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Jane E. Ferrie[1], Mika Kivimäki[1,2], Hugo Westerlund[3], Jenny Head[1], Maria Melchior[4], Archana Singh-Manoux[1,4], Marie Zins[4], Marcel Goldberg[4], Kristina Alexanderson[5], Jussi Vahtera[2,6]

[1]Department of Epidemiology and Public Health, UCL, London, UK
[2]Finnish Institute of Occupational Health, Helsinki, Finland
[3]Stress Research Institute, Stockholm University, Stockholm, Sweden
[4]INSERM, CESP U1018 Occupational and Social Determinants of Health, Villejuif, France
[5]Karolinska Institute, Division of Insurance Medicine, Stockholm, Sweden
[6]Department of Public Health, University of Turku and Turku University Hospital, Turku, Finland

Correspondence: Jane Ferrie, Department of Epidemiology and Public Health, UCL, 1-19 Torrington Place, London, WC1E 6BT, UK. j.ferrie@ucl.ac.uk

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ABSTRACT

Objectives Although sickness absence is a strong predictor of health, little work has examined whether this association varies by occupational position. The aim of this study was to investigate overall and diagnosis-specific sickness absence as a predictor of future long-term sub-optimal health by occupational position.

Methods Prospective occupational cohort study; 15,320 employees (73% men) aged 37-51. Sickness absences (1990-1992), including 13 diagnostic categories, were examined by occupational position, in relation to self-rated health measured annually 1993-2006.

Results 60% of employees in higher occupational position and 22% in lower position had no sickness absence. Conversely, 9.5% of employees in higher position and 40% in lower occupational position had over 30 sick-leave days. Repeated-measures logistic regression analyses adjusted for age, sex, and chronic disease showed employees with over 30 days absence, compared to those with no absence, had approximately double the risk of suboptimal health over the 14-year follow-up in all occupational positions. However, 1-30 days sick-leave was associated with greater odds of suboptimal health in the high; odds ratio 1.48, 95% confidence intervals (1.27-1.72) and intermediate 1.29 (1.15-1.45), but not lower occupational positions 1.06 (0.82-1.38). Differences by occupational position in the association between sickness absence in 13 specific diagnostic categories and sub-optimal health over the ensuing 14 years were limited to stronger associations observed with cancer and mental disorders in the higher occupational positions.

Conclusions The association between sickness absence of over 30 days a year and future long-term self-rated health appears to differ little by occupational position.

INTRODUCTION

There are marked differences in rates of sickness absence by occupational position, such that a strong gradient is observed, with lower levels of sickness absence among employees in higher occupational positionss.[1-3] The distribution of sickness absence by diagnosis, likewise, is patterned by occupational position with much higher rates of absence for musculoskeletal and respiratory conditions, for example, in lower than in higher occupational positionss.[4]

Sickness absence has lately been shown to be a strong risk marker for future health outcomes, such as early retirement on medical grounds and mortality.[5-7] A recent study showed a remarkably persistent association between sickness absence and future long-term self-rated health that applied to overall sickness absence as well as the majority of diagnostic categories.[8] While the predictive ability of other global health measures, for example self-rated health,[9] has been found to vary between occupational positions, few studies have examined associations between sickness absence and health outcomes by occupational position. A recent, large, prospective study of Danish private sector employees provided some evidence of socio-economic differences in the association between sickness absence and mortality,[10] but we are unaware of corresponding studies on sickness absence and self-rated health.

In this report from the GAZEL study, France, we examine whether the value of routinely-collected data on sickness absence as a predictor of future long-term self-rated health status varies by occupational position over an extended follow-up of 14 years. As a marker of morbidity and risk factors, such as smoking, alcohol use and obesity, sickness absence is a plausible predictor of future health, and long-term sickness absence may in itself contribute to adverse outcomes, such as social exclusion, stigma and stress that in turn contribute to poor health over time.[11] Sickness absence in the GAZEL cohort follows a distinct statistically significant gradient by occupational position.[3]

METHODS

Study population

The GAZEL cohort, established in 1989, is comprised of employees from the French utility company: Electricité de France-Gaz de France (EDF-GDF).[12] At baseline, 20,625 employees (73% men), aged 35-50, agreed to participate. Data on health, lifestyle, social and occupational factors are collected by annual questionnaire. Sources within EDF-GDF provide additional data, e.g. sickness absence.

