determine how these related to the exposure response.

Methods: A cross-sectional study of 239 workers from in-store bakeries across the UK was carried out. Flour-specific IgG_4 antibodies were measured in 211 (88.3%) participants using an optimised ELISA technique.

Results: The frequency of individuals producing high flour IgG_4 increased with increasing exposure except at maximum exposure whereby the frequency was decreased. There was a modified Th2-like response seen in a category of workers that was likely to have had the highest cumulative exposure throughout their career (see fig). This modified Th2-like response seen in these workers consisted of having low levels of flour-specific IgE and high levels of flour-specific IgG_4 with an associated decrease in symptoms.



Abstract S6 Figure Proportion of bakers producing flour-specific IgE and high flour-specific IgG_4 antibodies stratified by exposure.

Conclusions: The relationship between flour-specific IgG_4 antibodies and exposure in bakery workers is complex. Flour-specific IgG_4 antibodies do not reflect exposure in the bakery workers in this study. Furthermore, a modified Th2 response was not demonstrated in individuals with the highest current exposure but in the group of workers who were likely to have incurred the highest cumulative/peak exposure to flour during their career. These individuals were likely to consist of a survivor population and whether the production of high levels of specific IgG_4 antibodies resulted in the tolerance observed in these individuals requires further investigation.

S7 CHRONIC OBSTRUCTIVE PULMONARY DISEASE IN WELSH MINERS

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Background: Slate mining formed an important part of the mining industry in North Wales for several centuries. It declined considerably in the 20th century and by the mid-1970s there were just approximately 400 individuals still employed at the mines; many older residents had been exposed in their youth. Previous studies indicate that occupational exposure to slate dust increases the risk of silicosis and tuberculosis. In this study we re-examined a historic cross-sectional dataset to examine whether slate miners have an increased risk of chronic obstructive pulmonary disease (COPD).

Methods: A cross-sectional survey of four North Wales slate mining areas was conducted in 1975. Participants were men selected at random from the electoral rolls and those employed in the industry at the time. Of 2123 individuals approached, 1255 (59%) fulfilled eligibility criteria, agreed to participate and attended the survey. Participants had their height measured, completed a respiratory questionnaire, had their smoking and occupational histories taken and underwent lung function testing. "Predicted" lung function values were obtained by internal regression.

Results: Participants had a median age of 59 years (range 15–95); the majority (84%) reported smoking at some point. 726 (58%) were classified as slate workers; they had worked in the industry from 1 to 72 years (median 15) and reported similar rates of smoking to the non-mining group. Median FEV_1 (% predicted) was significantly lower among miners compared with the unexposed group (100.0% vs 104.6%, respectively; p = 0.001). A similar association was found for forced vital capacity (100.3% vs 101.3; p = 0.03). Miners were also more likely to satisfy GOLD criteria for COPD (mild or worse) than non-miners (32.7% vs 26.0%; p = 0.02). When stratified by smoking history, differences between the mining and non-mining groups for FEV_1 were not significant among non-smokers (n = 197; 105.9% vs 108.0%; p = 0.13) but remained among smokers (n = 1048; 99.1% vs 103.4%; p = 0.003). Among those who had ever smoked, miners with a duration of exposure of more than 24 years had a reduced median FEV_1, but this difference was not statistically significant.

Discussion: These findings suggest that slate miners from North Wales have an increased prevalence of COPD; predicted FEV_1 levels appearing lowest in smoking slate miners.

S8 DISPROPORTIONATE SHALLOW BREATHING A FEATURE OF ASBESTOS PLEURAL DISEASE, NOT UNCOMPLICATED ASBESTOSIS

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In asbestosis, diffuse fibrosis of the lung parenchyma restricts lung expansion. The reduction (represented by change in tidal volume at

ventilation 30 l/min, Vt_{30}) appears to be appropriate for the now reduced forced vital capacity (FVC; Cotes JE *et al*, in Porter R, ed. Breathing, Hering–Breuer Centenary Symposium, London CIBA, 1970). By contrast, with asbestos pleural disease we have observed the reduction in Vt_{30} to exceed that attributable to restriction, so breathing is disproportionately shallow. Compared with asbestosis it is an additional factor increasing the ventilatory cost of exercise in these men (Cotes JE, Reed JW. *Proc Physiol Soc* 2006;**3**:C39; www.physoc.org).

