ORIGINAL ARTICLE

Burnout as a predictor of self-reported sickness absence among human service workers: prospective findings from three year follow up of the PUMA study

M Borritz, R Rugulies, K B Christensen, E Villadsen, T S Kristensen

Occup Environ Med 2006;**63**:98–106. doi: 10.1136/oem.2004.019364

See end of article for authors' affiliations

Correspondence to: Dr M Borritz, National Institute of Occupational Health, Denmark, Lersoe Parkallé 105, DK-2100 Copenhagen O, Denmark; mb@ami.dk

Accepted 29 July 2005

Aim: To investigate whether burnout predicts sickness absence days and sickness absence spells in human service workers.

Method: A total of 824 participants from an ongoing prospective study in different human service sector organisations were eligible for the three year follow up analysis. Burnout was measured with the work related burnout scale of the Copenhagen Burnout Inventory. Sickness absence was measured with self-reported number of days and spells during the last 12 months before the baseline and the follow up survey. A Poisson regression model with a scale parameter was used to account for over dispersion. A linear regression model was used for analysing changes in burnout and absence between baseline and follow up.

Results: Burnout was prospectively associated with both sickness absence days and sickness absence spells per year. Differences in sickness absence days varied from a mean of 5.4 days per year in the lowest quartile of the work related burnout scale to a mean of 13.6 in the highest quartile. An increase of one standard deviation on the work related burnout scale predicted an increase of 21% in sickness absence days per year (rate ratio 1.21, 95% CI 1.11 to 1.32) after adjusting for gender, age, organisation, socioeconomic status, lifestyle factors, family status, having children under 7 years of age, and prevalence of diseases. Regarding sickness absence spells, an increase of one standard deviation on the work related burnout scale predicted an increase of 9% per year (rate ratio 1.09, 95% CI 1.02 to 1.17). Changes in burnout level from baseline to follow up were positively associated with changes in sickness absence days (estimate 1.94 days/year, SE 0.63) and sickness absence spell (estimate 0.34 spells/year, SE 0.08).

Conclusion: The findings indicate that burnout predicts sickness absence. Reducing burnout is likely to reduce sickness absence.

Sickness absence is a major problem for the individual, the workplace, and society. For the individual, sickness absence can be the beginning of social decline with periods of longer sickness absence, job dismissal, and even permanent exclusion from the labour market. For workplaces, sickness absence denotes loss of manpower, payments for temporary workers, reduced productivity, and increased job turnover. For society, sickness absence means payments to sickness benefits and reduced productivity.

In the literature, it is assumed that sickness absence is a complex phenomenon that can be caused by individual, work related, organisational, and societal factors.[1–5] Sickness absence has been discussed as a consequence of ill health,[4 6] a coping mechanism,[2] a behaviour of social equity,[7] a reaction to organisational injustice,[8] or a consequence of exposure to adverse work–environment factors.[2 3 9–12]

Burnout is described as a negative consequence of human service work, characterised by emotional exhaustion, loss of energy, and withdrawal from work;[13–16] more than 5500 studies on burnout have been published since the beginning of the 1980s.[13 15] Despite this wealth of research, we found only 16 studies on burnout and absence. Of those, six were prospective studies,[9 17–21] one was a population study,[13] and nine were cross-sectional in design.[11 22–29] The prospective studies in general have found positive associations between burnout and sickness absence; however, the methodological heterogeneity of these studies, for example differences in population size, in follow up time, or occupational group makes interpretation difficult. Moreover, because of the assumed multi-factorial causation of sickness absence, studies on burnout and sickness absence must control for a wide range of potential confounders, a challenge that no studies have met so far.

The aim of this paper is to investigate the impact of burnout on sickness absence in a large cohort while controlling for numerous potential confounders. We consider burnout as a special category of occupational stress. We assume that burnout can make the individual more susceptible to illnesses, for example to infections such as the common cold.[30] Burnout might also cause sickness absence without the presence of illnesses, if sickness absence is chosen as a strategy to save energy and recover from exhaustion.[31–33] We analysed the associations between burnout and absence, both in a cross-sectional sample and in a prospective cohort, allowing us to compare the magnitude of effect sizes in these two different types of study designs.

We hypothesised that: (1) burnout at baseline is associated with sickness absence at baseline; (2) burnout at baseline predicts sickness absence at follow up; and (3) changes in burnout level from baseline to follow up predict changes in sickness absence from baseline to follow up.

METHODS

Study design and population

PUMA (Danish acronym for Study on Burnout, Motivation and Job satisfaction) is an ongoing five year prospective intervention study in seven different organisations in the human service sector, including social security offices in an urban area, a psychiatric prison, county institutions for

severely disabled people, four somatic wards from two county hospitals, one psychiatric ward from a psychiatric hospital, one homecare service in a rural area, and one homecare service in an urban area. All occupational groups in each organisation were eligible for the study. To date, data have been collected at baseline (1999–2000) and at the first follow up (2002–03), resulting in a mean follow up time of 3 years (2 ½ to 4 years). Survey questionnaires were sent to the home address of all employees in both rounds. The Danish Data Protection Agency (Datatilsynet) and Scientific Ethical Committees (Videnskabsetisk Komitéer) in the respective counties have given approval for the PUMA study. A more detailed description on the background, design, study population, and measurements of PUMA can be found elsewhere.[34]

At baseline, 1914 of 2391 eligible employees participated in the survey (response rate 80.1%). At follow up, 1759 of 2335 responded (response rate 75.3%). Of the 1914 responders from the baseline survey, 1463 were still employed in the same organisation at follow up. Of these 1463 employees, 1024 responded to the follow up questionnaire (response rate 70.0%).

For this article, we conducted analyses of two samples: cross-sectional analyses of the 1914 employees who participated in the baseline survey (cross-sectional sample), and prospective analyses of the 1024 employees who participated both at baseline and at follow up (prospective cohort). Due to missing values on one or more variables, 353 employees of the cross-sectional sample and 200 employees of the prospective cohort had to be excluded, resulting in final samples of 1561 (cross-sectional sample) and 824 (prospective cohort) respectively.

Measurements

Burnout

Burnout was measured with the Copenhagen Burnout Inventory (CBI), an instrument specifically developed for PUMA.[34] In contrast to the widely used Maslach Burnout Inventory[35] that includes three components of burnout (emotional exhaustion, depersonalisation, and reduced personal accomplishment), the CBI has its focus on exhaustion and its attribution by the person. The CBI has scales on personal burnout (six items on general exhaustion without a specific attribution), work related burnout (seven items on exhaustion attributed to work in general), and client related burnout (six items on exhaustion attributed to work with clients).[34] All items have five response categories, ranging either from ''to a very low degree'' to ''to a very high degree'' or from ''never'' to ''always''. Each scale ranges from 0 to 100 points, with high scores indicating high levels of burnout.