Participants excluded from this study were those with <3 measurements of self-rated health 1993-2006 (n=3339), those retired prior to 1994 (n=1750), those with >700 days sickness absence 1990-1992 (n=73), and those with missing data for any baseline covariate (n=143). The resulting cohort consisted of 15,320 employees.

Data on sickness absence

Computerised sickness absence records from 1 January 1990 to 31 December 1992 were obtained from EDF-GDF. The total number of days for all sickness absences which began between January 1, 1990 and December 31, 1992 were used to categorise participants into one of 3 groups: 0, 1-30, >30 overall sickness-leave days over the three-year exposure window. We used diagnoses in 13 ICD-9 chapters to study diagnosis-specific associations. Injury and poisoning were grouped under external causes, absences outside the 13 categories were classified as 'Other', and spells with no diagnosis as 'Diagnosis missing'.[7] Full details of these measures have been published previously.[8]

Data on self-rated health

Annual measures of self-rated health for the years 1993-2006 were used to assess future long-term sub-optimal health. Self-rated health was assessed on an 8-point scale (1 = very good….8 = very poor) and dichotomized by categorising response scores 1 - 4 as good health and scores 5 - 8 as sub-optimal health.[13]

Data on occupational position

Occupational position in 1990 was determined from data on occupation position supplied by the company and classified into 4 groups; managers, technical, clerical, and manual based on categorisations from the French National Statistics Institute classification (INSEE http://www.insee.fr/fr/nom_def_met/nomenclatures/prof_cat_soc/html/L03_N1.HTM, accessed 1/12/2010).. For the purposes of these analyses, the two lowest occupational groups, clerical and manual, were collapsed to form one lower category, with technical and managerial employees forming the intermediate and higher categories respectively. Income and working conditions vary considerably across the occupational position in the GAZEL cohort and the relative risk of all cause sickness absence among clerical and manual staff has been shown to be approximately 3 times that among managerial staff.[3]

Covariates

Variables obtained from EDF-GDF company records included sex and age. Affirmative responses to a checklist of over 50 chronic conditions in the annual surveys were used to identify occurrence of the following chronic diseases: ischaemic heart disease or stroke, asthma or bronchitis, rheumatoid arthritis or osteoarthritis, cancer, and depression.[13]

Ethical Approval: The GAZEL study received the approval of France´s national ethics committee (Commission Nationale Informatique et Liberté, CNIL).

Statistical methods

We examined self-rated health status 1993-2006 in relation to overall and diagnosis-specific sickness absence 1990-1992 using repeated-measures logistic regression analysis with generalized estimating equations (GEE) method with autoregressive correlation structure in the SAS 9.2 program.[14]. This method is not sensitive to missing measurements and takes into account that repeated measurements of health status in the same person are correlated. For the 3 categories of sickness absence (0 days, 1-30 days, >30 sickness absence days) during the 1990-1992 window, we calculated the odds ratios (OR) and 95% confidence intervals (95% CI) for sub-optimal health for the period 1993-2006. Annual estimates were derived from GEE-models including the interaction term "sickness absence x year". Tests of differences between the occupational groups were carried out by fitting an interaction term between occupational position, as a categorical variable as well as a continuous variable to test the per category increase, and the sickness absence categories. To examine the effect of missing data we repeated the analyses among the 7394 participants with data on self-rated health for all 14 years. Analyses were adjusted for age, sex (2-level interaction test sex x grade x sickness absence, p=0.14, justifies analyzing women and men combined), year of self-rated health assessment (treated as a categorical variable), and chronic diseases, treated as a time dependent covariates (disease in each year preceding the measurement of health). Subsequent analyses examined the ORs for suboptimal health by sickness-absence diagnostic category (absence or no absence), separately, and simultaneously adjusted for sickness absence in all other categories.

RESULTS

While 60% of employees in the higher occupational groups had no sickness absence 1990-1992, this applied to only 22% in the lower groups. Conversely, 40% of employees in the lower grades had over 30 sick-leave days compared with 9.5% in the higher grades – *e-Table 1*.