The evidence comes from standard measurements of lung function and responses to progressive treadmill exercise (Cotes JE. *Lung function*, 4th ed. Oxford, Blackwell Scientific, 1979) in men referred for assessment by the local pneumoconiosis medical panel during 1982 to 1989.

The subjects were the 11 men with asbestosis and 11 (out of 14) men with asbestos pleural disease plus asbestosis, selected as having raised ventilation during standardised submaximal exercise (ventilation at O_2 uptake 45 mmol/min or 1.0 l/min, normally 24 + 2.02 l/min). Mean $V'E_{st}$ in the two conditions were 38.2 and 38.9 l/min, respectively. The corresponding values for Vt_{30} were 1.24 and 0.93 litres, respectively, 93% and 74% ($p<0.05$) of the values predicted for observed FVC. Relative to the reference FVC the Vt_{30} in both conditions was reduced.

The disproportionately shallow breathing with asbestos pleural disease plus asbestosis was similar to that in men with asbestos pleural disease and raised $V'E_{st}$ but no restriction, whose shallow breathing during exercise was reported previously (Cotes JE, Reed JW. *Thorax* 2006;**61** (Suppl 11):ii49). Currently, the shallow breathing among the latter subjects is often attributed to functional hyperventilation. An alternative description, which embraces persons with and without restriction, might be pleural disease with reflex tachypnoea secondary to activation of receptors in proximity to pleural adhesions. The condition can occur with or without asbestosis, which has different physiological features. If the new mechanism is confirmed, the presence or absence of restriction will cease to be an issue for compensation.

S9 WORKFORCE DEMOGRAPHICS OF PEOPLE WITH ASTHMA COMPARED WITH THE GENERAL POPULATION: A NATIONWIDE STUDY

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It is not known to what extent, if any, people with asthma select an occupation with reference to their disease. In a nationwide study of asthma we examined the distribution of occupations currently held by people aged 18–65 years with asthma.

9201 adults from 18 general practices across the UK with registered current or past asthma were invited to complete a brief postal questionnaire enquiring into their work histories. Up to two reminders were sent; unfortunately the response rate was low (36%), an increasing problem in epidemiological research due to data protection and patient confidentiality issues.

We have developed a novel STATA programme that uses the current standard occupational classification (SOC 2000), a UK-based coding system employed by the Office of National Statistics.

Through sex-specific comparison of occupations with those published in the Annual Population Survey 2006 we calculated observed : expected (O : E) ratios for each of the nine major occupational groups.

Participants had a different distribution of occupations from those of the general population; this difference was statistically significant ($p<0.001$). In men O : E ratios were approximately unity in groups 1–2 (managers, senior officials and professional occupations), were increased in groups 3–7 (associate professional, technical, administrative, secretarial, skilled trades, personal services and sales and customer service occupations) and reduced in groups 8 and 9 (process, plant and machine operatives and elementary occupations). The last of these patterns was evident also in women, in whom O : E ratios for the other occupational groups 1–7 were less variable and uniformly close to unity. Regional comparisons suggested similar patterns across the UK, with the exception of the West Midlands where there was no evidence of any difference in occupational distributions.

The patterns may represent a response bias but are compatible with the selection of adults with asthma away from operative and elementary occupations and into technical and service occupations; there may be less room for selection in managerial and professional groups.

S10 IS THERE A SENSITIVE SPECIFIC IgE ASSAY TO AID DIAGNOSIS OF LABORATORY ANIMAL ALLERGY?