Missing values were low, ranging from 0.6% to 1.3%. Cronbach's alphas for the scales were 0.87 for both personal and work related burnout, and 0.85 for client related burnout. The correlation coefficients between the scales were 0.73 for personal and work related burnout, 0.46 for personal and client burnout, and 0.61 for work and client burnout, indicating some overlap but also differences between the scales. Co-occurrence of the burnout domains differed substantially between occupational groups, with some occupational groups showing high scores on two scales, whereas other groups scored high on one scale and low on the other.[34]

In this paper, our main focus will be on the work related burnout. This area offers the best potential for prevention, because the work environment is amenable to change. Hence, if we find an association between work related burnout and sickness absence, this would be an indication that improving the work environment could reduce both burnout and sickness absence. Selected findings on the personal and client related burnout scales will also be presented.

Sickness absence

We measured both sickness absence days and spells, because we wanted to analyse if burnout was related to both frequency and length of absence. We asked the participants in both the baseline and the follow up questionnaire to report their sickness absence during the last 12 months. The two questions were ''How many days of sickness absence did you have in the last 12 months?'' and ''How many spells of sickness absence did you have in the last 12 months?''. This means that, at baseline, we assessed sickness absence for the 12 months period before the baseline survey. At the three year follow up, we assessed sickness absence for the 12 month period prior to the follow up survey.

Covariates

As covariates, we included age, gender, organisation the participants worked for, socioeconomic status, family status, smoking, alcohol consumption, and body mass index. These variables have been found to be associated with sickness absence in other studies,[36] and we wanted to analyse if burnout had an effect that was independent of them. We further adjusted for prevalence of disease, because prevalent disease might cause both burnout at baseline and sickness absence at follow up.

Sociodemographic and work related factors

The covariate ''family status'' was made by combining cohabiting status and having children at home to a new variable with four groups: (1) cohabiting with children at home; (2) cohabiting without children at home; (3) being single with children at home; and (4) being single without children.

Socioeconomic status (SES) was based on job function and education using three groups: 1 = participants with supervisory function for more than 50 subordinates and/or with advanced education (academics); 2 = participants with supervisory function for less than 50 subordinates and/or with middle range education; and 3 = participants who were subordinates and/or had a short term education.

Health related lifestyle and body mass index

Smoking habits were categorised in four groups: non-smoker, former smoker, light smoker (less than 15 cigarettes per day), and heavy smoker (15 cigarettes or more per day).

Weekly physical activity was assessed in four groups: (1) no exercise (no or light exercise for less than two hours); (2) light exercise for 2–4 hours; (3) moderate exercise (light exercise for more than 4 hours); and (4) strenuous exercise for more than 4 hours per week.

Alcohol consumption was categorised in three groups: non-drinker, moderate drinker (14 or less drinks per week for women and 21 or less drinks for men), and heavy drinker (more than 14 drinks for women and more than 21 drinks for men). Participants were further asked to state their height and weight; we calculated the resulting body mass index (BMI).

Prevalence of diseases

In the follow up survey, participants were given a list with several diseases and were asked to check if they had these diseases now or have had them in the past. We defined an index of four disease categories: chronic diseases (diabetes, raised blood pressure, chronic bronchitis, asthma); severe diseases (coronary thrombosis or cardiovascular spasm, cerebral haemorrhage or cerebral thrombosis, cancer, gastric ulcer); ''women's diseases'' (illnesses of the internal female

Table 1 Characteristics of the cross-sectional (baseline) sample and the prospective cohort

