Arch Public Health
2003, 61, 33-51

Do regional differences in psychosocial variables contribute to regional differences in cardiovascular mortality in Belgium?

by

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Abstract

Background: *Since the end of the sixties the southern French speaking part of Belgium has shown an excess coronary and cardiovascular mortality as compared to the northern Dutch speaking region. The main hypothesis formulated 25 years ago related this excess mortality to less favourable nutritional patterns. In this paper we look in this paper at regional differences in psychosocial variables related to coronary heart disease as reported in the epidemiological literature. The hypothesis is that French speaking working subjects present a less favourable psychosocial profile as compared to Dutch speaking subjects.*

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Methods: *Study 1 concerns 3092 working subjects of both genders from the BIRNH study who answered the Jenkins Activity Survey; a self administered questionnaire related to the Type A behaviour pattern and the JobStress Questionnaire wich is a home made questionnaire. Study 2 concerns 21,419 subjects of the BELSTRESS study who answered self administered questionnaires concerning the Karasek model on Demand/Control/Social Support at work, depression, self-perceived health, exhaustion, social support outside work, aggression, sleep disturbances and anxiety. Univariate results in both genders stratified by level of education are presented in this paper.*

Results: *Study 1: French speaking subjects present the type A behaviour pattern more frequently and score significantly higher on the home made job-stress questionnaire. Study 2: French speaking subjects present higher average ratios of Demand/Control (job strain direction) as well as higher scores on depression, anxiety, agressivity, current health index (self-perceived health), vital exhaustion and lower prevalences of a high social support network outside work as well as higher prevalences of sleep problems.*

Conclusions: *Besides less favourable nutritional patterns French speaking subjects present less favourable profiles on a host of psychosocial variables related to coronary heart disease. Hence part of the excess coronary heart disease mortality, incidence and prevalence observed in the southern part of Belgium could be related to these psychosocial variables. This hypothesis should be tested in a large prospective study concerning both Belgian linguistic communities.*

Keywords

Belgium, coronary heart disease mortality, psychosocial variables, work environment.

Introduction

In 1977, a Belgian scientific group published a seminal paper in the Lancet (1). The paper focused on interprovincial differences in coronary heart disease mortality (CHD) and showed a significantly higher mortality in provinces from the South of Belgium (Walloon region) as compared to those situated in the North (Flanders and Campine). These differences were probably longstanding but were clearly detected in the beginning of the seventies with data from the National Institute of Statistics. In fact, in 1972, Vastesaeger et al. (2) had observed in a study of male post office workers a significantly higher prevalence of CHD in French speak-

ing subjects as compared to their Dutch speaking counterparts. This was confirmed in the Belgian Heart Disease Prevention Project (BHDPP) which showed on ECG a higher prevalence of coronary ischaemia in male middle-aged southern factory workers as compared to those working in Flanders and Campine. The excess CHD prevalence and mortality was in the order of 30-40% (3). In the beginning of the eighties, differences between the southern and northern male population for all causes, cardiovascular and coronary mortality were 28%, 27% and 21% respectively (4).

In 1983, two Acute Coronary Events Registries were established in Charleroi (South) and Ghent (North) within the WHO MONICA Project (5). Between 1983 and 1992, the average event rate ratio combining attack rates of fatal and non-fatal myocardial infarction in subjects aged 35-69 years was 1.5 or 50% higher in Charleroi than in Ghent in both genders (6). This was the first time that total incidence of acute coronary events was compared between cities from southern and northern Belgium. Although probably not representing the Walloon region and Flanders, these results confirmed the mortality and prevalence data for the two regions.

In search for correlates at the ecological level, different groups looked at the major coronary risk factors over a period of 30 years. Mean serum cholesterol was observed to be higher in French speaking as compared to Dutch speaking subjects in the Belgian army (7), in male post office workers (2), in male middle-aged factory workers (3), in the general male population aged 25-74 years (8) and lately (1995-1998) in a large cohort of a working population aged 35-59 years (non-published results). In the BHDPP (1972-74) a gradient was observed with lowest mean serum cholesterol in the Campine (5.8 mmol/l) and highest in the Walloon region (6.4 mmol/l) (3).

