Socioeconomic Position, Health, and Possible Explanations: A Tale of Two Cohorts

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Objectives. We examined whether the social gradient for measures of morbidity is comparable in English and French public employees and investigated risk factors that may explain this gradient.

Methods. This longitudinal study of 2 occupational cohorts—5825 London civil servants and 6818 French office-based employees—used 2 health outcomes: long spells of sickness absence during a 4-year follow-up and self-reported health.

Results. Strong social gradients in health were observed in both cohorts. Health behaviors showed different relations with socioeconomic position in the 2 samples. Psychosocial work characteristics showed strong gradients in both cohorts. Cohort-specific significant risk factors explained between 12% and 56% of the gradient in sickness absence and self-reported health.

Conclusions. Our cross-cultural comparison suggests that some common susceptibility may underlie the social gradient in health and disease, which explains why inequalities occur in cultures with different patterns of morbidity and mortality. (*Am J Public Health.* 2002;92:1290–1294)

Numerous factors have been hypothesized to explain persistent findings of social inequalities in morbidity and mortality.[1] Explanations include household income,[2] differential health behaviors,[2,3] early life environment,[4,5] differences in access to medical care,[6,7] and social relationships.[8,9] More recently, the psychosocial work environment has been shown to play an important part in explaining health differentials,[10,11] and neo–material interpretation (i.e., that inequalities result from differential accumulation of exposures and experiences that have their sources in the material world) have been hypothesized as another explanatory mechanism.[12]

This study examined—in 2 cultures with many similarities but also many differences (i.e., England and France)—the social gradient in health and possible risk factors in order to assess the degree of consistency of explanatory mechanisms. Life expectancy for men is virtually the same in both countries (~74 years), although for women, it is about 3 years longer in France (~83 years). Social inequalities in mortality and morbidity exist in both countries,[13] but cause-specific patterns of mortality differ between England and France (cardiovascular disease being most prevalent in British men and neoplasms being most prevalent in French men). Given this pattern, should we expect to find similar social gradients in risk factors for poor health across different cultures, or does the answer lie with culture-specific risk factors?

We explored the relations between socioeconomic position, health, and possible risk factors in 2 comparable samples on either side of the English Channel: the Whitehall II Study of British civil servants[14] and the GAZEL Study of personnel at the Gas and Electricity Public Utilities of France.[15] Many measures of morbidity used were identical or very similar, as were potential confounders and mediators. The objectives of this study were to determine (1) whether the social gradient for measures of morbidity and risk factors found among British civil servants was also observed among French public employees and (2) whether the same factors contributed to the gradient in health across the studies.

(***Note.*** In this article the terminology of the Whitehall II Study is used: "spells" refers to periods of time, "sickness absence" to illness-related absence from work.)

METHODS

For comparability purposes, samples were restricted to office-based workers (n=5825 in the Whitehall II Study; n=6818 in the GAZEL Study) in the same age range (ages 42–52 years for men; 37–52 years for women). Socioeconomic position was assessed by employment grade (Whitehall II Study) or occupational title (GAZEL Study). In the Whitehall II Study, employment grade was categorized into administrative (higher), professional/executive (intermediate), and clerical/support (lower)[14]; in the GAZEL Study, occupational title was categorized into senior managers and senior professionals (higher), supervisors and midlevel occupations (intermediate), and clerical and other support staff (lower). Information was obtained from questionnaires, clinical examination, and personnel and medical records. Data included doctor-certified long spells of sickness absence (≥8 days) and self-reported health (average or worse) as measures of morbidity. The extremely poor and extremely wealthy sectors of society were not represented in either cohort; however, a wide income range was found in both samples.

Measures

Health outcomes. Long spells of sickness absence (≥8 days) requiring a doctor's certification were obtained from administrative computerized records. Follow-up extended to 4 years from baseline measures; subjects were censored on the date they retired, left the company, or died, whichever occurred first. Sickness absence was expressed as rates per 100 person-years, and age-adjusted rates were calculated by direct standardization.

