

ORIGINAL ARTICLE

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The Atlas of Health and Working Conditions by Occupation

2. A comparison with the “Atlas of Health and Working Conditions in the Construction Industry”

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Abstract The results of the general *Atlas of Health and Working Conditions by Occupation* were compared with the results of the *Atlas of Health and Working Conditions in the Construction Industry*. Both are based on questionnaire data from periodical occupational health surveys [POHSs]. The scores on most of the items showed considerable differences between the two atlases, partly due to differences in the regional origin of the data. Therefore, direct comparisons between the atlases are biased by regional differences. To study the reliability and the generalizability of the results of both atlases, similarities between the data files with respect to occupations in the construction industry were studied. Most of the items on working conditions, especially those with a widespread distribution, showed a close resemblance between the data files in terms of the relative position of an occupation compared to other occupations in the construction industry. The items on health showed less resemblance, except for the items on musculoskeletal complaints, which showed results similar to those of the work items. These results indicate the reliability and generalizability of the judgments based on both atlases outside the regions of origin, as far as items with a widespread distribution are concerned. Therefore, we recommend the aggrega-

tion of POHS data on a national scale, taking regional differences into account. In that way, a greater number of occupations will be described and the reliability of the results will be enhanced.

Key words Work-related diseases · Information systems · Periodical occupational health survey · Occupational health services · Working conditions

Introduction

In the various sectors of industry – for example construction – a great need exists for systematic information about the prevalence of work-related health complaints and diseases and of problems at work experienced by the employees. The *Atlas of Health and Working Conditions by Occupation* [2] only partly meets that need. The information in this general atlas is considered too extensive for specific sector organizations. In addition, sectors need more details about their own industries and a discussion of the results, which should enhance the accessibility and the utility of the information. On behalf of the sector organization Arbouw Foundation, the *Atlas of Health and Working Conditions in the Construction Industry* has been published for this purpose [3]. In this atlas of the construction industry, occupations are described using a data file of the Arbouw Foundation, initially processed by the Dutch Institute for Preventive Health Care (NIPG-TNO) in Leiden [1]. This “construction industry file” (CI file) consists of data from periodical occupational health surveys [POHSs], gathered by five regional occupational health services [OHSs] spread over the Netherlands. The CI file contains data for more employees from the construction industry than the so-called “general atlas file” [GA file] of the OHS “Oost-Gelderland” on which the general atlas is based. Thus, more occupations can be described. Moreover, in this atlas exploratory attempts are made to relate specific

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working conditions to health complaints. The presentation of the results in the atlas of the construction industry is not essentially different from that in the general atlas.

The first goal of this article is the detection and the description of systematic differences in the answers to the POHS questionnaire between the two data files, and to compare those with regional differences found previously [1]. The existence of regional differences has consequences for the merging of POHS data of different regional origin, e.g. in a national monitoring institute [7, 9]. These consequences may lie in the necessity for stratification of data according to regional origin in the comparison of occupations and sectors of industry, and in a potential bias in the use of unadapted reference values of inter-regional origin by a regional OHS.

The second goal of this article is the description of the similarities between the results from the two data files, as an indication of the reliability and the generalizability of the results of both atlases.

Materials and methods

Both the general atlas and the atlas of the construction industry are based on the answers of employees on the items of the questionnaire of the POHSs. All employees working in the construction industry are invited to participate voluntarily. The data for male and female employees are analysed separately. We used two data files:

1. The GA file contains data of the most recent POHS in the period 1981–1990 for 36 000 employees from all companies and sectors of industry associated with the OHS "Oost-Gelderland". The large majority of the data were gathered from employees in industrial enterprises. Employees in the construction industry (numbering more than 4500) are included in the GA file [2,4]. In the general atlas a minimum of 50 employees per occupation was chosen.

2. The CI file consists of POHS data of 11 000 employees from the construction industry, gathered by five different OHSs in 1989 and 1990 [1, 8]. The OHS "Oost-Gelderland" was one of these five OHSs, with about one-quarter of the data, causing the two data files to overlap partially. Thirty-four occupations with male and two occupations with female employees were selected, with a minimum of 40 employees per occupation.