Data on average blood pressure as well as prevalence of hypertension are scarce. Results from the BHDPP (3), the BIRNH Study (4) and the MONICA Ghent-Charleroi Surveys (9) show very small differences between southern and northern Belgium in this respect. The same holds true for smoking behaviour although small differences in favour of southern Belgium, in males only, were observed in the beginning of the eighties (4).

Beyond their relation with blood lipids and atherosclerosis, nutritional patterns are related to clotting factors and probably to endothelial reactivity. Since the end of the fifties butter consumption was observed to be higher in the southern part of Belgium as compared to the north whereas the opposite was observed for margarine consumption (3).

Joossens et al. (1) observed a high interprovincial correlation between butter consumption and cardiovascular mortality. In the Belgian Interuniversity Research on Nutrition and Health (BIRNH) Study the polyunsaturated/saturated fats ratio is significantly lower in French speaking subjects of both genders. In the same study interdistrict ecological correlations between saturated fat intake and cardiovascular mortality (National Institute of Statistics) are positive in both males and females with an r of 0.69 and 0.49 respectively. Negative significant correlations are observed for cardiovascular mortality and polyunsaturated fat intake with an r of −0.73 and −0.41 in males and females respectively. But at close look of the graphs these significant associations are in fact due to two clusters of districts; one in the North and the other in the South of Belgium (10).

Finally, the predicted coronary risk based on the Framingham multiple- logistic- function coefficients is observed to be significantly higher in Charleroi as compared to Ghent with differences varying between 5% (men aged 45-64 years) and 21% (men aged 25-44 years). As stated in that paper “the difference between the two cities in predicted coronary risks is substantially smaller than the observed differences in terms of incidence of hard CHD events during the 10 year period” (9).

On the other hand as already stated these two cities are not necessarily representative of the two Belgian regions discussed here. Does the whole story of the North/ South Belgian differences in CHD mortality and morbidity relate to differences in nutritional patterns as well as serum cholesterol levels or are regional differences in other risk factors; both biological and psychosocial, adding up in “explaining” the excess in CHD and cardiovascular mortality in the Southern part of Belgium?

The purpose of this paper is to compare distributions of psychosocial risk factors for CHD, more specifically in the work environment, in the two cultural communities.

Material and methods

Study 1: The BIRNH study

The design and methodology has already been published (11), so we will summarise the principal features. Belgium has 43 administrative units, called districts; one of them is very small and formed by only two communes; therefore this district was not surveyed. In the 42 remaining districts there are a number of communes well defined administratively. The study period lasted from 1980 until 1985. The National

Register randomly selected between 2 and 4 communes and the most populated commune in each district was added ex officio; so, during the first years of the study period, 5 communes were screened in each district and later on, due to shortage of time and personnel, only 3 communes were screened.

In each commune 50 men and 50 women (10 per 10 year age group) were randomly selected by the National Register, giving 100 observations if the participation rate was 100%.

The total selected population consisted of 30,964 subjects from 170 communes in 42 districts. The participation rate was low: 36.5% for the whole population, 38.6% for men and 34.4% for women.

Questions were asked on social-professional level and educational level.

The type A coronary prone behaviour described by Rosenman and Friedman was evaluated through the Jenkins Activity Survey, wich is a self administered questionnaire with closed answers (12).

The Job Stress Questionnaire (JSQ) is a home made questionnaire with 27 items tapping on elements of psychosocial job demands, job control, social support at work, job stability and promotion. A weighted job stress score (JSS) was derived from a multiple discriminant function: the natural log of the JSS is taken after adding 4 to each score (13).

We report results from 3092 participants who answered both the JAS and the JSQ.

Study 2: the BELSTRESS Study

The design and methods of the BELSTRESS study have already been described in detail (14, 15). We will only summarise them.