Self-reported health. In the Whitehall II Study, self-reported health was measured as self-perceived health over the preceding 12 months (very good to very poor on a 5-point Likert scale, dichotomized to average or worse); in the GAZEL Study, the participant was asked to assess his or her health in general on an 8-point analogue scale (very good to very bad, dichotomized to average or worse).

Explanatory factors. The following measures were used to explore mechanisms likely to explain the health gradient. Proxy measures of early life environment were father's occupation (Registrar General's Social Class manual vs nonmanual for the Whitehall II Study; blue-collar worker vs all others for the GAZEL Study), height as a proxy for diet and other factors considered to influence physical development, and educational attainment. Smoking, alcohol consumption, and dietary habits (daily intake of fresh fruit and vegetables) were used as indicators of health behaviors. Body mass index, waist-to-hip ratio, and systolic and diastolic blood pressure were used as indicators of physiological activity that are associated with disease risk and that may reflect accumulated wear and tear on the body. Psychosocial environment outside the workplace reflects the structure, support, and stressors to which the subject is exposed; psychosocial environment was measured by marital status, social network, frequency of social contacts, and a life event score based on 6 life-threatening or chronic stressor events.[16] Psychosocial work characteristics were based on questions adapted from Karasek's occupational strain measures.[17] We used the subscales on psychological job demands and decision latitude in the workplace,[18,19] categorized by sex- and cohort-specific tertile, for each scale.

Statistical methods. Men and women were partitioned into 2 and 3 groups, respectively, based on 5-year age groups. Age-adjusted means and proportions were calculated by direct standardization, giving equal weight to each age group. Tests for trend, adjusting for age, were computed with Cochran–Mantel–Haenszel tests for dichotomous outcomes and with linear regression for continuous outcomes. Models for dichotomous variables were fitted with logistic regression, whereas Poisson regression was used for sickness absence and linear regression for continuous variables. Differences between studies in trends across employment grades were tested by fitting a trend-by-study interaction term. The capability of this term to explain the gradient in employment grade was assessed by the percentage change in the rate (or odds) ratios for employment grade after adjustment for the risk factors. Analyses were repeated with the relative index of inequality for employment grade,[20,21] a measure of the degree of inequality, which can be interpreted as the ratio (rate or odds) for subjects at the bottom vs the top of the socioeconomic hierarchy. SAS[22] and Stata[23] statistical software were used for all statistical analyses.

RESULTS

Table 1 presents demographic characteristics, health outcomes, and selected risk factors, by employment grade and sex. The distribution of grade differed by sex within each cohort (χ^2_2 test for differences in proportion, $P<.001$) and also differed by cohort for both sexes. Subjects in lower compared with higher employment grades were older in the Whitehall II Study but were younger in the GAZEL Study. The table shows a significant linear trend by sex and cohort for each health outcome, with higher levels of morbidity in lower grades. Early childhood environment and adult psychosocial work characteristics showed similar trends, but the magnitude of these gradients differed between the cohorts. Some of the explanatory variables followed the same gradient in both cohorts (waist-to-hip ratio, *P* for trend: Whitehall II Study, <.001, GAZEL Study, <.002; *P* for interaction=.13 [not shown]), whereas opposite trends were observed for measures of health behaviors and social environment: tobacco and fruit and vegetable consumption followed a social gradient in the Whitehall II Study that was not observed in the GAZEL Study. Sex differences were observed primarily for health behaviors and social environment. These findings persisted regardless of which measure of grade was used—categorically-defined employment grade or relative index of inequality.