	Baseline			Follow up				
	n	Work related burnout at baseline Mean (95% CI)	Absence days in the 12 months before baseline Mean (95% CI)	n	Work related burnout at baseline Mean (95% CI)	Work related burnout at follow up Mean (95% CI)	Absence days in the 12 months before baseline Mean (95% CI)	Absence days in the 12 months before follow up Mean (95% CI)
Women	1274	33.0 (32.0 to 33.9)	9.9 (8.9 to 10.8)	676	31.6 (30.3 to 32.9)	36.6 (35.2 to 38.0)	8.4 (7.5 to 9.4)	10.4 (9.0 to 11.7)
Men	287	30.9 (29.1 to 32.7)	6.8 (5.7 to 8.0)	148	32.1 (29.5 to 34.6)	38.2 (35.1 to 41.3)	6.9 (5.2 to 8.5)	8.4 (6.3 to 10.6)
Age <35	391	33.8 (32.0 to 35.5)	9.2 (7.9 to 10.5)	129	30.5 (27.9 to 33.1)	38.8 (35.5 to 42.1)	8.5 (6.8 to 10.2)	12.5 (8.6 to 16.4)
Age 35–44	495	32.7 (31.1 to 34.2)	9.9 (8.4 to 11.4)	273	32.1 (30.1 to 34.0)	36.0 (33.8 to 38.2)	8.9 (7.2 to 10.6)	9.8 (7.8 to 11.8)
Age >45	675	31.8 (30.5 to 33.2)	8.9 (7.6 to 10.2)	422	31.8 (30.1 to 33.5)	36.8 (35.0 to 38.7)	7.5 (6.4 to 8.7)	9.4 (7.9 to 10.9)
SES 1 (high)	83	30.1 (26.5 to 33.8)	4.3 (3.3 to 5.4)	38	30.1 (24.9 to 35.3)	32.6 (26.5 to 38.8)	3.9 (2.3 to 5.6)	3.8 (1.7 to 6.0)
SES 2	625	34.1 (32.7 to 35.5)	7.6 (6.5 to 8.6)	356	33.2 (31.4 to 34.9)	35.5 (33.6 to 37.5)	7.3 (6.0 to 8.6)	8.5 (6.8 to 10.2)
SES 3 (low)	853	31.7 (30.5 to 32.9)	11.1 (9.8 to 12.3)	430	30.6 (29.1 to 32.2)	38.4 (36.6 to 40.2)	9.2 (8.0 to 10.5)	11.8 (10.0 to 13.6)
Non-smoker	567	30.9 (29.6 to 32.3)	7.7 (6.5 to 9.0)	312	30.4 (28.6 to 32.1)	35.5 (33.4 to 37.5)	6.9 (5.5 to 8.2)	8.8 (6.9 to 10.8)
Ex-smoker	398	33.4 (31.6 to 35.1)	9.3 (7.5 to 11.2)	217	32.6 (30.3 to 34.9)	36.6 (34.3 to 39.0)	8.2 (6.3 to 10.1)	8.5 (6.9 to 10.0)
Light smoker	226	31.4 (29.2 to 33.6)	8.0 (6.6 to 9.4)	106	30.7 (27.6 to 33.8)	35.3 (31.3 to 39.3)	7.5 (5.8 to 9.1)	9.2 (6.8 to 11.6)
Heavy smoker	370	34.9 (33.1 to 36.8)	12.5 (10.7 to 14.3)	189	33.3 (30.8 to 35.9)	40.4 (37.5 to 43.3)	10.7 (8.9 to 12.5)	14.2 (10.9 to 17.5)
No alcohol consumption	254	33.7 (31.4 to 36.1)	12.9 (10.2 to 15.6)	120	32.5 (29.1 to 35.9)	37.9 (34.4 to 41.5)	10.4 (7.7 to 13.2)	13.1 (8.6 to 17.7)
Moderate alcohol consumption	1205	32.1 (31.1 to 33.1)	8.4 (7.6 to 9.2)	643	31.2 (29.9 to 32.4)	36.8 (35.3 to 38.3)	7.3 (6.5 to 8.2)	9.3 (8.1 to 10.5)
Heavy alcohol consumption	102	35.4 (31.7 to 39.1)	11.1 (7.8 to 14.5)	61	35.7 (30.9 to 40.4)	35.5 (30.8 to 40.2)	12.1 (6.9 to 17.4)	11.5 (7.0 to 15.9)
No exercise	104	38.4 (34.8 to 42.1)	11.5 (7.9 to 15.2)	44	35.5 (30.9 to 40.2)	39.2 (33.4 to 45.1)	9.0 (5.8 to 12.3)	12.1 (6.2 to 17.9)
Light exercise	861	32.7 (31.5 to 33.8)	9.4 (8.4 to 10.4)	456	31.7 (30.2 to 33.2)	37.5 (35.7 to 39.3)	8.3 (7.2 to 9.3)	11.0 (9.2 to 12.8)
Moderate exercise	516	31.9 (30.4 to 33.4)	8.6 (7.2 to 10.0)	289	31.5 (29.5 to 33.5)	35.4 (33.3 to 37.5)	7.9 (6.3 to 9.5)	8.6 (7.1 to 10.1)
Strenuous exercise	80	28.4 (24.7 to 32.1)	10.1 (6.0 to 14.2)	35	28.7 (23.6 to 33.8)	38.2 (31.8 to 44.5)	8.1 (3.5 to 12.6)	6.8 (4.2 to 9.4)
Cohabiting with children	767	32.1 (30.9 to 33.3)	8.9 (7.8 to 10.0)	433	31.0 (29.5 to 32.5)	36.8 (35.0 to 38.6)	8.6 (7.0 to 9.6)	10.0 (8.3 to 11.8)
Cohabiting without children	486	32.2 (30.7 to 33.8)	9.3 (7.9 to 10.7)	261	31.6 (29.4 to 33.7)	36.3 (33.9 to 38.7)	8.1 (6.8 to 9.4)	9.7 (7.7 to 11.8)
Single with children	137	37.0 (33.9 to 40.2)	10.9 (7.8 to 14.0)	65	37.9 (32.9 to 43.0)	40.0 (34.8 to 45.2)	7.1 (5.4 to 8.8)	11.3 (8.4 to 14.1)
Single without children	171	32.0 (29.3 to 34.6)	9.9 (6.9 to 12.8)	65	30.7 (26.6 to 34.8)	36.7 (32.5 to 40.9)	8.7 (5.5 to 11.9)	9.7 (6.2 to 13.1)
Children <7 years at home	369	33.2 (31.4 to 35.0)	10.4 (8.4 to 12.4)	158	30.7 (28.2 to 33.2)	37.6 (34.5 to 40.7)	9.0 (6.6 to 11.4)	10.3 (7.8 to 12.8)
No children or older at home	1192	32.4 (31.4 to 33.4)	9.0 (8.1 to 9.8)	666	31.9 (30.6 to 33.2)	36.7 (35.3 to 38.2)	8.0 (7.1 to 8.8)	9.9 (8.6 to 11.3)
Total	1561	32.6 (31.7 to 33.4)	9.3 (8.5 to 10.1)	824	31.7 (30.6 to 32.8)	36.9 (35.6 to 38.2)	8.2 (7.3 to 9.0)	10.0 (8.8 to 11.2)

sexual organs, cystitis, menstruation related pain); and other diseases (mental disorder, allergy, skin diseases, backache).

Data analysis

Significance of changes in sickness absence days and spells between baseline and follow up were analysed using paired *t* tests. With regard to the impact of burnout on sickness absence, we analysed: (1) cross-sectional associations between burnout and sickness absence at baseline; (2) prospective associations between burnout at baseline and sickness absence at follow up; and (3) prospective associations between changes in burnout and changes in absence from baseline to follow up. For the cross-sectional analyses and the analyses on the impact of burnout at baseline on absence at follow up, we calculated rate ratios (RR) and 95% confidence intervals (CI) using Poisson regression models with a scale parameter to account for over dispersion. Poisson distributions are a natural choice for modelling count data and are widely used in the sickness absence literature. For the analyses on associations between changes in burnout and changes in sickness absence from baseline to follow up, we calculated estimates and standard errors (SE) with linear regression models, because changes in absence are not count data and therefore cannot be analysed with a Poisson model. The analyses were adjusted successively for different covariates: Model I for age and gender; Model II additionally for type of organisation and SES; Model III additionally for BMI, smoking, alcohol consumption, and leisure time physical activity; Model IV additionally for family status and having children below the age of 7; and Model V additionally for prevalence of disease. Because prevalence of disease was only measured at follow up, the cross-sectional analyses included Models I to IV only, whereas the prospective analyses included all five models.

To illustrate the impact of changes in burnout on changes in absence, we further dichotomised burnout by the midpoint of the scale to define low (<50 points) and high burnout ($\geqslant 50$ points). By choosing the midpoint of the scale, rather than the mean or median of the scores, we ensured that the definition of low and high burnout was independent from the actual distribution of burnout in the study sample. The dichotomisation resulted in four groups regarding burnout level at baseline and follow up: (1) low–low; (2) low–high; (3) high–high; and (4) high–low. For each of these groups we created figures, showing means and 95% confidence intervals of absence days at baseline and follow up. Significance of changes between baseline and follow up was analysed with paired *t* tests in each of the four groups.