The fieldwork in 25 large companies or public administrations across Belgium has been conducted in the period between 1994 and 1998. Of all those on the payroll, a total of 21,419 subjects aged 35-59 years accepted to participate in this study, which represent 48% of all eligible subjects.

The main variables below were recorded by a self-administered questionnaire:

– socio-demographic: age, sex, marital status, level of education, mother tongue and country of birth.

– **health perception**: The "Current Health Index" (CHI) is a score computed from the VOEG scale (Vragenlijst Over Ervaren Gezondheid) [questionnaire on perceived health], a Dutch scale built up of 13 closed questions each having two possible outcomes (yes = 1 / no = 0) and thus adding up to a scale between 0 and 13 (16). The scale was categorised in tertiles.

The Karasek's Job Content Questionnaire (17, 18): a total of 18 standardised questions including 9 on Psychological Job Demands and 9 on Control or Decision Latitude. These two scales are combined using sex specific medians and divided into two categories: strained jobs (high demands, low control), and all other jobs. These two scales proved to contain acceptable internal consistency (Cronbach a between 0.66 and 0.87 in men and between 0.66 and 0.88 in women) and scale validity in the Belstress cohort (19).

A third scale **Social Support at Work** was added later on by Johnson and Hall (20). It contains 8 questions.

– **depression**: The Iowa short version (11 items) of the original CES-D scale developed by Kohout et al. (21) is used. This short version has been validated in elder subjects (22) and in women (23).
– **anxiety**: we use the sub-scale from a short version (24) of the Psychiatric Symptom Index (25).
– **social support outside the work**: The standardised questionnaire of Berkman and Syme (social contacts with relatives and friends) is used (26).
– **vital Exhaustion**: one question with closed answers.
– **sleeping disorders**: A score formed by 3 questions from the Current Health Index (VOEG Questionnaire).

In this descriptive paper we are looking at regional differences in several psychosocial variables according to gender and stratifying for level of education, a powerful confounding variable. Psychosocial variables are nearly normally distributed and non parametric tests gave the same results as compared to t-tests of variance. In most cases nevertheless, we used non- parametric tests.

In both studies levels of education are regrouped:

Level I: elementary or lower secondary school; Level II: secondary or incomplete higher education; Level III: complete higher education.

Results

Type A behaviour stratified by level of education for both genders shows rather consistent differences: mean scores for the JAS AB are significantly higher (type A direction) in French speaking lower and higher educated males whereas no significantly lower scores are observed in the French mid-level educated group. In females all the differences between French and Dutch speaking subjects are non- significant (table 1).

Self-perceived stress at work according to a self-made questionnaire, the JSQ, shows significantly higher mean scores across both genders in all 3 education levels in French speaking subjects as compared to their Dutch speaking counterparts (table 1).

Analysing the Karasek Demand/Control/Social Support/Strain model we observe significantly higher average scores for psychological demands but also higher scores for control resulting in higher Demand/Control ratios (a surrogate for job strain) in French speaking males; social support at work is perceived to be higher in French speaking males in each educational level (table 2).

In women, average scores for perceived psychological demands are significantly higher in French speaking subjects whereas perceived control is significantly lower in Dutch speaking subjects in 2 out of the 3 strata for education.Hence the average ratio Demand/Control (a surrogate for job strain) is higher in French speaking subjects. Finally, perceived social support is higher in French speaking women (table 3).

French speaking men have less social support outside work, higher mean scores for depression, anxiety, hostility (agressivity), vital exhaustion, perceived health (Current Health Index) and more sleeping problems as compared to Dutch speaking men (Table 4). The same is observed in women (table 5).

Discussion

Based on the results of two epidemiological studies, the Belgian Interuniversity Research on Nutrition and Health (BIRNH) and the BELSTRESS Study, this paper reports significant differences for several psychosocial variables between Dutch speaking subjects from the northern part of Belgium and French speaking subjects from the southern part.

