



Cohort Profile

Cohort Profile: The Well-being in Hospital Employees (WHALE) study

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Why was the cohort set up?

Most health care systems face a challenge to balance efficiency and quality under the pressure of limited resources and budget cuts. Consequently, hospital employees may face stressful working conditions, which may increase the risk of health problems as well as poor co-operation between staff. Combined, these may increase the risk of inefficiency, poor quality of care or even malpractice.^{1,2} The Well-being in Hospital Employees (WHALE) study is an ongoing prospective, observational cohort on work environment among all health care employees within the Capital Region of Denmark. The data are collected to continuously monitor the well-being of employees, in order to develop targets for potential intervention.

The term ‘psychosocial work environment’ denotes the interplay of a range of psychological and social factors that affect the employees’ well-being. The concept of job strain was introduced with the job demand-control model,³ describing job stress from the balance between high job demands and low control. Self-reported job strain has been associated with an elevated risk of a number of adverse health outcomes such as cardiovascular disease,^{4–6} type 2 diabetes,⁷ affective disorders⁸ and mortality.⁹ Another

aspect of psychosocial work environment is reflected in the multidimensional concept of organizational justice.¹⁰ Here, it is argued that a poor psychosocial work environment arises from the perception of injustice at work. In addition, other stressors such as negative interpersonal relations in the workplace have received increasing research interest, and empirical evidence indicates that bullying is strongly associated with subsequent depression and elevated risk for cardiovascular disease.¹¹

The psychosocial work environment also encompasses positive elements with potential beneficial effects on job performance and individual health in occupational settings. Social capital has been defined as features of a social structure which facilitate the action of individuals within the structure.¹² Key elements within an occupational setting include norms and trust between co-workers, which facilitate coordination and co-operation.¹³ Over the past decades, social capital in occupational settings has received increasing attention, as the concept differs from other factors of the psychosocial work environment mentioned above, by being a positive resource and by being a characteristic of the workplace rather than an individual perception of the work environment. In periods of high demand,

high social capital may buffer employees' stress levels, and the transmission of informal social norms may lead to healthier lifestyles.¹² A recent prospective study on social capital in relation to long-term sickness absence found a decreased risk among higher occupational grade workers with high vs low social capital.¹⁴ In addition, several publications based on the Finnish Public Sector study have linked workplace social capital to health outcomes such as depression,^{15,16} hypertension,¹⁷ healthy lifestyle^{18,19} and mortality.²⁰

In a hospital setting, the concept of social capital is particularly relevant as the work environment, the efficiency, and the quality of care highly depend on co-operation across professions. However, the literature on social capital in hospital settings is sparse. A recent cross-sectional study among Japanese health care professionals found a positive association between unit-level social capital and work engagement as an indicator of well-being.²¹ In addition, a Swedish prospective study found that an increase in social capital among health care professionals was related to higher levels of engagement and job satisfaction.²² Other previous studies related social capital to quality of care, productivity, patient satisfaction and employee satisfaction and well-being.^{2,23-31} A recent large cross-sectional study found that nurses in better work environments (as measured by managerial support for nursing, nurse participation in hospital affairs, and doctor-nurse relations) reported higher care quality and better patient safety. Also, patients in hospitals with better work environments rated the hospital more highly.¹ Thus, several international studies suggest that challenges with regard to efficiency, quality of care and well-being of employees within the health care sector could in part be met by strengthening the social capital.

The majority of the above-mentioned studies are cross-sectional in design and thus not designed to address effects of social capital by separating cause and effect in time. Given the collective dimension of social capital, neither

individual nor ecological approaches in isolation will capture the essence of the concept. Therefore it has been argued that a multi-level approach to the analysis of health effects of social capital is more appropriate, taking into account the organizational levels in which the individual responses are embedded.^{32,33} The data collected for the WHALE study are a unique source to prospectively relate social capital and other aspects of the psychosocial work environment to various outcomes, through linkage with registers on sickness absence, health outcomes, prescription of medicine, socioeconomic outcomes and questionnaire data on patient satisfaction. In addition, the structure of the database provides detailed information on organizational levels for every individual, which allows for the determination of effects of dimensions of the work environment at different aggregate organizational levels. This may help to address common methods bias which is an important source of bias in the majority of studies in the field.³⁴

Who is in the cohort?