The employees of the GA file were classified into occupations using the four-digit classification of the Dutch Central Bureau of Statistics (CBS) [5]. The occupations in the CI file were classified according to the classification of the Social Fund for the Construction Industry (SFB). The two classification systems differ in the extent of specification, and the overlap is only partial. However, eight occupations had an identical or nearly identical description and a sufficient number of employees in both files (see Table 1).

The SFB classification in the CI file has a finer distinction between occupations than the CBS classification in the GA file. One occupation code in the GA file may correspond to several occupation codes in the CI file. Of all the CI codes corresponding to one GA code, we selected the CI code containing most employees. For example, the CI file contains three types of house painters, and 76% of them had the CI code "painter-maintenance" (666 out of 877 house

Table 1 Occupations with corresponding descriptions in the GA and the CI file

GA file	CI file
Carpenter, construction industry (<i>n</i> = 1821)	Carpenter (<i>n</i> = 3181)
Bricklayer (<i>n</i> = 1194)	Bricklayer (<i>n</i> = 1056)
House painter (<i>n</i> = 650)	Painter – maintenance (<i>n</i> = 666)
Bricklayer's assistant (<i>n</i> = 305)	Bricklayer's assistant (<i>n</i> = 274)
Road worker (<i>n</i> = 151)	Road worker (<i>n</i> = 211)
Excavation worker – finisher construction industry (<i>n</i> = 126)	Excavation worker (<i>n</i> = 251)
Plasterer (<i>n</i> = 120)	Plasterer – traditional (<i>n</i> = 144)
Pipe and tube layer (<i>n</i> = 54)	Cable and tube layer (<i>n</i> = 79)
All eight occupations (<i>n</i> = 4421)	All eight occupations (<i>n</i> = 5862)

painters). Therefore, we assume that systematic differences between corresponding occupation codes in the two data files are absent or only small.

To reduce the influence of random error on the differences between the two files, we only compared the complaint percentages of the three occupations with the largest numbers of employees: carpentry, bricklaying and painting. For each of these three occupations, we compared the mean complaint percentages on each item between the two data files.

In the subsequent analysis of similarities between the files, we computed the Pearson correlation between the two complaint percentages of the eight corresponding occupations in Table 1. In this last analysis, the reference population consisted of the same eight occupations in both data files, and was therefore comparable. The correlation would be near 1.0 if the complaint percentages from both data files were strongly related. In the presentation of the correlations between the data files, the correlations are classified by magnitude: over 0.75 indicates a good relationship; between 0.5 and 0.75 is reasonable; between 0.25 and 0.5 is mediocre; and under 0.25 does not indicate any relation between the two data files.

The direct method of standardization for age was used in both analyses. Age was recoded in four categories (< 35, 35–44, 45–54, ≥ 55 years). The age distribution of the total GA file (*n* = 23 507) was used as the standard.

The items were divided into five categories. First, items on health and on working conditions were distinguished and then the items on health were subdivided into four categories:

- Items about musculoskeletal complaints
- Items about medical treatment for specific diseases in the last 5 years
- Items about life-style, e.g. smoking, alcohol and prescribed drug consumption and physical exercise during both work and leisure
- The rest of the items on health.

Some health and work items were excluded from the analysis because of complementary response alternatives. Three work items on unfavorable expectations about future employment were excluded because the results for these items were very deviant. The reason for this deviation will be discussed below.

Results

Differences between the two data files in three occupations

In Table 2 the differences between the two data files are shown by occupation and item category in the following format: first the number of items with a higher percentage of complaints in the CI file, then the items with a higher percentage of complaints in the GA file. The mean difference of all items in the item category is presented in the last column.

For more than 85% of the items the complaint percentages of the CI file are higher, and the mean differences indicate an extra percentage of 1%–4%. The difference can amount incidentally to 15% extra complaints. The differences presented here appear to be systematic. To explain these differences, we will first discuss the composition of the two files.