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Aim: To provide a specific and sensitive test to aid the diagnosis of laboratory animal allergy and determine any association between specific IgE titre and symptoms.
Introduction: The detection of an IgE response is almost wholly sensitive in the diagnosis of laboratory animal allergy, provided appropriate test methods are utilised. One of the main considerations in designing a test for the measurement of specific IgE is the use of appropriate allergen. We have measured specific IgE to both rat urine (containing the major allergen) and rat epithelium. We have further analysed associations between the titre of specific IgE and skin prick test wheal size with symptoms of laboratory animal allergy.
Methods: Specific IgE was measured by either skin prick testing or by radioallergosorbent assay (RAST).
Results: The sensitivity and specificity of specific IgE to rat urine were 83% and 100%, and 53% and 100% for rat epithelium. There was a significant increase in skin prick test wheal size to rat urine in those who were sensitised with chest and nose symptoms compared with asymptomatic individuals. The same significant difference was not observed for IgE titre, measured by RAST and symptoms.
Discussion: The sensitivity of measuring specific IgE to rat allergen is very dependent on using rat urinary protein as an allergen rather than rat epithelium. The skin prick test wheal size was significantly associated with symptoms of laboratory animal allergy in sensitised subjects, but IgE titre, as measured by RAST, was not. It is possible that the differences observed between skin prick test and RAST may reflect that one assay is in vivo and the other is in vitro. Skin prick test may reflect the affinity of specific IgE along with the presence of "inhibitory" IgG antibodies.

S11 TOBACCO USE IN SUSSEX ASBESTOS WORKERS

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Introduction and Objectives: Asbestos-related lung disease is likely to increase. Smoking, apart from being the major risk factor for lung cancer, may be a co-factor in the development of asbestosis in lung disease. The Health and Safety Executive report mentions the high rate of smokers in asbestos-related industry.[1] We have reviewed our local population of asbestos workers to explore that further.
Methods: Between 1994 and 2007, 268 workers were seen for Health and Safety Executive medical examinations, which included clinical assessment, spirometry and health safety advice on working practice and smoking cessation. A retrospective analysis of health records including questionnaires, medical examination, spirometry

Abstract S12 Table

COPD category	SABA (%)	SAMA (%)	LABA (%)	LAMA (%)	ICS/LABA (%)	ICS (%)	Theophylline (%)	Mucolytic (%)
Mild	74% (70)	14% (16)	4% (10)	28% (24)	41% (32)	23% (31)	4% (6)	6% (4)
Moderate	82% (78)	18% (19)	4% (12)	38% (41)	60% (43)	23% (32)	7% (9)	9% (8)
Severe	91% (86)	18% (19)	7% (15)	55% (52)	75% (54)	24% (31)	17% (19)	25% (12)
FEV_1 >80%	67% (59)	8% (12)	5% (6)	27% (20)	37% (26)	19% (24)	3% (5)	5% (2)

COPD, chronic obstructive pulmonary disease; ICS, inhaled corticosteroids; LABA, long-acting beta agonists; LAMA, long-acting anticholinergics; SABA, short-acting beta agonists; SAMA, short-acting anticholinergics.

(FEV, FVC), smoking habits and effect of smoking cessation advice, was undertaken.

Results: 268 subjects were seen, 65 on multiple occasions. 214 (79%) were involved with asbestos handling or removal. 42 (16%) worked in supervisory or managerial capacities. 12 (5%) were laboratory analysts. Current smoking rates for handlers and removers was 67% (144/214), for the supervisory and managerial group 36% and analysts 33% ($p = 0.015$). Ex-smoking rates were 11% for handlers and removers, 38% for the supervisory and managerial group and 8% for analysts. Non-smoking rates were 22% for handlers and removers, 46% for supervisors and managers and 58% for analysts. The proportions of smokers, ex-smokers and non-smokers did not change with time. The rate of decline in FEV_1 for current smoking handlers and asbestos removers was 52.8 ml per year, and for supervisors, managers and analysts 22.3 ml per year ($p = 0.0023$). The mean for FEV_1 decline in non-smokers and ex-smokers was 37.5 ml/year.

Conclusions: Workers with highest asbestos exposure are significantly more likely to be current smokers and to have greater decline in FEV_1, conferring greater disease risk.[2] Smoking behaviour has not changed since our first records in 1983. Consultant advice on cessation was ineffective for the group most at risk.

1. HSE Asbestos-related database, 2007,
2. HSE Executive report, mesothelioma deaths the latest picture for Great Britain, 1981–2005.