The cohort includes employees at hospitals within the Danish Capital Region at the time of the questionnaire assessments in 2011 and 2014. All 35 894 ordinary employees who were actively working by 1 October 2010 throughout 12 January 2011 were invited to participate in the survey. Data were collected in the period 12 January to 9 February 2011. Employees with a work e-mail address filled out a web-based questionnaire, and paper versions were handed out among remaining employees. A response rate of 81% was obtained in the 2011 survey. Following the same procedures, 37 720 employees were invited for a second survey in March 2014 (response rate 84%). In 2014, the organizations included nine hospitals and institutions involved with handicaps, psychiatry, pharmacy, emergency care, and central administration (Figure 1). Information on sex, institution, department, work unit and professional group was obtained from the payment system.

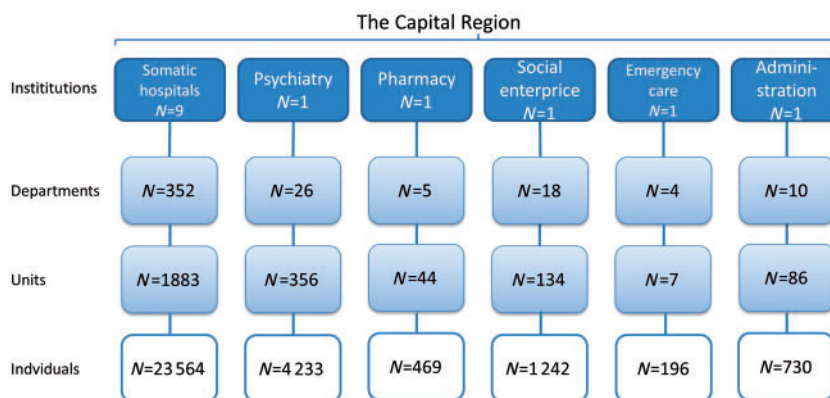


Figure 1. Overview of the organizational structure of the Danish Capital Region in 2014.

The 2011 sample included 29 004 employees with any information on the psychosocial work environment, including 28 785 employees with information on social capital. After exclusion of 26 persons who had responded twice (due to being affiliated with two departments), the total sample comprised 28 759 persons. Likewise, the 2014 sample included a total of 31 823 employees including 30 434 with information on social capital (excluding 11 duplicates). In total, 21 969 of the respondents in 2011 were employed in 2014. Of these, 19 572 responded to the 2014 survey.

The mean age of employees was 45 years [standard deviation (SD) = 11] and women constituted 78% and 79% in 2011 and 2014, respectively. Nurses were the largest staff group, constituting 31% in 2011 and 34% in 2014, whereas medical doctors represented 12% of the respondents in both years. Administrative personnel comprised 21% and 19% in 2011 and 2014, respectively. In both years, 64% were employed full-time and 92% and 93%, respectively, were appointed on standard terms in 2011 and 2014. The percentage of employees with a seniority of 10 or more years varied from 36% in 2011 to 38% in 2014.

Socio-demographic information on non-respondents was retrieved from the regional administration system, enabling comparisons with participants in either of the waves and with those participating in both waves

(Table 1). The sex distribution was somewhat skewed between participants and non-respondents, in that a higher proportion of men was observed among non-respondents. Also, non-respondents were slightly younger than participants in both waves, with the exception of employees who were eligible but declined to participate in any of the surveys. Most notably, medical doctors and dentists were over-represented among non-respondents in both the 2011 and 2014 survey. Thus, these data suggest that study participants represent a somewhat selected group, primarily with respect to profession.

How often have they been followed up?

Figure 2 illustrates the collection of questionnaire information, the data linkages and the sample sizes at each of the two waves already collected. An additional wave is planned for 2017. The questionnaire responses from 2011 and 2014 have been linked to individual-level data on sickness absence from the payment system, which were collected on a monthly basis according to number of hours absent due to: general sickness absence, work injuries and absence in relation to sick children or chronic illnesses. In addition, the data linkage included information on standard working hours for each individual, seniority and length of employment. The data cover the period from January 2009 to June 2016.