All-cause sickness absence

In all occupational groups, employees with >30 absence days had approximately double the risk of suboptimal health over the 14-year follow-up, compared to those with no absence – *Table 1*. Higher and intermediate grade employees with 1-30 sick-leave days were also at increased risk; OR (95% CI) 1.39 (1.24-1.55), and 1.32 (1.22-1.44) respectively. However, there was no association in the lower occupational groups between 1-30 days absence and subsequent sub-optimal health, OR (95% CI) 0.96 (0.81-1.14). This lack of association generated an interaction between occupational position and sickness absence; p<0.001 for occupation used as a categorical variable and p=0.022 when used as a continuous variable.

Replication of these analyses among the 7,394 participants with data on self-rated health for all 14 years provided results almost identical to those for all participants (n=15,320). To examine the effects of missing data in greater depth we also identified those who had missing data for between 1-7 years (n=4554) and those who had missing data for more than 7 years (n=1424). Missing data were more common among those who had >30 days of sickness absence at baseline. However, associations between baseline sickness absence and future sub-optimal health did not significantly depend on the amount of missing data at follow-up (test of interaction in higher, intermediate, and lower grade, p=0.66, p=0.77 and p=0.51, respectively) – *e-Table 1*.

It is possible that the strong, longitudinal associations observed between sickness absence and future sub-optimal health are due to a repetitive pattern of absence over the follow-up period. To explore this possibility we examined the associations between sickness absence and sub-optimal health before and after retirement. During the follow-up, 87% of the participants retired, allowing associations between sickness absence and sub-optimal health to be analysed before and after retirement. Before retirement the age and sex adjusted odds ratios for sub-optimal health were 2.77 (2.33-3.31), 2.70 (2.45-2.99), and 2.36 (1.95-2.86) in the high, intermediate and lower occupational groups respectively for participants with more than 30 days absence; and 1.48 (1.32-1.68), 1.46 (1.34-1.61), and 1.05 (0.86-1.28) for those with 1-30 days absence. The corresponding odds ratios in the years after retirement were 2.15 (1.72-2.69), 2.06 (1.82-2.34), and 2.00 (1.58-2.53) for 30 days absence; and 1.39 (1.19-1.62), 1.24 (1.11-1.39), and 0.98 (0.77-1.25) respectively. Mutually adjusted odds ratios for sub-optimal self-rated health after retirement by sickness absence diagnosis 1990-1992 within occupational groups essentially replicated the results seen for the whole exposure window (shown in eTable 2). (data not shown).

Diagnosis-specific sickness absence

In univariate analyses, occupational group differences were not observed between the ORs for subsequent sub-optimal health for sickness absence in most of the 13 specific diagnostic categories, with the exception of cancer and mental disorders where associations were stronger in the higher occupational groups. Similarly, no differences were observed for the categories ‘other’ and ‘diagnosis missing’ – *Table 2*. Mutual adjustment for sickness absences in every other category attenuated all the relationships with future suboptimal health in all groups, including those between cancer or mental disorders and future suboptimal health in the higher occupational groups – *e-Table 2*.

DISCUSSION

In this cohort of French employees followed up with annual surveys for 14 years, associations between sickness absence (overall and diagnosis-specific) and future suboptimal health differed little by occupational position. The only exceptions were overall absence of 1-30 days among employees in lower occupational groups where the lack of an association with future suboptimal health contrasted with the strong associations observed in the intermediate and higher groups; and cancer and mental disorders where associations were stronger in the higher occupational groups. Overall sickness absence of more than 30 days was associated with approximately double the relative risk of future suboptimal health in all occupational groups.

Further analyses stratified by the status of retirement at follow-up indicated that the strong, longitudinal associations between sickness absence and sub-optimal health are only partly explained by repeated patterns of absence. In addition, self-rated health has been shown to be a strong predictor of premature mortality,[15, 16] and findings from the present study are similar to associations between sickness absence and mortality observed in a recent study of private sector workers in Denmark.[10] In line with our findings, no associations were observed between sickness absences of less than 6 weeks and mortality in blue-collar and clerical workers, although substantial excess risk of death was associated with absences of 6 weeks and over in all occupational groups.[10] Sickness absence is not only determined by diagnosis, but also the severity of the disease and its effect on work capacity in relation to the job-specific requirements and employees' attitudes.

