

determine if there is a relationship between confirmed hospital flu cases and the number of NIV admissions, intubations and deaths (ie, NIV therapy failure). In this study the following seasons were categorised as: summer, June to August; autumn, September to November; winter, December to February; and spring, March to May. Total flu cases stated includes types A and B.

Results Figure 1 shows the prevalence of confirmed hospital flu cases and the number of NIV admissions, intubations and deaths as a result of failure of therapy. Observation of the data suggests that seasonal peaks (as by hospital cases) do indirectly result in an increase in admissions requiring NIV and resultant rises in intubations and deaths. The data do not show how many NIV episodes were directly flu related.

Conclusions This observational study may suggest that seasonal outbreaks of community flu and therefore the resultant increase in hospital flu admissions may have an impact on the workload of NIV units, with an increase in admissions requiring NIV and ultimately an increase in the requirement for invasive ventilatory support and death. Predicting outbreaks of flu may allow better workforce planning for NIV units to cope with surges in activity.

S55 NON-INVASIVE VENTILATION IN MOTOR NEURON DISEASE: QUALITATIVE ACCOUNTS OF INITIATION AND IMPACT

¹LH Piggin, ¹EW Thornton, ²RM Angus, ²B Chakrabarti, ³CA Young. ¹School of Psychology, University of Liverpool, Liverpool, UK; ²Aintree Chest Centre, University Hospital Aintree, Liverpool, UK; ³Walton Centre for Neurology and Neurosurgery, Liverpool, UK

doi:10.1136/thx.2009.127076c

Introduction Non-invasive ventilation (NIV) can palliate symptoms of nocturnal hypoventilation in motor neuron disease (MND) and improve quality of life. There has been no qualitative description of how patients' thoughts and feelings may evolve whilst making the transition onto NIV and how physical/psychological changes are perceived by patients.

Methods 10 patients with MND participated in semi-structured interviews before being established on NIV and again 3 months following NIV initiation. Interviews were transcribed verbatim before undergoing thematic analysis. Salient themes were used to provide a phenomenological narrative.

Results Pre-NIV, framing in regard to disease progression was an important determinant of early emotional response. For some, NIV represented a negative "milestone" in physical decline, whilst for others, an opportunity/hope for improvement. Most were reluctant to consider "realities" of NIV until use was imminent, with resignation and anxiety common themes. Resistance increased where the link between ventilation and actual symptoms was poorly understood, creating conflict between subjective/objective need for treatment. Most patients perceived no subjective need for ventilation pre-NIV, describing decision making as led by professionals and family members. Reports of having "no choice" were common; however, after ventilation many patients reported that the non-invasive nature of treatment did give them choice which reassured and empowered them. Post-NIV, most reported improved sleep/energy levels; negative aspects were outweighed by positive physical effects. However, managing expectation was important; a minority finding effects disappointing or the struggle to adjust to the machine actually increasing sleep disturbance and anxiety. Patients reporting no effect were still motivated to continue "just in case" fearing no change with NIV might equate to significant physical decline without NIV.

Conclusion The diversity of experience and feeling amongst patients demonstrates that the physical and emotional landscape continually shifts in MND. Prior to treatment, perceptions of NIV ranged from alarm, with NIV seen as a marker of severe decline, to positivity as a

potentially beneficial therapy. Some expectations were unrealistic, which correlated with later disappointment. In general, patients appeared ambivalent pre-NIV; however, following initiation of NIV they reported improved sleep and energy levels. This work suggests managing expectations is a central issue in using NIV in MND.

Epidemiology of chronic respiratory disease

S56 EVIDENCE FOR ASSOCIATION BETWEEN SARCOIDOSIS AND PULMONARY EMBOLISM FROM 30-YEAR RECORD LINKAGE STUDY

¹AP Nataraja, ²CJ Wotton, ²MJ Goldacre, ¹L-P Ho. ¹Oxford Sarcoidosis Clinic, Oxford Centre for Respiratory Medicine, Oxford, UK; Radcliffe Hospitals NHS Trust and MRC Human Immunology Unit, Weatherall Institute of Molecular Medicine, Oxford, UK; ²Unit of Health-Care Epidemiology, Department of Public Health, University of Oxford, Oxford, UK

doi:10.1136/thx.2009.127076d

Introduction Sarcoidosis is a multisystem disorder of unknown aetiology, characterised by the formation of non-caseating granuloma. A higher than expected incidence of pulmonary embolism (PE) was observed anecdotally in our Sarcoidosis Clinic over a 3-year period, raising the question of disease association.