All statistical analyses were performed using SAS 8.2.

RESULTS

Characteristics of the study population

In the prospective cohort, the mean number of sickness absence days in the study population increased from 8.2 days (95% CI 7.3 to 9.0) at baseline to 10.0 days (95% CI 8.8 to 11.2) at follow up ($p < 0.01$, table 1). Mean number of sickness absence spells was 1.7 (95% CI 1.6 to 1.8) at baseline and 1.8 (95% CI 1.6 to 1.9) at follow up ($p = 0.77$). For the cross-sectional sample the annual number of spells was 1.8 (95% CI 1.7 to 1.9) at baseline.

The lowest educated socioeconomic status group (SES 3) had more sickness absence days than the higher educated groups; and heavy smokers had a higher number of annual sickness absence days compared with non-, ex-, and light-smokers. In general, women had more sickness absence days and spells than men.

We also investigated burnout levels and absence data of the persons who participated at baseline only (that is, those who had left the workplace or were non-responders at follow up). The burnout level in this group (33.8 points, 95% CI 32.6 to 35.0) was comparable to the burnout level of persons who participated in both rounds (32.3 points, 95% CI 31.3 to 33.4). With regard to sickness absence, no substantial differences could be found in sickness absence spells (1.9 spells per year (95% CI 1.8 to 2.0) and 1.8 spells per year (95% CI 1.7 to 1.9) for persons who participated at baseline only, and participants in both rounds, respectively). However, non-participants at follow up had more sickness absence days (10.5 days per year, 95% CI 9.2 to 11.8) than persons who participated in both rounds (8.3 days per year, 95% CI 7.5 to 9.1).

Cross-sectional associations between work related burnout and sickness absence

Cross-sectionally, work-related burnout was positively associated with absence days and spells in all models (table 2). An increment of one standard deviation (= 17.7 points) on the work related burnout scale was associated with 37% (95% CI 30% to 45%) more absence days and with 22% (95% CI 16% to 28%) more absence spells in the full model.

Being a woman was associated with both higher sickness absence days and spells, and higher age was associated with more sickness absence days but fewer sickness absence spells.

The cross-sectional associations of the client related and the personal burnout scale showed patterns similar to the scale for work related burnout showed in table 1.

Prospective impact of work related burnout on sickness absence

Participants with higher work related burnout at baseline had a higher number of sickness absence days at follow up than participants with lower work related burnout (table 3). The rate ratios became attenuated with further adjustments, but remained significant in the full model. An increment of one standard deviation (17.7 points) on the work related burnout scale at baseline predicted 21% (95% CI 11% to 32%) more sickness absence days and 9% (95% CI 2% to 17%) more spells at follow up in the full model.

Participants who ranked in the lowest quartile of the work related burnout scale had 5.4 days of sickness absence per year, while participants in the following quartiles had 6.3, 9.0, and 13.6 absence days, respectively.

Being a woman increased sickness absence days by 39% (95% CI 4% to 87%) in the full model but not sickness absence spells. Higher age predicted a lower number of sickness absence spells, but was not associated with sickness absence days. The lowest SES group had more annual absence days than the two others, but showed no difference regarding spells. Heavy smokers had more absence days than ex-smokers, and more absence spells than non- and light-smokers. Participants doing light weekly exercise had more absence days than the heavily exercising groups and the passive group, but showed no difference regarding spells (data on SES, smoking, and exercise not shown in table).

The personal and the client related burnout scales showed similar associations with absence as work related burnout. In the full models, an increase of one standard deviation on the personal burnout and the client related burnout scales, predicted 21% (95% CI 11% to 31%) and 14% (95% CI 5% to 25%) more sickness absence days, respectively.

Prospective impact of change in work related burnout on change in absence

A change of one standard deviation on the work related burnout scale from baseline to follow up predicted a change of 1.94 sickness absence day per year (SE 0.63, $p = 0.002$) in the full model, independent of where on the scale the starting point was sited (table 4). This means that an increase in work related burnout from baseline to follow up predicted an

Table 2 Cross-sectional associations of work related burnout with sickness absence days and spells at baseline (cross-sectional sample, n = 1561)

	Model I		Model II		Model III		Model IV	
	Rate ratio	p value	Rate ratio	p value	Rate ratio	p value	Rate ratio	p value
Sickness absence days								
Work related burnout*								
RR	1.39	<0.001	1.39	<0.001	1.37	<0.001	1.37	<0.001
95% CI	1.32 to 1.47		1.31 to 1.47		1.29 to 1.45		1.30 to 1.45	
Being a woman								
RR	1.36	<0.001	1.38	0.001	1.42	<0.001	1.45	<0.001
95% CI	1.36 to 1.63		1.14 to 1.67		1.17 to 1.72		1.19 to 1.76	
Age†								
RR	1.00	NS	1.04	NS	1.04	NS	1.10	0.007
95% CI	0.94 to 1.06		0.98 to 1.10		0.98 to 1.10		1.03 to 1.18	
Sickness absence spells								
Work related burnout*								
RR	1.25	<0.001	1.23	<0.001	1.22	<0.001	1.22	<0.001
95% CI	1.20 to 1.31		1.18 to 1.29		1.16 to 1.28		1.16 to 1.28	
Being a woman								
RR	1.11	NS	1.19	0.02	1.21	0.01	1.21	0.01
95% CI	0.98 to 1.26		1.03 to 1.37		1.05 to 1.40		1.05 to 1.40	
Age†								
RR	0.84	<0.001	0.85	<0.001	0.84	<0.001	0.84	<0.001
95% CI	0.84 to 0.88		0.81 to 0.89		0.80 to 0.88		0.80 to 0.89	

*Increases of 1 standard deviation on the work related burnout scale. †Increases of 10 years.
Model I: Adjusted for age, gender.
Model II: Model I plus adjustment for organisation and SES.
Model III: Model II plus adjustment for BMI, smoking, alcohol consumption, and leisure time physical activity.
Model IV: Model III plus adjustment for family status and having children below the age of 7.

increase in sickness absence, and a decrease in work related burnout from baseline to follow up predicted a decrease in sickness absence days.