TABLE 1
The birnh study

	Men Level of Education*								
	I			II			III		
Psychosocial variables	Dutch speaking (n = 734)	French Speaking (n = 273)	P	Dutch speaking (n = 393)	French Speaking (n = 356)	P	Dutch speaking (n = 272)	French Speaking (n = 219)	P
Jenkins Activity survey (Type A behavior) (M)	−3.76	−2.48	0.025	−0.39	−1.00	NS	−0.30	1.12	0.052
Job Stress Questionnaire (M)	−0.22	0.77	<0.01	−0.01	0.95	<0.01	−0.27	0.85	<0.01
	Women								
	(n = 214)	(n = 101)		(n = 160)	(n = 159)		(n = 101)	(n = 110)	
Jenkins Activity survey (Type A behavior) (M)	−1.71	−2.19	NS	−0.21	0.44	NS	−0.48	3.05	<0.01
Job Stress Questionnaire (M)	−0.29	0.39	0.002	−0.27	0.83	<0.001	−0.22	0.81	<0.001

* Level of education, I: elementary or lower secondary; II: secondary or incomplete higher education; III: complete higher education.

TABLE 2
The belstress study

	Men Level of Education*								
	I			II			III		
Psychosocial variables	Dutch speaking (n = 4854)	French Speaking (n = 2105)	P	Dutch speaking (n = 3241)	French Speaking (n = 1348)	P	Dutch speaking (n = 3113)	French Speaking (n = 1379)	P
The Karasek Model									
Demands (M)	22.00	22.67	<0.0001	23.53	24.32	<0.0001	25.08	25.31	<0.05
Control (M)	65.46	65.71	NS	69.76	71.65	<0.0001	75.51	75.69	NS
Social support at work (M)	22.88	23.08	<0.05	22.51	22.86	<0.005	22.82	23.17	<0.001
Ratio demands/control (M)*	0.349	0.360	<0.0001	0.345	0.348	NS	0.338	0.341	NS

* A measure of the strain concept (high demands with low control).

TABLE 3
The belstress study

	Women Level of Education*								
	I			II			III		
Psychosocial variables	Dutch speaking (n = 1244)	French speaking (n = 697)	P	Dutch speaking (n = 1229)	French speaking (n = 627)	P	Dutch speaking (n = 741)	French speaking (n = 420)	P
The Karasek Model									
Demands (M)	22.09	22.55	0.002	23.21	24.03	<0.0001	24.22	25.07	<0.001
Control (M)	60.27	59.73	NS	63.71	65.61	<0.0001	69.04	70.13	<0.05
Social support at work (M)	22.45	22.79	NS	22.53	22.80	0.06	22.61	22.89	0.067
Ratio demands/control (M)*	0.383	0.401	<0.05	0.375	0.380	NS	0.360	0.371	NS

* A measure of the strain concept (high demands with low control).

TABLE 4
The belstress study

	Men Level of Education*								
	I			II			III		
Psychosocial variables	Dutch speaking	French speaking	P	Dutch speaking	French speaking	P	Dutch speaking	French speaking	P
Social support (%) (4 or more social contacts)	16.60	9.90	<0.0001	14.70	8.20	<0.0001	12.60	7.70	<0.0001
Depression (M)	14.62	16.05	<0.0001	14.53	16.09	<0.0001	14.46	15.70	<0.0001
Anxiety (M)	2.52	2.92	<0.0001	2.57	2.92	<0.0001	2.57	2.82	<0.001
Aggression (hostility) (M)	2.97	3.16	<0.0001	3.00	3.18	<0.0001	3.00	3.11	<0.003
Vital exhaustion (M)	1.49	1.63	<0.0001	1.55	1.67	<0.0001	1.59	1.66	<0.05
Current health index (M)	4.07	5.39	<0.0001	3.62	5.31	<0.0001	3.25	4.79	<0.0001
Sleep problems (%)	13.60	21.10	<0.0001*	11.80	20.30	<0.0001*	10.50	17.00	<0.0001*

* X heterogeneity 3 x 2.