Table 2 presents the age- and fully-adjusted risk estimates for grade of employment and health outcomes (long spells of sickness absence and poor self-reported health). Fully adjusted models used cohort- and sex-specific explanatory variables that showed a significant gradient in employment grade (Note: waist-to-hip ratio was not included in the multivariate models because it was unavailable for half of the GAZEL cohort, but sensitivity analyses on the subsample with these data did not alter the results). After adjusting for cohort- and sex-specific best predictors ($P<.05$) as explanatory measures, between 12% and 21% of the gradient in employment grade (relative index of inequality) in sickness absence was explained. For self-reported health, the age-adjusted odds ratios were in the range of 1.6 to 3.2, with steeper gradients for the Whitehall II Study than for the GAZEL Study. Despite larger reductions in self-reported health for the Whitehall II Study (men: 56%; women: 42%; 27% for GAZEL women and no change in GAZEL men), these measures explained only part of the gradient, and significant employment-grade differences in health persisted in both cohorts. Limiting the analysis to those variables that showed a social gradient in both cohorts ($P<.20$) marginally weakened the gradient for sickness absence and decreased it by more than half for self-reported health in the Whitehall II Study, although not in the GAZEL Study.

DISCUSSION

Findings from this study show equivalent inverse social gradients in 2 cohorts for the health outcomes examined: long spells of sickness absence (≥8 days) and self-reported health. The magnitude of the grade effect varied according to the measure of morbidity, with a much steeper gradient observed in both cohorts for long spells of sickness absence than for self-reported health. This variation may reflect the view that sickness absence is a measure of social, physical, and mental health,[24] and, as such, may be caused partially by illness and partially by a response to illness based on personal and societal attitudes that may vary by socioeconomic position and social policies. Because we used prospectively measured and doctor-certified long spells of absence from employer's databases, we minimized any reporting bias that may have influenced findings obtained for self-reported health.

These results are informative about what factors may or may not be important in explaining social gradients in disease and poor health. In the presence of a similar social gradient in ill health in 2 culturally different cohorts, the different distributions of smoking,

TABLE 1—Age-Standardized Prevalence and Means of Health Outcomes and Selected Risk Factors, by Grade of Employment[a] and Sex: Whitehall II and GAZEL Cohorts

	Whitehall II: Employment Grade				GAZEL: Employment Grade				
	Higher	Intermediate	Lower	*P* for Trend	Higher	Intermediate	Lower	*P* for Trend	*P* for Interaction[b]
Demographics									
No. (%)									
Men	1417 (43.9)	1505 (46.6)	305 (9.5)	…	954 (31.6)	1579 (52.4)	482 (16.0)	…	<.001
Women	307 (11.8)	1017 (39.2)	1274 (49.0)	…	277 (7.8)	2558 (67.3)	968 (25.4)	…	<.001
Mean age, y									
Men	46.8	46.6	47.3	>.25	47.3	47.0	47.0	.03	.05
Women	43.3	43.8	45.4	<.001	44.6	44.6	43.6	<.001	<.001
Health outcomes									
Sickness absence (long spells ≥8 days), rates per 100 person-years									
Men	6.6	13.8	30.9	<.001	11.4	24.9	45.9	<.001	>.25
Women	9.7	22.5	38.2	<.001	23.6	41.8	63.4	<.001	.10
Average or poor health, %									
Men	17.7	23.3	35.4	<.001	12.0	15.4	19.9	<.001	.19
Women	23.3	32.8	42.4	<.001	13.5	18.7	23.5	<.001	.23
Explanatory factors									
Early childhood environment									
Father blue collar or manual, %									
Men	7.9[c]	10.9	14.4	.002	23.9	31.1	33.6	<.001	>.25
Women	1.1	11.2	19.2	.001	15.0	29.5	32.1	<.001	<.001
Height, cm									
Men	177.4	175.6	172.4	<.001	174.4	173.5	172.5	<.001	<.001
Women	164.9	163.4	160.8	<.001	163.3	162.1	161.3	<.001	<.001
Education: higher, %									
Men	64.6	30.9	26.1	.001	51.0	6.4	3.3	<.001	<.001
Women	82.0	34.3	16.1	.001	62.2	7.1	2.3	<.001	<.001
Health behaviors									
Tobacco: current smokers, %									
Men	9.3	17.9	35.8	<.001	28.9	32.5	31.9	.14	<.001
Women	12.8	20.7	27.5	<.001	21.6	18.6	18.8	>.25	<.001
Heavy weekly alcohol consumption, %									
Men (≥22 units)	19.3	18.1	11.5	.008	21.2	29.5	28.3	<.001	<.001
Women (≥15 units)	25.0	12.1	3.5	<.001	12.6	10.5	10.2	>.25	<.001
Fruits and vegetables: ≥daily, %									
Men	61.9	51.6	36.0	<.001	59.1	57.3	61.4	>.25	<.001
Women	81.4	66.7	54.4	<.001	73.7	73.5	72.6	>.25	<.001
Psychosocial environment									
Married, %									
Men	89.6	80.7	60.1	<.001	92.6	90.9	88.8	.01	<.001
Women	58.9	54.0	68.2	<.001	69.2	78.7	76.1	>.25	.01
Work characteristics: low decision latitude, %									
Men	11.8	34.7	82.5	<.001	18.3	42.0	77.9	<.001	.003
Women	2.2	13.7	49.2	<.001	4.3	29.5	51.2	<.001	<.001