The two files differ in regional origin and in the period of gathering, leading to two possible explanations: First, complaint percentages in the Oost-Gelderland region may be systematically lower than those in the other four regions. Confirmation of this explanation ought to be possible within the CI file. Standardized for age and occupation, the complaint percentages

Table 2 Number of items with complaint percentages higher or lower in the CI file compared to the GA file for three occupations. The minimum and maximum of the difference, and the mean difference are also presented. (NA not applicable)

Item group ^a occupation	CI < GA			CI ≥ GA			Mean difference
	No.	Min.	Max.	No.	Min.	Max.	
H.1 Carpenter	20	0.3	7.7	0	NA	NA	2.4
H.2 Carpenter	14	0.2	7.8	3	0	-0.1	1.7
H.3 Carpenter	3	1.5	12.6	3	-1.1	-5.6	2.0
H.4 Carpenter	68	0.1	7.7	2	-0.2	-1.0	2.0
W Carpenter	47	0.6	8.9	1	-0.1	-0.1	3.6
H+W Carpenter	152	0.1	12.6	9	0	-5.6	2.5
H.1 Bricklayer	18	0.7	5.9	2	-0.1	-0.2	3.0
H.2 Bricklayer	16	0.1	5.4	1	0	0	1.3
H.3 Bricklayer	3	3.8	14.1	3	-0.6	-2.1	3.5
H.4 Bricklayer	66	0.1	8.8	4	0	-0.5	2.3
W Bricklayer	47	0.2	10.2	1	-0.6	-0.6	3.5
H+W Bricklayer	150	0.1	14.1	11	0	-2.1	2.7
H.1 Painter	18	0.2	7.6	2	-0.9	-1.4	2.6
H.2 Painter	14	0.1	7.1	3	0	-1.7	1.5
H.3 Painter	3	4.9	15.7	3	-0.6	-4.4	4.2
H.4 Painter	60	0.1	9.6	10	0	-2.1	2.1
W Painter	43	0.2	11.1	5	-0.1	-1.5	3.6
H+W Painter	138	0.1	15.7	23	0	-4.4	2.6

^aItem groups: H.1, questionnaire health: musculoskeletal complaints (20 items); H.2, questionnaire health: items about medical treatment (17 items); H.3, questionnaire health: items about life-style (6 items); H.4, questionnaire health: remaining health items (70 items); W, questionnaire working conditions (48 items); H + W, all health and work items of the questionnaire (161 items)

differ distinctly between regional OHSs [1]. In addition, a comparison of the complaint percentages of carpenters within the CI file was made between the OHS "Oost-Gelderland" and the other four OHSs. Indirectly standardized for age and analysed per item, the complaint percentages of the OHS "Oost-Gelderland" were considerably lower than those of the other four OHSs (especially on the items on working conditions). However, in this analysis we could only reproduce a part of the difference we found between the two data files. Second, complaint percentages in the period 1989–1990 may be systematically higher than those in the preceding period, 1981–1988, at least in the Oost-Gelderland region. We performed an analysis of all employees in the construction industry in the GA file. Three periods with sufficient numbers of employees could be identified: 1985–1986, 1987–1988 and 1989–1990. The complaint percentages, standardized directly for age, showed a slight decrease, especially for the items on working conditions. This result is incompatible with the second explanation of the differences between files.

As a second result of this analysis, we found large differences for three items concerning unfavorable expectations about future employment. The percentages on these items approximately halved from the first to the third period. For example, the percentage of employees complaining about insufficient security in their job in the three periods examined was 38%, 24% and 18% respectively. This result indicates a rapid improvement in employment, also reflected by the tripling of the number of vacancies in the Dutch construction industry in the period 1986–1990 (5600 and 16800 vacancies respectively [6]). Bloemhoff et al. also reported a significant decrease in the years 1989 and 1990 in the complaint percentages on the cluster about "perspectives" [1]. The items on unfavorable expectations about future employment are part of that cluster. A major part of the GA file consists of data from the period before 1989, when expectations of the future were unfavourable. The mean percentages of complaints on these items in the GA file will therefore be relatively high compared with the mean percentages in the CI file. Therefore, these items were excluded from the analysis.