TABLE 5
The belstress study

	Women Level of Education*								
	I			II			III		
Psychosocial variables	Dutch speaking	French speaking	P	Dutch speaking	French speaking	P	Dutch speaking	French speaking	P
Social support (%) (4 or more social contacts)	10.70	3.60	<0.005	11.30	5.00	<0.001	14.10	5.00	<0.0001
Depression (M)	15.94	18.17	<0.001	15.80	16.67	<0.0001	15.30	17.47	<0.0001
Anxiety (M)	2.90	3.14	<0.0001	2.93	3.40	<0.0001	2.84	3.29	<0.0001
Aggression (hostility) (M)	3.20	3.50	<0.0001	3.29	3.49	<0.0001	3.24	3.39	<0.05
Vital exhaustion (M)	1.71	1.98	<0.0001	1.84	1.99	<0.0001	1.76	1.97	<0.0001
Current health index (M)	5.25	7.14	<0.0001	5.01	6.96	<0.0001	4.50	6.60	<0.0001
Sleep problems (%)	23.70	36.10	<0.0001*	21.30	34.90	<0.0001*	18.20	30.40	<0.0001*

* X heterogeneity 3 x 2.

Type A Coronary Prone Behaviour

In 1981 a Review Panel on coronary-prone behaviour and CHD concluded: type A behaviour as defined by the Structured Interview or the Jenkins Activity Survey is associated with an increased risk of clinically apparent CHD in employed middle-aged US citizens (27). However in a review published in 1992 it was concluded that only 5 out of 12 prospective studies showed a significant association of type A behaviour with the incidence of CHD whereas seven did not (28). Since then two other European prospective studies showed no association between type A and CHD. Thus in only 5 out of 14 prospective studies is type A behaviour associated with incidence of CHD. Among them three Belgian prospective studies with only one showing a significant relation between type A behaviour and risk of CHD (29-31).

Using the Bortner Scale consisting of 14 bipolar scales correlating well with the Structured Type A interview (32) already in the beginning of the seventies we observed significantly higher scores (type A behaviour) in French speaking middle-aged working males as compared to French speaking subjects. The same was observed for the Jenkins Activity Survey (33).

In the BIRNH study, when stratifying for level of education, results are not clear-cut although in general for both genders the mean JAS AB score points in the direction of type A behaviour in French speaking subjects of both genders in most strata.

In the 1992 review of type A behaviour it was suggested the concept should be reconsidered: type A being a mosaic of behaviours, one component, namely hostility or its expressions, anger and aggression could be predictive of CHD incidence and mortality (28).

Hostility (aggression)

Thus in a recent review the authors reported that 5 out of 10 prospective studies found an association of hostility with coronary heart disease (34). Mittelman et al. (35) have shown that bursts of anger are an important triggering factor for MI. In the Belstress study the score for aggression is significantly higher in French speaking middle-aged working subjects of both genders at all levels of education.

Depression

Depression is characterized by a depressed mood, feelings of hopelessness and helplessness, sleep disturbances, fatigue and suicidal thoughts. It is a well-defined psychiatric entity.

In general, prospective studies show a predictive relation with CHD incidence in healthy subjects as well as risk of MI recurrence and death in CHD patients.

The evidence from observational epidemiological studies is impressive as recently reviewed (34).

In the Belstress study mean depression scores are significantly higher by at least two units in French speaking middle-aged working subjects of both genders as compared to their Dutch speaking counterparts, across all levels of education.

Anxiety syndromes

Recently, some prospective studies have reported an association of anxiety syndromes with the risk of CHD mortality in healthy populations, the excess mortality being confined to sudden cardiac death (34).

In the Belstress study the anxiety score was systematically higher in French speaking working subjects of both genders as compared to Dutch speaking subjects.

Social isolation and lack of social support

The first epidemiological studies focused on quantitative lack of social support or small social networks whereas more recently qualitative aspects of social isolation, such as perceived amount of emotional or financial support, were studied.