[a]Grade of employment is based on salary and occupational title.
[b]Tests whether the magnitudes of the grade gradient between the 2 cohorts are the same.
[c]The values for the Whitehall II Study are lower because jobs classified as skilled manual (3M) in the United Kingdom are not considered blue collar according to the French classification we used. The corresponding values would be 36.1, 44.9, and 55.8 for men and 18.4, 44.0, and 62.6 for women if skilled manual were included for the United Kingdom. The tests for trend do not change, nor do any other results.

TABLE 2—Age- and Fully-Adjusted[a] Rate Ratios and Odds Ratios (ORs) (95% Confidence Intervals [CIs]) for the Effect of Employment Grade on Long Spells of Sickness Absence (≥8 Days) and Self-Reported Health (Average or Worse), by Study and Sex

	Men		Women	
Sickness Absence	Age-Adjusted Rate Ratios (95% CI)	Fully Adjusted Rate Ratios (95% CI)	Age-Adjusted Rate Ratios (95% CI)	Fully Adjusted Rate Ratios (95% CI)
Whitehall II Study[b] (n = 2119 men; 1395 women)				
Employment grade				
Higher	1.0	1.0	1.0	1.0
Intermediate	2.04 (1.71, 2.43)	1.86 (1.55, 2.24)	1.98 (1.47, 2.68)	1.86 (1.36, 2.53)
Lower	5.17 (4.21, 6.34)	3.85 (2.96, 4.99)	3.26 (2.42, 4.38)	2.76 (2.00, 3.80)
GAZEL[c] (n = 1948 men; 2258 women)				
Employment grade				
Higher	1.0	1.0	1.0	1.0
Intermediate	2.13 (1.86, 2.43)	1.99 (1.73, 2.27)	1.64 (1.40, 1.92)	1.52 (1.29, 1.78)
Lower	3.77 (3.23, 4.40)	3.17 (2.67, 3.75)	2.27 (1.93, 2.68)	1.96 (1.65, 2.32)
Self-reported health	Age-Adjusted OR (95% CI)	Fully Adjusted OR (95% CI)	Age-Adjusted OR (95% CI)	Fully Adjusted OR (95% CI)
Whitehall II Study[b] (n = 2244 men; 1626 women)				
Employment grade				
Higher	1.0	1.0	1.0	1.0
Intermediate	1.42 (1.14, 1.79)	1.19 (0.93, 1.52)	1.30 (0.88, 1.92)	1.19 (0.79, 1.79)
Lower	2.97 (2.13, 4.15)	1.65 (1.09, 2.49)	1.91 (1.30, 3.80)	1.48 (0.94, 2.33)
GAZEL (n = 1948 men; 2245 women)				
Employment grade				
Higher	1.0	1.0	1.0	1.0
Intermediate	1.20 (0.90, 1.60)	1.25 (0.93, 1.70)	1.25 (0.80, 1.96)	1.21 (0.76, 1.92)
Lower	1.61 (1.08, 2.41)	1.60 (1.02, 2.51)	1.53 (0.95, 2.49)	1.39 (0.84, 2.30)