For client related burnout, a difference of one standard deviation from baseline to follow up led to a difference of 2.39 sickness absence days (SE 0.70, $p < 0.001$) over time in the full model. For personal burnout, a difference of one standard deviation from baseline to follow up resulted in a difference of 2.03 sickness absence days (SE 0.62, $p = 0.001$) over time in the full model.

Absence days at baseline and follow up related to work related burnout levels

Figure 1 shows how sickness absence days changed over time, stratified by groups with high or low work related burnout at baseline and follow up. Participants with low

Table 3 Prospective impact of work related burnout at baseline on sickness absence days and sickness absence spells at three year follow up (prospective cohort, n = 824)

	Model I		Model II		Model III		Model IV		Model V	
	Rate ratio	p value	Rate ratio	p value	Rate ratio	p value	Rate ratio	p value	Rate ratio	p value
Sickness absence days										
Work related burnout*										
RR	1.31	<0.001	1.29	<0.001	1.26	<0.001	1.26	<0.001	1.21	<0.001
95% CI	1.20 to 1.42		1.18 to 1.40		1.16 to 1.37		1.16 to 1.37		1.11 to 1.32	
Being a woman										
RR	1.20	NS	1.40	0.02	1.50	0.004	1.50	0.004	1.39	0.03
95% CI	0.93 to 1.53		1.06 to 1.85		1.14 to 1.97		1.14 to 1.98		1.04 to 1.87	
Age†										
RR	0.91	NS	0.96	NS	0.94	NS	0.95	NS	0.96	NS
95% CI	0.82 to 1.01		0.86 to 1.06		0.85 to 1.04		0.84 to 1.06		0.86 to 1.08	
Sickness absence spells										
Work related burnout*										
RR	1.19	<0.001	1.15	<0.001	1.13	<0.001	1.13	<0.001	1.09	0.01
95% CI	1.11 to 1.27		1.07 to 1.24		1.05 to 1.21		1.05 to 1.21		1.02 to 1.17	
Being a woman										
RR	1.00	NS	1.09	NS	1.13	NS	1.12	NS	1.05	NS
95% CI	0.82 to 1.21		0.88 to 1.35		0.91 to 1.39		0.90 to 1.39		1.05 to 0.83	
Age†										
RR	0.74	<0.001	0.77	<0.001	0.77	<0.001	0.76	<0.001	0.75	<0.001
95% CI	0.68 to 0.80		0.71 to 0.83		0.71 to 0.83		0.69 to 0.83		0.69 to 0.83	

*Increases of 1 standard deviation on the work related burnout scale. †Increases of 10 years.
Model I: Adjusted for age, gender.
Model II: Model I plus adjustment for organisation and SES.
Model III: Model II plus adjustment for BMI, smoking, alcohol consumption, and leisure time physical activity.
Model IV: Model III plus adjustment for family status and having children below the age of 7.
Model V: Model IV plus adjustment for prevalence of disease.

Table 4 Changes in work related burnout predicting changes in sickness absence days and sickness absence spells (prospective cohort, n = 824)

	Model I		Model II		Model III		Model IV		Model V	
	Estimate	p value	Estimate	p value	Estimate	p value	Estimate	p value	Estimate	p value
Sickness absence days										
Work related burnout*										
Estimate	1.97	0.001	2.04	0.001	2.00	0.001	2.02	0.001	1.94	0.002
SE	0.61		0.63		0.63		0.63		0.63	
Being a woman										
Estimate	0.51	NS	−0.16	NS	0.03	NS	−0.05	NS	−0.48	NS
SE	1.60		1.84		1.87		1.88		2.08	
Age†										
Estimate	−0.01	NS	0.01	NS	−0.09	NS	−0.40	NS	−0.03	NS
SE	0.72		0.73		0.75		0.86		0.88	
Sickness absence spells										
Work related burnout*										
Estimate	0.31	<0.001	0.33	<0.001	0.33	<0.001	0.33	<0.001	0.34	<0.001
SE	0.07		0.08		0.08		0.08		0.08	
Being a woman										
Estimate	−0.16	NS	−0.24	NS	−0.24	NS	−0.27	NS	−0.07	NS
SE	0.19		0.22		0.22		0.23		0.25	
Age†										
Estimate	−0.17	0.05	−0.19	0.03	−0.17	NS	−0.22	0.03	−0.26	0.02
SE	0.09		0.09		0.09		0.10		0.11	

*Changes of 1 standard deviation on the work related burnout scale. †Increases of 10 years.
Model I: Adjusted for age, gender.
Model II: Model I plus adjustment for organisation and SES.
Model III: Model II plus adjustment for BMI, smoking, alcohol consumption, and leisure time physical activity.
Model IV: Model III plus adjustment for family status and having children below the age of 7.
Model V: Model IV plus adjustment for prevalence of disease.

burnout both at baseline and at follow up (low–low group) had a mean increase of 1.3 absence days from baseline to follow up ($p = 0.06$). Participants with increasing burnout (low–high) showed an increase of 4.5 days ($p = 0.01$), and participants with constant high burnout levels (high–high) had 3.8 more days of sickness absence days from baseline to follow up ($p = 0.04$). Participants with decreasing burnout (high–low), though, showed a decrease of 2.8 absence days ($p = 0.34$).

DISCUSSION

This study has two main findings. First, we found that burnout was associated with sickness absence days and sickness absence spells in the cross-sectional sample and predicted sickness absence days and spells in the prospective cohort. The length of follow up time of three years combined with adjustments for demographic, work, and health related confounders is to our knowledge unique and provides important insights into the impact of burnout on sickness absence.

Second, we found that changes in burnout levels predict changes in sickness absence, meaning that increase in burnout predicts increase in sickness absence, and decrease in burnout predicts decrease in sickness absence. Although, there was a general increase in sickness absence days in the whole study population (1.9 days more), this increase was much more pronounced among those who changed from low burnout at baseline to high burnout at follow up (4.5 days more) or who had constant high burnout (3.8 days) than in persons with constant low burnout (1.3 days more). The only group that showed a decrease in sickness absence days were the individuals who had changed from high burnout at baseline to low burnout at follow up (2.8 days less). This finding confirms a study from Harvey and Burns, where similar associations were found, but in a smaller population ($n = 18$) and with a follow up of six months.[19] The results are also in line with an intervention study among 300 health professionals which found in the experimental group ($n = 36$) that a reduction of burnout was followed by a decrease in sickness absence 12 months later, whereas in the control group sickness absence increased.[17]

Burnout predicted both absence days and spells in the prospective analyses. However, the higher rate ratios for absence days suggest that burnout had a stronger influence on the length than on the frequency of absence periods. This could indicate that burnout is not only a risk factor for sickness absence but also for delayed return to work. For the future, we are planning specific analyses on burnout and return to work by merging the PUMA dataset with social transfer payment registries.