Chronic obstructive pulmonary disease: organisation of care

S12 BENCHMARKING CHRONIC OBSTRUCTIVE PULMONARY DISEASE ACROSS AN INNER CITY PRIMARY CARE TRUST: ONE YEAR ON

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Background: Our integrated chronic obstructive pulmonary disease (COPD) team works closely with general practice to improve COPD care in a primary care trust (PCT) with high levels of social deprivation and COPD. Integral to our approach is the general practice COPD register that uses a standardised template to structure consultations in line with national guidelines. De-identified data are collected remotely at 3-month intervals.

Aims: To compare data from baseline with those available at 12 months. To establish general practice adherence to guideline recommendations on COPD follow-up and management.

Methods: We retrospectively analysed data from the COPD register at 12 months and compared with baseline COPD prevalence, FEV_1 percentage predicted, MRC score, smoking status and current medication.

Results: 12-month data were available from 25 of 56 practices (55% of the total population and 56% of the COPD population). Recorded diagnosis of COPD n = 3291 (n = 2888 baseline). Mean prevalence 2.4% (range 1.3–4.5%; 2.1% baseline). 53% female. Mean age 68.7 years (range 30–97). Smoking status at 12 months (baseline), never smoked 12% (12%), ex-smoker 48% (46%), current smoker 40% (42%). 48% of patients (n = 1574) had a read code for COPD review in the last 12 months (range 0–83%). 54% (n = 1781) of patients had undergone spirometry in the last 12 months. Severity of COPD could not be ascertained from 51 of these readings. 12% had FEV_1 greater than 80% (10% baseline), 53% mild COPD (44% baseline), 27% moderate COPD (30.5% baseline), 8% severe COPD (10% baseline) according to NICE guidelines (2004). MRC score was recorded on 48% of patients (27% at baseline). The table highlights the proportion of patients receiving drug treatment category according to severity for total COPD population at 12 months (baseline).

Conclusions: In the 12 months since baseline: 430 additional patients were added to the COPD register. Smoking rates remain above the national average and have not reduced significantly. Only 50% of patients were reviewed or had spirometry within the last 12 months as per NICE 2004 guidelines. This maybe due to general practice opting to follow QOF requirements to review patients every 15 months rather than NICE guidelines.

S13 SHOULD CHRONIC OBSTRUCTIVE PULMONARY DISEASE SERVICE DELIVERY IN AN INNER CITY PRIMARY CARE TRUST BE TARGETED AT GENERAL PRACTICE OR PRACTICE-BASED COMMISSIONING CLUSTER LEVEL?

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Background: Socioeconomic deprivation has been independently associated with chronic obstructive pulmonary disease (COPD) in both longitudinal and cross-sectional analyses. It is not known if such associations influence COPD at a local level. Furthermore, there is a paucity of literature on methodologies that can guide health commissioners to redesign COPD services to meet the health needs of their local population.

Objectives: To investigate the association between socioeconomic status and COPD prevalence and morbidity (defined by disease severity (FEV_1 % predicted), unscheduled hospital admissions and length of hospital stay) in an inner city primary care trust and to inform service redesign.

Methods: An exploratory cross-sectional analysis of the general practice-registered COPD population of the PCT using innovative data collection methods. Data were pooled from a variety of sources at practice-based commissioning cluster level. Pearson's correlation coefficient was used to investigate simple linear relationships between IMD and outcome measures. Analyses were carried out in SAS version 9.1 in a Windows NT environment.

Results: The mean level of socioeconomic deprivation at cluster level was 41 (SD 11.1) and varied significantly ($p \leqslant 0.001$). The mean age of the cluster population was 37.1 years (SD 4.3) and mean age of the COPD population was 68.7 years (SD 10.7). The mean prevalence of COPD was 2.5% (SD 0.9). 53.4% of the COPD population were women. Smoking rates were significantly higher in both the general and COPD population of deprived clusters. The proportion of the COPD population with severe disease was 9.5%. There was a strong positive association between socioeconomic deprivation and COPD prevalence ($r = 0.76$, $p = 0.02$). Positive but non-significant associations between hospital admission and deprivation were also seen ($r = 0.26$, $p = 0.053$).