Methods We carried out a retrospective cohort analysis using data from a well-established record linkage data set in Oxford ("ORLS"; years 1963–1998), and a more recent record linkage data set covering England ("England"; 1999–2005), to compare rate ratios (RRs) for pulmonary embolism and deep vein thrombosis (DVT) between people admitted to hospital for sarcoidosis and a reference cohort for all ages and those below 65 years. RRs of myocardial infarction, subarachnoid haemorrhage, abdominal aortic aneurysm and cardiac failure were also analysed as controls. The reference cohorts comprised individuals with various minor medical and surgical conditions as main diagnoses (eg, squint, otitis media and nasal polyps). They were standardised by age, gender, year of first admission and district of residence. Rates of PE and control conditions were calculated based on person-years at risk, relative to that in the reference cohort. The confidence interval for the rate ratio and χ^2 statistics for its significance were calculated.

Results We found a significantly increased RR for PE in patients with sarcoidosis, for patients both above and below 65 years of age, and in both data sets (RR 1.87, 95% CI 0.96–3.27 (ORLS); RR 2.72; 95% CI 1.52 to 4.50 (England) for all age patients). The RR of cardiac failure in sarcoidosis (RR 1.78, 95% CI 1.09 to 2.75 (ORLS); RR 3.23; 95% CI 2.02 to 4.89 (England) for all age patients), but not of other control diseases, was also increased.

Conclusions There appears to be an increase in susceptibility to PE, but not of control acute vascular incidents such as myocardial infarction and subarachnoid haemorrhage in patients with sarcoidosis. This supports anecdotal clinical observations, and suggests a link between coagulopathy and sarcoidosis, with clinical implications for management of these patients.

S57 INCREASING PREVALENCE OF SPIROMETRY-DEFINED COPD IN MIDDLE AGED MEN AND WOMEN IN SCOTLAND, 1995–2003

M Gillies, J Lewsey, H Starkie, A Briggs, M Shepherd, K MacIntyre. University of Glasgow, Glasgow, UK

doi:10.1136/thx.2009.127076e

Background Chronic obstructive pulmonary disease (COPD) is a growing public health problem. We examined the prevalence of spirometry-defined COPD over time in a nationally representative sample of the Scottish population.

Methods 13 142 individuals aged 35–64 years participated in the Scottish Health Surveys (1995, 1998 and 2003). Sociodemographic, lifestyle and health-related information was collected for each participant. Respiratory symptoms were assessed using the Medical Research Council (MRC) respiratory questionnaire and spirometry measured according to a standardised protocol. Complete data were available on 61.0% of participants; missing data were multiply imputed. The prevalence of spirometry-defined COPD (Global Initiative for Chronic Obstructive Lung Disease (GOLD) criteria) was calculated. Baseline characteristics of participants with spirometry-defined COPD were described. Logistic regression was used to model temporal changes in the prevalence of spirometry-defined COPD.

Results The overall prevalence of spirometry-defined COPD was 17.0% (95% CI 16.2% to 17.7%), 15.7% (14.5% to 16.9%), 15.5% (14.4% to 16.7%) and 20.0% (18.5% to 21.5%) in the 1995, 1998 and 2003 surveys, respectively. Of those with spirometry-defined COPD, 43.3.1% (40.7% to 45.9%) had mild disease, 41.2% (38.8% to 43.5%) moderate disease and 15.5% (13.9% to 17.2%) severe or very severe disease. Participants with spirometry-defined COPD were older ($p < 0.001$), more likely to be male ($p = 0.036$), more socioeconomically deprived ($p < 0.001$), more likely to be a current smoker ($p < 0.001$) and more likely to report symptoms of breathlessness ($p < 0.001$), phlegm ($p < 0.001$) or wheeze ($p < 0.001$) than other participants. The prevalence of spirometry-defined COPD increased over time (2003 vs 1995 odds ratio (OR) 1.46 (1.27 to 1.69)) independent of age, sex, socioeconomic deprivation, smoking status and respiratory symptoms. Only 15.4% (13.4% to 17.5%) of participants with spirometry-defined COPD reported having a long-standing respiratory condition; 3.9% (3.0% to 4.8%) specifically mentioned COPD. Two-thirds (64.6% (62.1% to 67.1%)) of the participants with spirometry-defined COPD that did not report a long-standing respiratory illness were current smokers. Among participants with spirometry-defined COPD there has been no change over time in the proportion that reported a respiratory diagnosis (2003 vs 1995 OR 1.08 (0.76 to 1.55)).