Strengths

This is a prospective study that controlled for a wide range of potential confounders. Among observational studies, prospective designs are the gold standard for studying assumed causal associations between predictors and endpoints. The results in our study were robust and remained significant after adjustment for a large number of potential confounders. However, we acknowledge that even in prospective designs, causal inference has to be drawn with caution, because, in contrast to randomised experimental studies, observational studies can only control for known and measured confounders. Therefore, we cannot rule out that we have missed other variables that might have had an impact on the statistical association between burnout and absence.

While causal inference needs to be drawn with caution, a prospective design is clearly superior to cross-sectional designs, which have been used in most previous research on burnout and sickness absence. Direction of causation cannot be established in cross-sectional studies and effect estimates might be inflated by the simultaneous assessment of predictor and outcome. It is of interest to note that while we found statistically significant effects in both the cross-sectional and the prospective analyses, rate ratios were attenuated in the prospective analyses both for sickness absence days (1.37 *v* 1.26) and spells (1.22 *v* 1.13). This indicates that cross-sectional analyses are prone to a

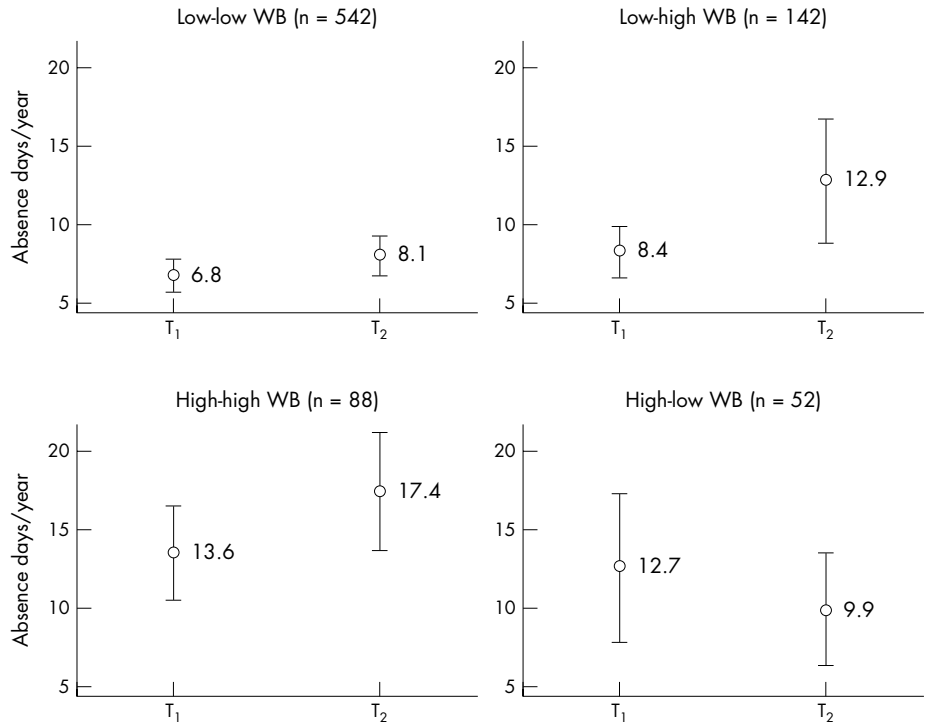

Figure 1 Mean number of absence days per year (95% CI) at baseline (T_1) and follow up (T_2) for 824 participants in the prospective cohort with constant low burnout (low–low), constant high burnout (high–high), increasing burnout (low–high), or decreasing burnout (high–low). Low burnout was defined by scoring <50 points, high burnout by scoring ⩾50 points on the work related burnout scale.

moderate overestimation of the associations between burnout and sickness absence.

The study was conducted among employees who were working with clients, the part of the workforce believed to be most likely to develop burnout.[16] However, our study is not a single occupation study, but a study that included a wide range of different organisations and occupational groups within the human service work sector. The human service work sector is a large part of the labour market in Denmark and there is growing need to understand work and health in this area better, including burnout and sickness absence.

The fact that decrease in burnout over time was accompanied with decrease in sickness absence points to the possibility that interventions aimed at reducing burnout could also reduce sickness absence. In PUMA, we have documented if and which ad hoc interventions have been conducted by the workplaces during the follow up. In future analyses we will investigate if these interventions have impacted burnout and sickness absence.

Limitations

The relative long follow up period of three years has not only advantages (for example, sufficient time for exposure to create effects on the outcome variable), but also disadvantages. During this period, burnout levels of some individuals might have changed several times. Hence, the long follow up period might have caused some non-differential misclassification of the exposure variable, which would bias our results towards an underestimation of the effects.

With regard to selection bias, it has to be pointed out that 890 employees participated at baseline but not at follow up, resulting in a 46.5% reduction. Job turnover constituted the major part of the reduction as 39.2% (range 29.0–51.8%) of the employees had quit their job between baseline and follow up. While we found no difference in burnout between the group that participated at baseline only and the group that participated in both rounds, there was a slightly higher level of sickness absence days among those who did not participate in both rounds.

Another limitation is the use of self-reported data for both predictor and endpoint. This inherits the danger for common method variance, which could bias effect estimates towards an overestimation. We would have preferred to use absence registries from the participating organisations, not only to avoid the possibility of common method variance, but also because this is the most objective measure of sickness absence.[37] However, not all organisations and employees were able or willing to provide individual data from absence registries. In addition, the available registries were not comparable between the different organisations (for example, some collected pregnancy related sickness absence together with ordinary sickness, whereas others recorded this separately). While we would have had preferred data from absence registries, we are nevertheless confident that our absence data are reliable. We compared some of the self-reported absence data with information on absence rates we obtained from the organisation project committees and found high correlations. Moreover, other studies have shown that self-reported absence is highly correlated with company based measurement, but with a tendency to under-report the factual absence days and spells.[38 39] Ferrie *et al* recently compared self-reported sickness absence with company recorded sickness absence in the Whitehall II study and found that in 63% of the women and 67% of the men, the total number of self-reported annual absence days was within 2 days of the recorded number of days.[40]

Finally, there are two limitations with regard to the measurement of prevalent diseases. First, this variable was based on self-report, and therefore might have resulted in incomplete data. Second, the variable was assessed at follow up, but not at baseline. This is problematic, because we included this variable to control for the possibility that