Similarities between the two data files in eight occupations

In the general atlas, each occupation is evaluated on the basis of its relative position compared to the reference population of all occupations of the general atlas. An occupation with a high percentage of complaints is assessed as having a relatively heavy load with respect to the relevant factor in the working conditions. The assumption has been made that the results can be generalized to a larger population than the employees in the Oost-Gelderland region. If this assumption is

Table 3 Classification of the items, stratified by standard deviation (SD) and total, according to the correlation between the complaint percentages of the eight corresponding occupations from the GA and the CI data files. Within each SD stratum, five item groups are distinguished, and a total count is given. Presented are row percentages and the number of items per item group

Item group ^a	Correlation				Total
	< 0.25	0.25–0.50	0.50–0.75	0.75–100	
<i>Items with an SD of less than 2.5</i>					
H.1	17%	33%	17%	33%	6
H.2	27%	13%	47%	13%	15
H.3	100%	0%	0%	0%	1
H.4	55%	21%	12%	12%	58
W	78%	0%	11%	11%	9
H+W	51%	18%	18%	13%	89
<i>Items with an SD of 2.5 or more</i>					
H.1	0%	0%	36%	64%	14
H.2	0%	0%	0%	100%	2
H.3	20%	20%	40%	20%	5
H.4	25%	8%	17%	50%	12
W	3%	8%	15%	74%	39
H+W	7%	7%	21%	65%	72
<i>All items</i>					
H.1	5%	10%	30%	55%	20
H.2	24%	12%	41%	24%	17
H.3	33%	17%	33%	17%	6
H.4	50%	19%	13%	19%	70
W	17%	6%	15%	63%	48
H+W	31%	13%	19%	37%	161

^a Item groups: H.1, questionnaire health: musculoskeletal complaints (20 items); H.2, questionnaire health: items about medical treatment (17 items); H.3, questionnaire health: items about life-style (6 items); H.4, questionnaire health: remaining health items (70 items); W, questionnaire working conditions (48 items); H+W, all health and work items of the questionnaire (161 items)

correct, an assessment of an occupation on the basis of the GA file should correspond to an assessment on the basis of another data file, in the present study the CI file. We computed the correlation between the complaint percentages of the eight occupations listed in Table 1.

We expected an influence of the spread of complaint percentages on the correlation between the data files. Therefore, we computed the standard deviation (SD) of the distribution of the eight occupations in each data file per item and used the smaller of the two standard deviations to classify the items into two groups with an SD of less than 2.5 and of 2.5 or more respectively. Table 3 shows the correlations between the data files.

The relation between the complaint percentages of the two data files is shown graphically in Fig. 1, using the item back pain as an example. First of all, the difference between the two files in the general level of complaints is demonstrated (an average of 8% extra complaints in the CI file on this item). Secondly, the order of the occupations in the two data files is almost