Conclusion The prevalence of COPD in Scotland is high, and rising. A significant proportion of individuals with spirometry-defined COPD do not report a long-standing respiratory illness; many continue to smoke. Despite increasing awareness among the public and healthcare professionals COPD remains underdiagnosed.

S58 IMPLICATIONS OF SCREENING FOR COPD: RESULTS FROM THE BURDEN OF OBSTRUCTIVE LUNG DISEASE (BOLD) STUDY FROM 14 COUNTRIES

¹A Jithoo, ²P Enright, ³WM Vollmer, ³S Gillespie, ¹PGJ Burney. ¹Imperial College, London, UK; ²University of Arizona, Tucson, USA; ³Center for Health Research, Kaiser Permanente, Portland, USA

doi:10.1136/thx.2009.127076f

Background A diagnosis of chronic obstructive pulmonary disease (COPD) requires the administration of prebronchial and post-bronchodilator spirometry. However, it is not always feasible to perform spirometry in short office visits and particularly in countries with limited healthcare resources.

Aim To investigate the use of questionnaire predictors and peak expiratory flow (PEF) to identify those most likely to have COPD.

Methods Random samples of adults aged ≥ 40 years from 14 sites ($n = 9390$) completed questionnaires about respiratory symptoms, COPD risk factors and health status, and performed prebronchial and postbronchodilator spirometry, including PEF, according to the standardised Burden of Obstructive Lung Disease (BOLD) study methodology. We used general classification and regression tree modelling (CART) to develop prediction models for COPD using questionnaire items and PEF. We conducted model building using a test sample (70%) and validated the results using a validation sample (30%).

Results CART modelling identified a high risk subgroup comprising 54.3% of the sample and consisting of individuals who had been told they have COPD/emphysema or who were long-term smokers (> 20 years) or reported any dyspnoea. This subgroup had a 13% risk for having confirmed COPD and identified 87.2% of all cases. A reciprocal low risk group comprising 45.7% of the sample had only a 2.3% probability of having COPD (table 1). Adding prebronchodilator PEF data into the CART analysis resulted in a high risk group based only on the PEF data. This PEF model identified a high risk subgroup comprising a much smaller proportion of the population (21.6%) and yet capturing 83.8% of the true COPD cases.

Conclusion The use of PEF reduces the number of individuals who need confirmatory spirometry by more than half compared with questionnaire data, but retains high sensitivity. Using questionnaires and/or PEF screening for COPD can be useful especially in resource-limited settings.

Abstract S58 Table 1 General CART modelling for detecting moderate-severe COPD*

Prediction variables	Risk status	Definition of group	% population	% cases	Risk
Test sample results					
Questionnaire data only	High	Reports doctor-diagnosed COPD/emphysema or any dyspnoea or smoking > 20 years	54.3	87.2	13.0
	Low	Rest of the sample	45.7	12.8	2.3
Prebronchodilator PEF and questionnaire data	High	PEF/Ht ² ≤ 2.2	21.6	83.8	31.4
	Low	PEF/Ht ² > 2.2	78.4	16.2	1.7
Validation sample results					
Questionnaire data only	High	Reports doctor-diagnosed COPD/emphysema or any dyspnoea or smoking > 20 years	55.4	87.5	12.6
	Low	Rest of the sample	44.6	12.5	2.2
Prebronchodilator PEF and questionnaire data	High	PEF/Ht ² ≤ 2.2	21.8	83.9	30.7
	Low	PEF/Ht ² > 2.2	78.2	16.1	1.6

Forced expiratory volume in 1 s (FEV₁) $< 80\%$ predicted.

*Postbronchodilator FEV₁/FVC $< LLN$.

CART, classification and regression tree modelling; COPD, chronic obstructive pulmonary disease; FVC, forced vital capacity; LLN, lower limit of normal; PEF, peak expiratory flow.

S59 IS ADULT HEIGHT RELATED TO THE RISK OF HAVING CHRONIC OBSTRUCTIVE PULMONARY DISEASE?