Main messages

- Very few prospective studies to date have elucidated the association between burnout and absence from work.
- In this study of Danish human service workers, the following predictors of absence were found: burnout, being a woman, use of tobacco, and low socioeconomic status.
- Burnout was independently associated with absence days and spells in cross-sectional and prospective analyses after adjustment for numerous confounders.
- In the prospective analyses of changes over three years, increasing burnout was associated with increasing absence, while decreasing burnout was associated with decreasing absence.

prevalent diseases at baseline might have caused both burnout at baseline and sickness absence at follow up and therefore might have been a confounder. By measuring this variable at follow up only, it is possible that a few diseases listed by the participants had been developed after the baseline assessment. Controlling for these diseases would be over-adjustment, because they might have been in the causal pathway from burnout to sickness absence. We were aware of this, but still decided to include the variable, because we valued adjustment for a potential confounder (diseases at baseline) higher than the potential danger of over-adjustment (diseases that have been developed after baseline). Empirically, it turned out that adjusting for prevalent diseases reduced the effect estimates only marginally, as can be seen by comparing Model IV with Model V.

Reflections

This study explores two complex phenomena: burnout and absence. We consider burnout as a special category of occupational stress, mostly to be found in human service work, and with emotional exhaustion as the core symptom. With regard to medical aspects, burnout might make the individual more susceptible to infections such as the common cold.[30] With regard to behavioural aspects, the theory on conservation of resources (COR) might explain why burnout could increase sickness absence, even without the presence of a disease.[31 32] The COR theory proposes that individuals strive to retain and protect their values—that is, resources as objects, conditions, personal characteristics, and energies. According to the COR theory, psychological stress occurs when the individual is threatened with or has actually experienced the loss of resources, or when the individual fails to gain new resources after investing existing resources. Hobfoll considers burnout as a special form of psychological stress, emerging when a significant investment of time and energy does not lead to the gain of new resources.[32] In this perspective, taking sickness absence might be viewed as a strategy of a burned out individual to save energy and to recover from exhaustion.[33] It has also been proposed to view sickness absence as a coping behaviour often used by persons who do not have a diagnosed medical disease, but nevertheless feel limited in their health.[2] Burnout might well fall in this grey area between good health and medical disease. When sickness absence under 14 days can be taken without a medical certification, as is the case for most Danish employees, limited health without diagnosed medical disease might be an important determinant for sickness absence days and spells.

Policy implications

- In the present sample of human service workers, burnout was prospectively associated with both sickness absence days and sickness absence spells per year. Reductions of burnout among human service workers could potentially lead to substantial reductions in absence days and absence spells.

Conclusion

The findings in this study indicate that burnout is a contributor to sickness absence. The length of follow up time of three years combined with adjustments for demographic, work, and health related confounders is to our knowledge unique. The fact that changes in burnout level over time predicted changes in sickness absence in the same direction points to the possibility that preventing burnout can reduce sickness absence.

Authors' affiliations

M Borritz, R Rugulies, K B Christensen, E Villadsen, T S Kristensen, National Institute of Occupational Health, Copenhagen, Denmark

Funding: The PUMA study has been funded by grants from The Work Environment Fund (Arbejdsmiljøfondet), The Danish Work Environment Service (Arbejdstilsynet), The Work Environment Council (Arbejdsmiljørådets Servicecenter via Arbejdsministeriets sundhedsfremmepulje), and The Health Insurance Foundation (Sygekassernes Helsefond).

Competing interests: none declared

REFERENCES

1 **Alexanderson K**. Sickness absence: a review of performed studies with focused on levels of exposures and theories utilized. *Scand J Soc Med* 1998;**26**:241–9.
2 **Kristensen TS**. Sickness absence and work strain among Danish slaughterhouse workers: an analysis of absence from work regarded as coping behaviour. *Soc Sci Med* 1991;**32**:15–27.
3 **Niedhammer I**, Bugel I, Goldberg M, *et al*. Psychosocial factors at work and sickness absence in the Gazel cohort: a prospective study. *Occup Environ Med* 1998;**55**:735–41.
4 **Savikko A**, Alexanderson K, Hensing G. Do mental health problems increase sickness absence due to other diseases? *Soc Psychiatry Psychiatr Epidemiol* 2001;**36**:310–16.
5 **Allebeck P**, Mastekaasa A. Chapter 3. Causes of sickness absence: research approaches and explanatory models. *Scand J Public Health* 2004;**32**(suppl 63):36–43.
6 **Marmot M**, Feeney A, Shipley M, *et al*. Sickness absence as a measure of health status and functioning: from the UK Whitehall II study. *J Epidemiol Community Health* 1995;**49**:124–30.
7 **Geurts SA**, Schaufeli W, Rutte CG. Absenteeism, turnover intention and inequity in the employment relationship. *Work Stress* 1999;**13**:253–67.
8 **Kivimäki M**, Elovainio M, Vahtera J, *et al*. Organisational justice and health of employees: prospective cohort study. *Occup Environ Med* 2003;**60**:27–34.
9 **Bakker AB**, Demerouti E, Boer Ed, *et al*. Job demands and job resources as predictors of absence duration and frequency. *Journal of Vocational Behavior* 2003;(62):341–56.
10 **Nielsen ML**, Rugulies R, Christensen KB, *et al*. Impact of the psychosocial work environment on registered absence from work: a two-year longitudinal study using the IPAW cohort. *Work Stress* 2004;**18**:323–35.
11 **North FM**, Syme SL, Feeney A, *et al*. Psychosocial work environment and sickness absence among British civil servants: the Whitehall II Study [published erratum appears in *Am J Public Health* 1996;**86**(8 pt 1):1093]. *Am J Public Health* 1996;**86**:332–40.
12 **Voss M**, Floderus B, Diderichsen F. Physical, psychosocial, and organisational factors relative to sickness absence: a study based on Sweden Post. *Occup Environ Med* 2001;**58**:178–84.
13 **Hallsten L**, Bellaagh K, Gustavsson K. *Utbränning i Sverige—en populationsstudie [Burning-out in Sweden—a population study]*. Stockholm: Arbetslivsinstitutet, 2002.
14 **Kristensen TS**, Borritz M. *Forebyggelse af udbrændthed. En forundersøgelsesrapport [Prevention of burnout. A pilot study]*. Copenhagen: Arbejdsmiljøfondet, 1998.
15 **Schaufeli W**, Enzmann D. *The burnout companion to study and practice: a critical analysis*. London: Taylor & Francis, 1998.
16 **Söderfeldt M**. *Burnout?* Lund: Lunds Universitet, 1997.