[a]Using set of best predictors for each cohort and sex (i.e., explanatory variables with statistically significant linear trends for grade). Waist-to-hip ratio not included because of missing values in half of the GAZEL cohort. Sensitivity analyses show similar results.
[b]Fully adjusted Whitehall II men: age, father's social class, height, smoking, alcohol, fruit and vegetable intake, body mass index, not married, low decision latitude, high job demands. Women: age, father's social class, height, smoking, alcohol, fruit and vegetable intake, body mass index, not married, low decision latitude, high job demands.
[c]Fully adjusted GAZEL men: age, father's social class, height, alcohol, body mass index, not married, low decision latitude, high job demands. Women: age, father's social class, height, body mass index, low decision latitude, high job demands.

alcohol intake, and fruit and vegetable intake make it unlikely that these are major explanatory variables for the social gradient. On the contrary, the consistency of the gradient in early childhood environment factors and adult psychosocial work characteristics makes it plausible that these factors have universal importance in explaining social gradients in poor health. The explanatory power of early childhood environment factors and adult psychosocial work characteristics was moderate but greater in the Whitehall II Study, a finding that may reflect cultural differences in the subjective evaluation of self-reported health.

One limitation of the study was the measure of socioeconomic position. Both samples had internally defined employment grade systems, and categorization into 3 groups may mean that the grades were not comparable across the cohorts or that relative inequalities among progressively lower grades did not follow the same slope. Possible differences in this measure could give rise to divergent results.[25] However, results from relative index of inequality analyses, which take into account the grade distributions, did not differ from those in Table 2, indicating that the findings were not due to different distributions of grade across the cohorts.

Another limitation was the nature of the study samples. Both were occupational cohorts of office-based personnel. They are not necessarily representative of working populations of either country. Nonetheless, the measures of socioeconomic position were hierarchical and therefore allowed us to study how social position influences health, even within such relatively homogeneous samples.

Factors thought to play a major role in generating health inequalities in Britain—smoking and low consumption of fruit and vegetables, for example—did not show social gradients in this French cohort comparable to those in the Whitehall II sample. Yet, as this study illustrates, both cohorts had a similar social gradient in morbidity. Does this mean that smoking and diet are not causes of the social gradient but are merely confounders? Alternatively, is there 1 set of causes of the social gradient operating in Britain and a different set in France? Given the pervasiveness of health inequalities across cultures, the latter explanation is somewhat unsatisfactory.[26] A third possibility is that some common susceptibility underlies the social gradient in health and disease that explains why inequalities occur in cultures with different patterns of morbidity and mortality. This susceptibility may be influenced by early environment or may determine the experience of psychosocial factors. Precise diseases that contribute to the social gradient will depend on culture-specific factors. Helping sort through these different types of questions may be the real contribution of cross-national comparative research. ■

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Contributors

R. Fuhrer was the principal author of this article, responsible for inception, design, analysis, and interpretation. M.J. Shipley performed all statistical analyses for the combined data set and Whitehall II analyses and contributed to the writing of the article. J.F. Chastang performed GAZEL statistical analyses. A. Schmaus was the data manager of the GAZEL database and contributed to the analyses. I. Niedhammer participated in the analysis and interpretation of the results. S.A. Stansfeld, M. Goldberg, and M.G. Marmot discussed design, analyses and their interpretation and contributed to the writing of the article.

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Human Participant Protection

Ethical approval for the Whitehall II Study was obtained from the University College London Medical School Committee on the ethics of human research. The GAZEL study was approved by the ethics review committee of l'Institut National de la Santé et de la Recherche Médicale (INSERM).

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