K Ward, R Hubbard. *University of Nottingham, Nottingham, UK*

doi:10.1136/thx.2009.127076g

Background A number of historical studies have suggested that shorter people are more likely to die from chronic obstructive pulmonary disease (COPD). The postulated mechanism for this association is that early life deprivation is associated with decreased growth and shorter adult stature and is also associated with an increased risk of developing COPD in adult life. Whether this association remains true today now that living conditions have improved in general is not known. The aim of this study is to quantify the current association between adult height and COPD, and to determine how this varies by age and adult socioeconomic status.

Methods Data on 1 204 110 people (>35 years old) were obtained from The Health Improvement Network—a longitudinal computerised general practice database. Height was compared between people with and without a diagnosis of COPD using linear regression. The potential confounders in this study were age, sex and adult socioeconomic score (measured as quintiles of postcode-linked Townsend score).

Results In our data set we had information on adult height for 1 025 662 (85%) people, and of these 2.7% had a diagnosis of COPD. The mean height for men was 175.8 cm and for women was 161.7 cm. Adult height and COPD showed a strong inverse relationship, with people diagnosed with COPD being 1.12 cm shorter on average than the general population after adjusting for sex, current social class and age. This difference was most marked in people aged 35–50 years (1.76 cm (95% CI 1.37 to 2.15) and decreased progressively with age, and was only 0.51 cm (95% CI 1.09 to –0.06 cm) in people over the age of 90 years. There was no

clear trend between current adult socioeconomic status and the difference in height between people with and without COPD.

Conclusions Adult height is strongly associated with the risk of having COPD. This association was strongest in the youngest age category, suggesting that early life experience will remain an important risk factor for COPD for some time to come and possibly that COPD related to early life deprivation is more severe and tends to present at a younger age.

S60 RELATIONSHIP BETWEEN SERUM IGE LEVELS, SMOKING AND SMOKING CESSATION IN AN AGEING POPULATION IN THE UK (THE ELSA COHORT)

¹J Fingleton, ²S Webster, ³N Rice, ³D Melzer, ²B Patel. ¹Royal Cornwall Hospital NHS Trust, Truro, UK; ²Royal Devon and Exeter NHS Foundation Trust, Exeter, UK; ³Epidemiology and Public Health, Peninsula Medical School, Exeter, UK