17 **Dierendonck DV**, Schaufeli WB, Buunk BP. The evaluation of an individual burnout intervention program: the role of inequity and social support. *J Appl Psychol* 1998;**83**:392–407.
18 **Firth H**, Britton P. ''Burnout'', absence and turnover among British nursing staff. *J Occup Psychol* 1989;**62**:55–9.
19 **Harvey E**, Burns J. Staff burnout and absenteeism through service transition. *Mental Handicap Research* 1994;**7**:328–37.
20 **Iverson R**, Olekalns M, Erwin P. Affectivity, organizational stressors, and absenteeism: a causal model of burnout and its consequences. *Journal of Vocational Behavior* 1998;**52**:1–23.
21 **Westman M**, Etzion D. The impact of vacation and job stress on burnout and absenteeism. *Psychology and Health* 2001;**16**:595–606.
22 **Deery S**, Iverson R, Walsh J. Work relationship in telephone call centres: understanding emotional exhaustion and employee withdraw. *Journal of Management Studies* 2002;**39**:471–96.
23 **Fagin L**, Carson J, Leary J, *et al*. Stress, coping and burnout in mental health nurses: findings from three research studies. *Int J Soc Psychiatry* 1996;**42**:102–11.
24 **Grossi G**, Soares JJ, Angesleva J, *et al*. Psychosocial correlates of long-term sick-leave among patients with musculoskeletal pain. *Pain* 1999;**80**:607–19.
25 **Huibers MJH**, Beurskens AJHM, Prins JB, *et al*. Fatigue, burnout, and chronic fatigue syndrome among employees on sick leave: do attributions make the difference? *Occup Environ Med* 2003;**60**(suppl 1):26–31.
26 **Parker PA**, Kulik JA. Burnout, self and supervisor-related job performance, and absenteeism among nurses. *J Behavior Med* 1995;**18**:581–99.
27 **Petterson I-L**, Arnetz B, Arnetz J. Predictors of job satisfaction and job influence—results from a national sample of Swedish nurses. *Psychother Psychosom* 1995;**64**:9–19.
28 **Pierce C**, Molloy G. Psychological and biographical differences between secondary school teachers experiencing high and low levels of burnout. *Br J Educ Psychol* 1990;**60**:37–51.
29 **Price L**, Spence S. Burnout symptoms amongst drug and alcohol service employees: gender differences in the interaction between work and home stressors. *Anxiety, Stress, and Coping* 1994;**7**:67–84.
30 **Mohren DCL**, Swaen GMH, Kant I, *et al*. Common infections and the role of burnout in a Dutch working population. *J Psychosom Res* 2003;**55**:201–8.
31 **Hobfoll SE**, Freedy JR. Conservation of resources: a general stress theory applied to burnout. In: Schaufeli WB, Maslach Ch, Marek T, eds. *Professional burnout*. New York: Taylor & Francis, 1993;**7**:115–29.
32 **Hobfoll SE**. The influence of culture, community, and the nested-self in the stress process: advancing conservation of resources theory. *Appl Psychol Int Rev* 2001;**50**:337–421.
33 **Croon EM**, Sluiter JK, Frings-Dresen MHW. Need for recovery after work predicts sickness absence. A 2-year prospective cohort study in truck drivers. *J Psychosom Res* 2002;(55):331–9.
34 **Borritz M**, Rugulies R, Bjorner J, *et al*. Burnout among employees in human service sector—design and baseline findings of the PUMA study. *Scand J Public Health*. In press.
35 **Maslach C**, Jackson SE. *Maslach Burnout Inventory*. Palo Alto, CA: Consulting Psychologists Press, 1986.
36 **Allebeck P**, Mastekaasa A. Chapter 5. Risk factors for sick leave—general studies. *Scand J Public Health* 2004;**32**(suppl 63):49–108.
37 **Hensing G**, Alexanderson K, Allebeck P, *et al*. How to measure sickness absence? Literature review and suggestion of five basic measures. *Scand J Soc Med* 1998;**26**:133–44.
38 **Johns G**. How often are you absent? A review of the use of self-reported absence data. *J Appl Psychol* 1994;**79**:574–91.
39 **Rees D**, Cooper CL. Research Note: Reliability of self-reported sickness absence data in the health service. *Health Serv Manage Res* 1993;**6**:140–1.
40 **Ferrie JE**, Kivimaki M, Head J, *et al*. A comparison of self-reported sickness absence with absences recorded in employers' registers: evidence from the Whitehall II study. *Occup Environ Med* 2005;**62**:74–9.

ECHO

Hydrolysable tannins in plant dusts cause airway obstruction

Please visit the *Occupational and Environmental Medicine* website [www.occenvmed.com] for a link to the full text of this article.

In vitro research has suggested that airway obstruction linked to occupational or environmental exposure to plant dusts is caused by the hydrolysable tannins they contain.

A series of tests in organ baths on standard lengths of trachea and bronchi dissected from guinea pigs previously unexposed to the dusts established that hydrolysable tannins inhibit synthesis of protective nitric oxide in the airway epithelium, resulting in spasm. Tannic acid provoked a rapid concentration dependent contraction of the bronchotracheal rings for 30–60 minutes with a mean EC_{50} of 0.19 μmol/l and maximum contraction of 85%; the threshold concentration causing significant contraction was 0.7 nmol/l (equivalent to 1.2 mg/m^3).

The reaction was shown to be due to non-competitive inhibition of the constitutive endothelial isoform of nitric oxide synthase in airway epithelium by using an array of inhibitors and pretreatments in combination with hydrolysable tannic acid. It was also specific to hydrolysable tannins.

Total hydrolysable tannins in barley flour, oak wood, and green tea were determined spectrophotometrically as 8.7, 11.2, and 5.9 mg/g, respectively. The researchers predict that an acute response in people encountering the dusts for the first time would be elicited by a direct effect of hydrolysable tannic acids at dust concentrations over 100 $\mu g/m^3$. Chronic obstructive respiratory symptoms resulting from occupational exposure to dusts at average inhalable concentrations of 5–20 mg/m^3 would be accounted for by tannin accumulation in the airway epithelium.

Exposure to plant dusts is known to increase risk of obstructive lung diseases but until now the triggers and underlying mechanism were not.

▲ Taubert D, *et al*. *Thorax* 2005;**60**:789–791.