Fifteen prospective studies found on average a 2- to 3-fold increase in CHD over time in those with a small social network (34).

In this paper we report prevalences of a large social network (at least 4 or more social contacts) to be significantly higher in Dutch speaking middle-aged working subjects of both genders by more than 5 units as compared to their French speaking counterparts.

Vital exhaustion and sleep disturbances

The Maastricht School of Medical Psychology proposed a questionnaire on vital exhaustion with a part of it related to sleep disturbances. In

a large prospective study, vital exhaustion was an independent predictor of CHD incidence in males (36, 37). Lately the same has been observed in females (38).

As shown in the Belstress Study, a score for vital exhaustion is systematically higher in French speaking males and females across all levels of education compared to Dutch speaking subjects. Moreover prevalences of symptoms related to sleeping problems are 50 to 80% higher in French speaking subjects of both genders.

Current health index

A British questionnaire on general health complaints, the Goldberg General Health Questionnaire, is a powerful predictor of mortality (39, 40).

In the Belstress study we used a Dutch equivalent and observed its average scores to be systematically higher in French speaking subjects of both genders.

Stress at work

Stress has been the subject of numerous studies starting with the models of "fight or flight" from Cannon and that of the "General Adaptation Syndrome" from Selye. In the seventies we focused on a model of stress at work, the Job Stress Questionnaire (JSQ) and tested it in a retrospective "ecological" study comparing a private bank with a higher 10 year CHD mortality as compared with a semi-public savings bank. For both executives and clerks, a mean Job Stress Score was significantly higher in the private bank as compared to the semi-public savings bank (13).

The JSQ has been tested prospectively in the BIRNH study and has been shown to be an independent predictor of 10 year CHD mortality (non-published results). This is probably one of the earliest questionnaires testing the hypothesis that job stress could be a risk factor for CHD.

Recently, R. Karasek, an American sociologist, proposed a job stress model based on psychological demands and control and social support at work. He proposed that the conjunction of high demand with a perception of poor control would lead to a situation of strain (17). Later on, the concept of isostrain by adding a scale on social support at work was proposed by Johnson and Hall (20). The model was tested in several prospective studies and was found to be predictive of CHD incidence or mortality in most but not all of these studies (34, 41).

In the BIRNH study where the home-made JSQ is used, average scores are systematically and significantly higher in French speaking subjects of both genders as compared to their Dutch speaking counterparts.

In the Belstress study the Karasek model is used. Whereas mean scores for psychological demands are significantly higher in French speaking subjects (except for women with secondary level of education), mean job control scores are generally higher in French speaking subjects although not always at a statistically significant level. The average ratios for demands/control, a quantification of job strain, is systematically, although not always significantly, higher in French speaking subjects of both genders.

Finally, social support at work considered as a buffer against job stress is systematically more favourable in French speaking subjects.

Limitations of the results

The two studies concern middle-aged working populations although in the BIRNH study, the working population is extracted from a non-selected stratified population sample. Moreover, as the participation rates for both studies are rather low, a selection bias can not be ruled out and results should not be generalised to the population at large.

Some of the psychosocial factors like job stress only concerns working populations. Several of these psychosocial factors are interrelated and testing them in a multifactorial model applied to incidence of CHD at the community level in both cultural communities will show which of them are indeed independent predictors of CHD, taking into account the major coronary risk factors. Nevertheless, causal relations between exposures and events remain elusive in ecological studies in general and even more in those with comparison of two entities given the possibility of powerful confounders, the so-called “ecological fallacy”.

Conclusions

This paper shows that numerous psychosocial risk factors related to the risk of CHD differentiate French speaking from Dutch speaking middle-aged subjects of both genders across all levels of education. In almost all cases, French speaking subjects show a less favourable profile as compared to their Dutch speaking counterparts in terms of these psychosocial factors. Hence we make the hypothesis that besides nutritional patterns, psychosocial variables could “explain” the excess coro-

nary incidence and mortality observed in the southern French speaking part of Belgium as compared to the northern Dutch speaking region.

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