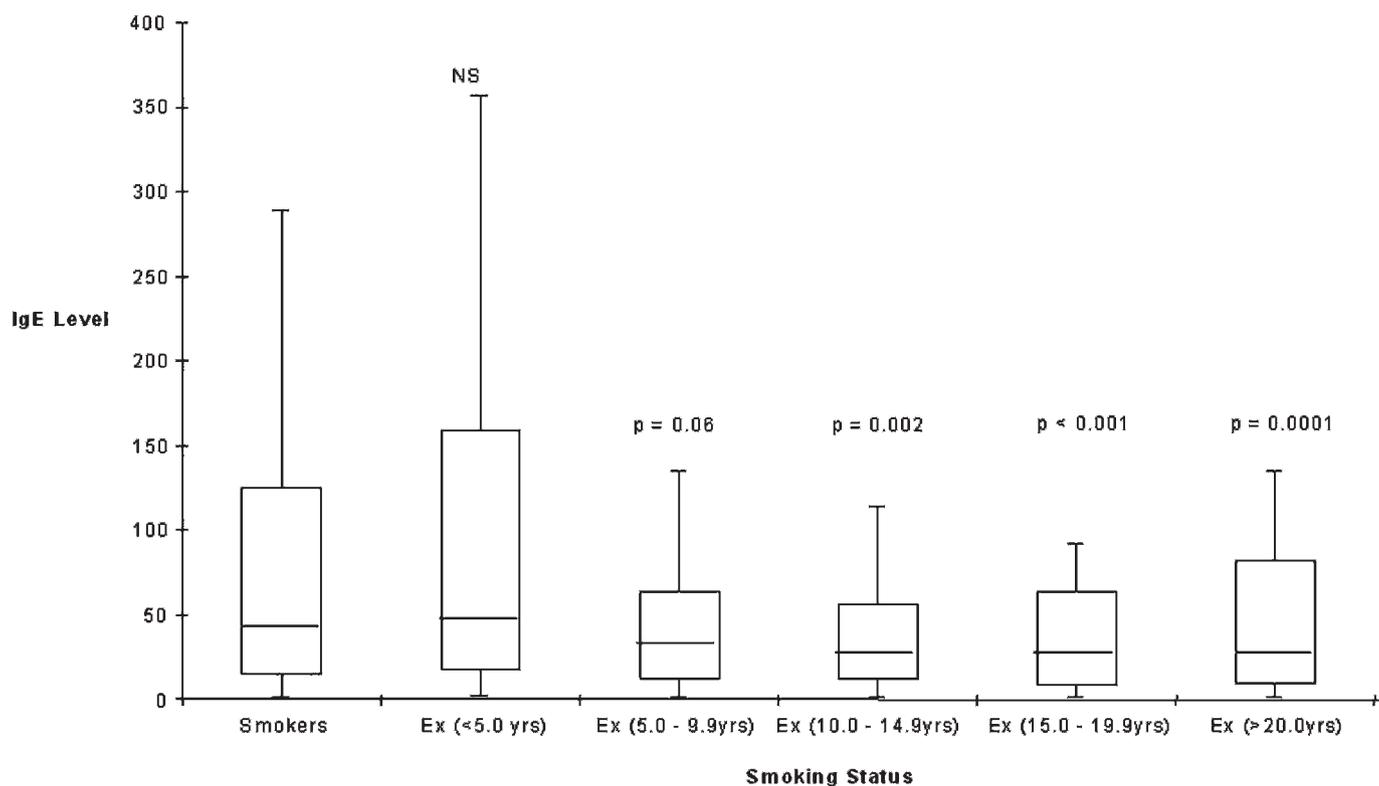
doi:10.1136/thx.2009.127076h

Introduction Cigarette smokers have higher immunoglobulin E (IgE) levels than non-smokers, but little is known about the effect of smoking cessation on IgE levels.

Aims The purpose of this study was to investigate the association between smoking and smoking cessation on serum IgE levels.

Methods We assessed the association between self-reported IgE levels and smoking history in 2365 individuals from the English Longitudinal Study of Ageing (ELSA) cohort.

Results The 424 current smokers had higher IgE levels (median 42 kU/l (interquartile range 110)) than the 1052 ex-smokers (28 kU/l (70), $p \leq 0.0001$). Ex-smokers had significantly higher IgE levels than the 889 non-smokers (22 kU/l (53), $p \leq 0.001$). Ex-smokers were then further categorised according to time since smoking cessation. Ex-smokers of <5 years had IgE levels that were



Abstract S60 Figure 1 Immunoglobulin E (IgE) levels decline with time since smoking cessation. p Values are given relative to smokers.

not significantly different from those of current smokers (46 kU/l (141)) (see fig 1). Ex-smokers of 5–9.9 years had lower levels than current smokers (32 kU/l (52)) but this failed to reach statistical significance ($p = 0.06$). Ex-smokers of >10 years had IgE levels that were similar to those of non-smokers and significantly lower than those of current smokers ($p < 0.001$).

Conclusions The mechanism underlying elevated IgE levels in smokers is unknown. Our data suggest that this may be a direct effect of cigarette exposure that is reversible on cessation. However, the temporal decline appears to take place over a period of years.

S61 EXPLAINING ETHNIC GROUP DIFFERENCES IN LUNG FUNCTION: A CROSS-SECTIONAL STUDY

R Hooper, MK Tumilty, JF Potts, PGJ Burney. *Imperial College London, London, UK*

doi:10.1136/thx.2009.127076i

Introduction and Objectives Different normal ranges for lung function are often assumed for different ethnic groups, though these are usually estimated from non-smoking, asymptomatic individuals, without adjustment for other risk factors. Assigning lower norms to a racial group that has experienced deprivation or other occupational/early life exposures may be discriminatory. Using data from the UK Burden of Lung Disease (BOLD) study, we estimated differences in lung function between ethnic groups adjusted for confounding variables.

Methods Participants aged ≥ 40 years were randomly selected from practice lists at three general practices in London. The practitioner made initial contact, and those interested arranged an appointment with the study team for assessment. Forced expiratory volume in 1 s (FEV₁) and forced vital capacity (FVC) were measured by spirometry, prebronchodilator and postbronchodilator. Quality of spirometry was reviewed centrally, and all technicians were trained and certified. Ethnic group, respiratory symptoms, health status and other risk factors were obtained from face-to-face interviews. Multivariable regression was used to estimate differences between ethnic groups in FEV₁, FVC and the FEV₁/FVC ratio, adjusting for confounders.