There was an association between shorter absences and later sub-optimal health in higher and intermediate occupational groups, but such association was not observed in lower occupational group. It is possible that the health problems leading to short sick leaves among employees in lower occupational positions have less effects on long-term health than those in higher positions. An example of this is a strained muscle that would not prevent deskwork but is disabling in work that entails heavy lifting. Thus the same exposure would result different absence behaviours depending on the type of job. We also cannot discount the possibility that employees in lower occupational positions may have less job involvement and so are less motivated to attend work in the event of a minor illness. Such eventualities would weaken the association between shorter spells of sickness absence and self-rated health in the lower occupational groups.

Cohorts like GAZEL that follow the same participants over long follow-up periods are prone to a “healthy survivor” effect as those with severe diseases drop out over time.[17] However, as the findings were almost identical in analyses restricted to participants with data on self-rated health every year, missing values and attrition over the follow-up period seem unlikely sources of major bias in this study, although, absence of "healthy worker" bias can never be ruled out in observational studies. Although EDF-GDF employees enjoy stability of employment and good terms and conditions, the similarity between findings from this study and those from the study of mortality in a representative sample of Danish private sector employees reduces the likelihood of bias arising from the setting.

Although our findings may not apply to other indicators of socioeconomic position, such as education and income, this study suggests that the link between sickness absence and subsequent self-rated health is remarkably robust and pervasive across the occupational gradient and across diagnostic categories. Our results show that sickness absence data routinely collected over 3 years can identify employees who will go on to have poor health over the next 14 years. If such persons could be seen by an occupational health physician it may be possible to identify and rectify health problems generated by the work environment and identify or improve treatment regimes for employees with chronic conditions such as depression.

e-Table 1 — Descriptive statistics. Figures are numbers (percentages), unless otherwise stated

Baseline variable	Number of participants (%)	Sickness absence in 1990-1992 Participants (%) with 0 days	Participants (%) with 1-30 days	Participants (%) with >30 days
Occupational position				
Higher	4552 (30)	2727 (60)	1391 (31)	434 (9.5)
Intermediate	8513 (55)	3147 (37)	3324 (39)	2042 (24)
Lower	2255 (15)	497 (22)	849 (38)	909 (40)
Sex				
Women	4135 (27)	998 (24)	1662 (40)	1475 (36)
Men	11185 (73)	5373 (48)	3902 (35)	1910 (17)
Age, mean (SD)	44.8 (3.3)	45.2 (3.1)	44.6 (3.3)	44.4 (3.5)
Chronic diseases at baseline				
Asthma, bronchitis	763 (5.0)	233 (31)	287 (38)	243 (32)
Ischaemic heart disease, stroke	143 (0.9)	30 (21)	43 (30)	70 (49)
Musculoskeletal disorders	2285 (14.9)	664 (29)	810 (35)	811 (36)
Cancer	71 (0.5)	11 (16)	15 (21)	45 (63)
Depression	1228 (8.0)	264 (22)	394 (32)	570 (46)
Chronic diseases at the end of follow-up				
Asthma, bronchitis	828 (5.4)	288 (35)	280 (34)	260 (31)
Ischaemic heart disease, stroke	539 (3.5)	203 (38)	167 (31)	169 (31)
Musculoskeletal disorders	3449 (22.5)	1102 (32)	1312 (38)	1035 (30)
Cancer	591 (3.9)	228 (39)	207 (35)	156 (26)
Depression	1148 (7.5)	260 (23)	396 (34)	492 (43)
Missing data during follow-up				
No missing data	7394 (55)	3325 (45)	2740 (37)	1329 (18)
Data missing for between 1-7 years	4554 (34)	1823 (40)	1620 (36)	1111 (24)
Data missing for between 8-11 years	1424 (11)	535 (38)	499 (35)	390 (27)

TABLE 1 — Odds ratios for sub-optimal self-rated health in 1993-2006 by prior sickness absence: Repeated measures logistic regression GEE analyses