Backache complaints

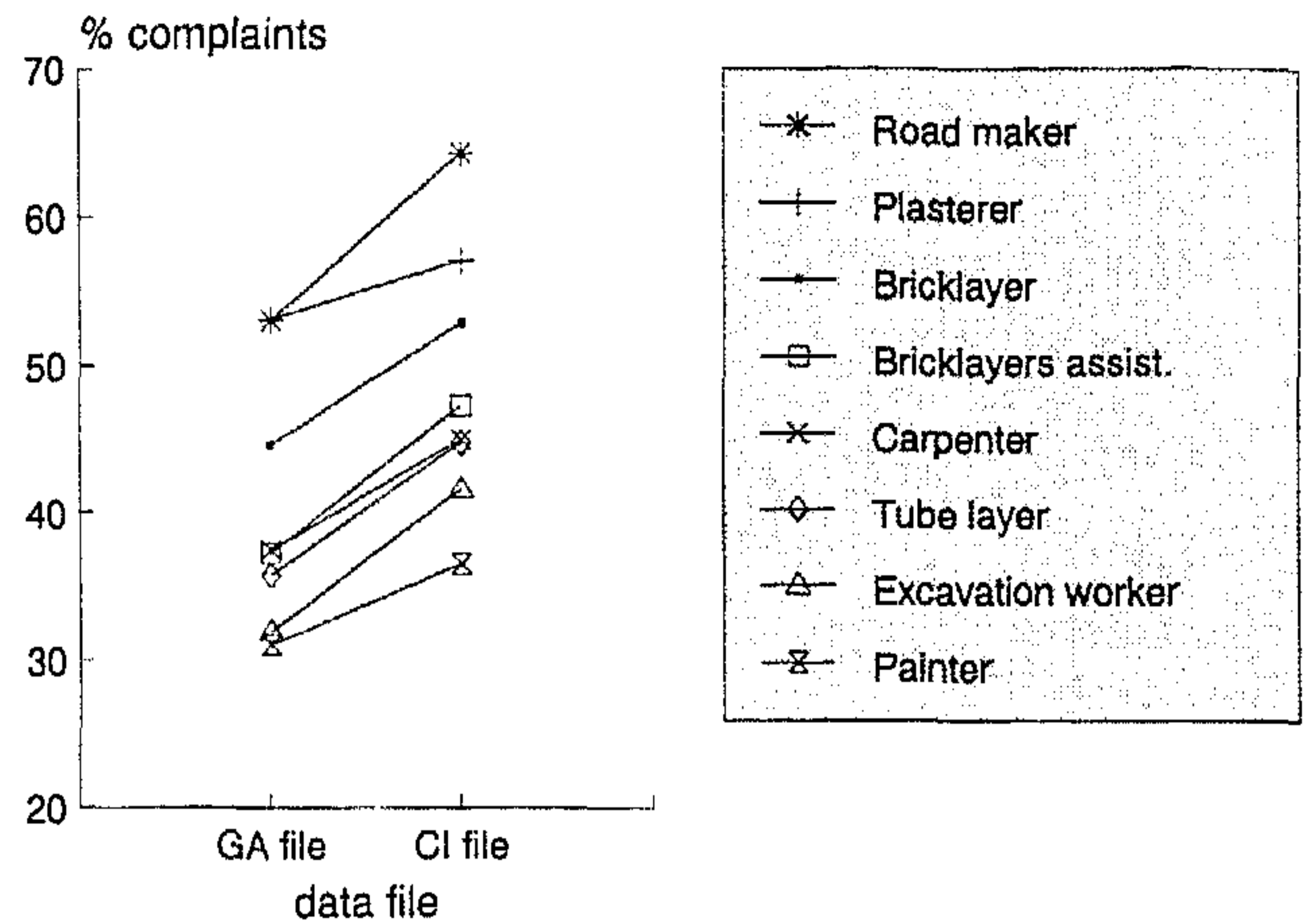


Fig. 1 The relation between the backache complaint percentages of eight occupations in the GA file and the CI file

the same, and, therefore, the connecting lines hardly ever cross. For this item, the correlation between the complaint percentages of the two data files was high: 0.96.

From Table 3 it can be concluded that the relative positions of the complaint percentages of the corresponding occupations from the two data files are similar for most of the items on working conditions [W], especially those with a wide spread. The items on health show less resemblance, except the musculoskeletal complaints (H.1), which show results similar to the items in working conditions.

In cases where the eight selected occupations do not differ systematically, differences in complaint percentages between occupations within a file will occur, caused by random factors. However, these differences will be relatively small due to the large number of employees per occupation. Moreover, if the same occupations are selected from another regional population, the differences between these occupations within the region will again be both small and caused by random factors. In that case, the relative position of an occupation may differ from the relative position in the first selection. According to this line of reasoning, the low correlations found for the items with a small spread of complaint percentages indicate the absence of systematic differences between these eight occupations. The complaint percentages on the items on working conditions (W) generally are both spread widely and correlate reasonably to well. This observation is as expected, because the topics of these items are the work characteristics, and that is what differs primarily between occupations. Furthermore, the physical work load in a number of occupations in the construction industry is heavy, which may lead to several sorts of musculoskeletal complaint. These items show both wide spread and high correlations (H.1). Many of the items on