Results 4467 individuals were selected for recruitment, and investigators spoke to 1927. 677 provided complete questionnaire data and good quality spirometry. We present results in three ethnic groups: white ($n = 550$), black ($n = 65$, including mixed black/white) and Asian/other ($n = 62$, including mixed white/Asian, and other ethnic groups). In an unadjusted analysis, there was a significant difference in FEV₁/FVC between blacks and whites (see table 1), which disappeared after adjusting for possible confounders. In contrast, there was no evidence for ethnic group differences in an unadjusted analysis of FEV₁, but after adjusting for confounders there was a lower FEV₁ in the black and Asian/other groups than in whites. Similarly, ethnic group differences in FVC became larger after adjusting for confounders.

Conclusions We found differences between ethnic groups in FEV₁ and FVC which were not explained by age, height or other risk factors for respiratory disease. The FEV₁/FVC ratio was more stable across ethnic groups. Several other studies have shown poorer lung function in blacks than whites. It remains unclear whether this indicates pathology or is a natural adaptation.

Innate immune responses to bacteria

S62 ABERRANT PERIPHERAL NEUTROPHIL MIGRATION IN THE HEALTHY ELDERLY AS A POTENTIAL CAUSE OF REDUCED BACTERIAL CLEARANCE

¹E Sapey, ¹N Aaronson, ¹A Ahmad, ¹H Chalal, ²RH Insall, ¹J MLord, ³RA Stockley. ¹University of Birmingham, Birmingham, UK; ²Beatson Institute, Glasgow, UK; ³University Hospital Birmingham NHS Foundation Trust, Birmingham, UK

doi:10.1136/thx.2009.127076j

Pneumonia is the leading infectious cause of death in the elderly, and associated with a poor response to antimicrobial therapy. Neutrophil function declines with age, with reduced phagocytosis and superoxide production. In contrast there have been conflicting data as to whether neutrophil migration is altered during ageing. Inaccurate migration of neutrophils to a site of infection may reduce pathogen clearance and cause an increase in “by-stander” tissue damage as neutrophils use

Abstract S61 Table 1

	Lung function measurement	Confounders	Mean ethnic group differences adjusted for confounders	
			Black–white	Asian/other–white
Women	FEV ₁ /FVC (%)	–	6.8 (4.6 to 9.0)	2.0 (–1.5 to 5.5)
		Age and height	4.2 (2.1 to 6.4)	0.4 (–2.5 to 3.2)
		Full list*	1.6 (–0.9 to 4.1)	–0.4 (–3.6 to 2.7)
	FEV ₁ (litres)	–	–0.06 (–0.28 to 0.16)	–0.28 (–0.56 to 0.00)
		Age and height	–0.39 (–0.53 to –0.25)	–0.18 (–0.32 to –0.03)
		Full list*	–0.43 (–0.55 to –0.30)	–0.30 (–0.46 to –0.15)
	FVC (litres)	–	–0.31 (–0.57 to –0.06)	–0.45 (–0.74 to –0.16)
		Age and height	–0.65 (–0.82 to –0.49)	–0.26 (–0.43 to –0.09)
		Full list*	–0.61 (–0.78 to –0.45)	–0.40 (–0.58 to –0.22)
Men	FEV ₁ /FVC (%)	–	7.2 (4.2 to 10.2)	3.7 (–1.4 to 8.8)
		Age and height	4.3 (0.8 to 7.8)	2.3 (–1.3 to 5.9)
		Full list*	1.2 (–2.1 to 4.4)	1.2 (–1.7 to 4.0)
	FEV ₁ (litres)	–	–0.09 (–0.42 to 0.23)	–0.44 (–0.90 to 0.03)
		Age and height	–0.44 (–0.68 to –0.20)	–0.41 (–0.72 to –0.10)
		Full list*	–0.61 (–0.85 to –0.38)	–0.50 (–0.67 to –0.32)
	FVC (litres)	–	–0.47 (–0.91 to –0.02)	–0.79 (–1.27 to –0.32)
		Age and height	–0.77 (–1.08 to –0.46)	–0.67 (–1.03 to –0.32)
		Full list*	–0.87 (–1.14 to –0.61)	–0.74 (–0.95 to –0.54)

*Age, height, pack years of smoking, current smoking, passive smoking, cough, phlegm, wheeze, breathlessness, diagnosed respiratory disease, body mass index, years in a dusty job, current dusty job, current exposure to fumes at work, family history, tuberculosis, diabetes, childhood hospitalisation, education, father's education.

FEV₁, forced expiratory volume in 1 s; FVC, forced vital capacity.