			Sub-optimal health in 1993-2006								
			All participants						**Participants with no missing data at follow-up**		
			Model 1: Adjusted for year of self-rated health assessment		**Model 2: Model 1+age, sex**		**Model 3: Model 2+ chronic diseases†**			**Model 3**	
Occupational position	**Sickness absence in 1990-1992**	Number of participants	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)	Number of participants	OR	(95% CI)
Higher	0 days	2727	1		1		1		1510	1	
	1-30 days	1391	1.44	(1.29-1.62)	1.43	(1.28-1.60)	1.39	(1.24-1.55)	793	1.48	(1.27-1.72)
	>30 days	434	2.52	(2.14-2.95)	2.49	(2.12-2.92)	2.22	(1.90-2.60)	219	2.24	(1.80-2.79)
Intermediate	0 days	3147	1		1		1		1604	1	
	1-30 days	3324	1.39	(1.27-1.51)	1.37	(1.26-1.49)	1.32	(1.22-1.44)	1592	1.29	(1.15-1.45)
	>30 days	2042	2.45	(2.24-2.68)	2.40	(2.18-2.63)	2.13	(1.95-2.33)	830	2.13	(1.85-2.41)
Lower	0 days	497	1		1		1		211	1	
	1-30 days	849	1.02	(0.85-1.21)	1.00	(0.84-1.20)	0.96	(0.81-1.14)	355	1.06	(0.82-1.38)
	>30 days	909	2.24	(1.89-2.65)	2.17	(1.83-2.57)	1.86	(1.58-2.20)	280	1.82	(1.40-2.37)
interaction with occupation (categorical)			*p*=0.008		*p*=0.008		*p*<0.0001			*p*<0.0001	
interaction with occupation (continuous)			*p=0.016*		*p=0.016*		*p<0.022*			*p<0.022*	

†Chronic disease (IHD or stroke, asthma or bronchitis, rheumatoid arthritis or osteoarthritis, cancer, and depression) adjusted as time-dependent covariates for the year preceding the assessment of the outcome.

TABLE 2 - Odds ratios for sub-optimal self-rated health 1993-2006 by sickness absence diagnosis 1990-1992 **within occupational grades:**

Sickness absence diagnosis 1990-1992†	**Number(%) of participants with sickness absence**	**Odds ratio* (95% CI) for sub-optimal health in 1993-2006 by occupational grade**						
		Higher grade (N=4552)		**Intermediate grade (N=8513)**		**Lower grade (N=2255)**		p-value for heterogeneity
Infections	183 (1.2)	1.09	(0.64-1.88)	1.50	(1.16-2.02)	1.04	(0.69-1.55)	0.257
Cancer	354 (2.3)	2.02	(1.26-3.24)	1.59	(1.31-1.94)	1.46	(1.03-2.06)	0.003
Endocrine, nutritional and metabolic diseases	142 (0.9)	2.98	(1.48-6.00)	2.07	(1.52-2.83)	1.98	(1.28-3.06)	0.150
Mental disorders	1008 (6.6)	3.45	(2.64-4.50)	2.04	(1.81-2.30)	2.18	(1.85-2.57)	0.002
Diseases of nervous system	95 (0.6)	4.21	(1.30-13.68)	2.25	(1.49-3.41)	2.19	(1.34-3.59)	0.440
Diseases of sense organs	252 (1.6)	1.72	(1.13-2.63)	1.60	(1.26-2.03)	1.55	(1.07-2.25)	0.241
Diseases of the gastro-intestinal system	1147 (7.5)	1.52	(1.17-1.96)	1.61	(1.43-1.81)	1.34	(1.11-1.61)	0.823
Diseases of the circulatory system	643 (4.2)	1.74	(1.34-2.26)	1.81	(1.55-2.11)	2.27	(1.79-2.88)	0.692
Diseases of the respiratory system	2292 (15.0)	1.62	(1.33-1.98)	1.45	(1.33-1.58)	1.32	(1.15-1.52)	0.913
Diseases of the skin and subcutaneous tissue	154 (1.0)	1.06	(0.41-2.72)	1.47	(1.08-2.00)	1.47	(0.96-2.24)	0.570
Diseases of the genitourinary system	615 (4.0)	1.82	(1.26-2.63)	1.57	(1.35-1.83)	1.80	(1.44-2.25)	0.459
Diseases of musculoskeletal system	1922 (12.3)	1.49	(1.23-1.81)	1.68	(1.53-1.84)	1.80	(1.56-2.08)	0.636
External causes	1400 (9.1)	1.45	(1.15-1.84)	1.33	(1.20-1.49)	1.27	(1.08-1.51)	0.759
Other	767 (5.0)	2.13	(1.56-2.91)	1.77	(1.54-2.02)	1.48	(1.22-1.80)	0.191
Diagnosis missing	5354 (34.9)	1.43	(1.28-1.61)	1.44	(1.34-1.55)	1.31	(1.16-1.49)	**Not estimated**

*Repeated measures logistic regression GEE analyses adjusted for sex, age and year of self-rated health assessment

†To be defined as absent in a particular diagnostic category, participants had to have at least one new absence for that diagnosis during the three-year exposure window.

eTable 2 —Mutually adjusted odds ratios for sub-optimal self-rated health 1993-2006 by sickness absence diagnosis 1990-1992† **within occupational groups**.

	Sub-optimal health in 1993-2006†					
	Higher occupational position		**Intermediate** occupational position		**Lower** occupational position	
Sickness absence diagnosis 1990-1992	OR	(95% CI)	OR	(95% CI)	OR	(95% CI)
Infections	1.01	(0.60-1.71)	1.15	(0.85-1.56)	0.84	(0.56-1.26)
Cancer	1.65	(1.00-2.70)	1.28	(1.06-1.55)	1.15	(0.82-1.63)
Endocrine, nutritional and metabolic diseases	2.47	(1.28-4.78)	1.81	(1.33-2.47)	1.39	(0.96-2.02)
Mental disorders	2.23	(1.68-2.97)	1.38	(1.22-1.55)	1.47	(1.24-1.75)
Diseases of nervous system	2.97	(0.77-11.48)	1.77	(1.15-2.74)	1.63	(0.99-2.70)
Diseases of sense organs	1.62	(1.06-2.50)	1.36	(1.08-1.71)	1.21	(0.86-1.71)
Diseases of the gastro-intestinal system	1.29	(0.98-1.69)	1.29	(1.15-1.45)	1.07	(0.89-1.29)
Diseases of the circulatory system	1.44	(1.10-1.89)	1.41	(1.21-1.64)	1.87	(1.48-2.36)
Diseases of the respiratory system	1.38	(1.12-1.70)	1.12	(1.02-1.22)	0.99	(0.86-1.14)
Diseases of the skin and subcutaneous tissue	1.16	(0.41-3.30)	1.13	(0.84-1.53)	1.22	(0.82-1.82)
Diseases of the genitourinary system	1.45	(1.00-2.11)	1.25	(1.07-1.45)	1.55	(1.23-1.96)
Diseases of musculoskeletal system	1.19	(0.98-1.45)	1.33	(1.22-1.46)	1.50	(1.31-1.73)
External causes	1.31	(1.04-1.65)	1.16	(1.05-1.29)	1.13	(0.96-1.32)
Other	1.41	(0.99-2.01)	1.28	(1.11-1.47)	1.03	(0.85-1.26)
Diagnosis missing	1.26	(1.12-1.41)	1.24	(1.16-1.33)	1.12	(0.99-1.27)

To be included as absent in a particular diagnostic category, participants had to have at least one new absence for that diagnosis during the three-year exposure window.

†Derived from repeated measures logistic regression GEE analyses adjusted for other categories of sickness absence, sex, age, year of self-rated health assessment and chronic disease (IHD or stroke, asthma or bronchitis, rheumatoid arthritis or osteoarthritis, cancer, and depression) as time-dependent covariates for the year preceding the assessment of the outcome.

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What this study adds

- Despite marked socio-economic differences in rates of sickness absence, little work has examined whether sickness absence as a predictor of future health outcomes varies by occupational position.
- This study examines socio-economic differences in the strong association observed between sickness absence and future long-term sub-optimal health.
- More than 30 days absence over 3 years identified a group with double the risk of poor health over the subsequent 14 years regardless of occupational position.
- Sickness absences of 30 days or less predicted poor long-term health in high and intermediate occupational groups but not in the lower occupational group.

- There was no evidence of differences by occupational position in the associations between sickness absence and sub-optimal health in 11 out of 13 diagnostic categories.

Competing Interest: None declared.

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