Table 1. Socio-demographic characteristics of participants vs non-respondents in 2011 or 2014, respectively, and participants in both waves versus only one and neither of the waves

	2011		2014		2011 and 2014		
	Participants	Non-respondents	Participants	Non-respondents	Participants ^a	Only 1 wave	None
N (%)	28759 (81)	6908 (19)	30434 (84)	5934 (16)	19589 (75)	5252 (20)	1347 (5)
Sex							
Women, %	78	73	79	72	78	74	64
Men, %	22	27	21	28	22	26	36
Age							
Mean (SD)	45 (11)	43 (12)	45 (11)	44 (12)	45 (10) ^b	43 (11) ^b	45 (11) ^b
Staff group, %							
Medical doctors/dentists	12	20	12	23	11	17	26
Nurses	31	32	33	31	32	35	28
SHS helpers	9	11	7	8	8	10	11
Biomedical lab technician	5	4	6	4	6	4	3
Midwives	1	2	1	2	1	2	3
Medical secretary	7	6	8	5	8	7	5
Other health staff	6	3	6	2	6	3	2
Social and pedagogical	4	2	4	3	4	3	2
Other administrative	14	6	12	9	14	7	4
Service-related	11	13	11	13	16	12	10

^aAmong all employees eligible to participate in both 2011 and 2014.

^bAge in 2011.

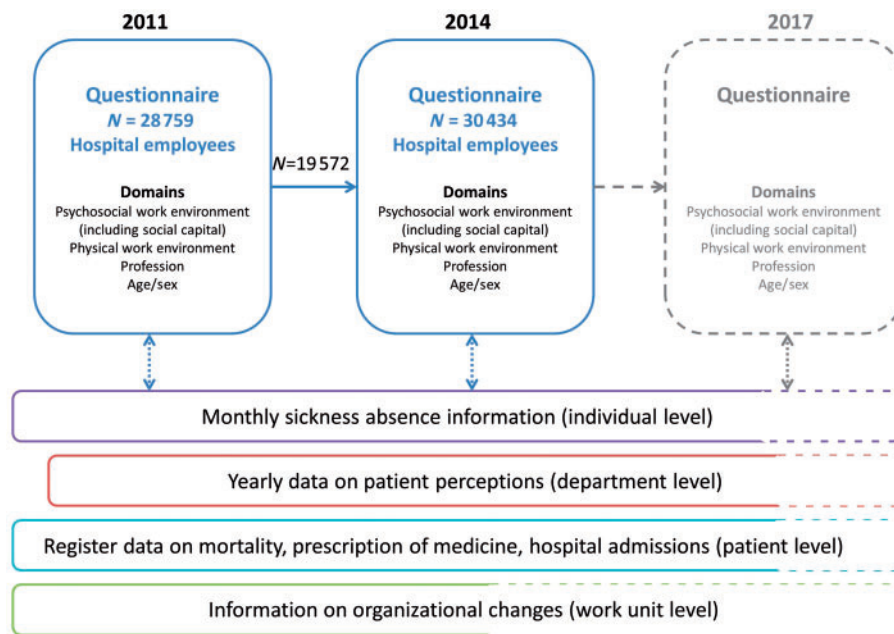


Figure 2. Illustration of the collection of questionnaire information, the data linkages and the sample sizes at each of the two completed waves.

The database is also linked to a database on patient perceptions of hospital admissions and outpatient treatments in the region. Every year a survey on treatment satisfaction among patients in each hospital department is carried out. A random sample of all treated patients during a specified inclusion period (12 weeks from August to October for admitted patients and 6 weeks from the end of August to the beginning of October for outpatients) are invited to participate. The sample consists of 400 patients per department per area of specialization. In departments with less than 400 treated patients during the inclusion period, all patients are invited. Patients both admitted and treated in outpatient care are only invited once.³⁵

In addition to linkage with the above-mentioned data sources, it is possible to link the survey data to various registers. Through the unique personal identification number, information on vital status, cause-specific mortality, hospital admissions and discharge diagnoses, prescription of medicine and emigration can be obtained.³⁶ Information on organizational changes (merging and division of work units, change in management, relocations, cuts in staff and financial down-sizing) in the period 2009–13 was also collected.³⁷

What has been measured?

The survey included a broad range of questions concerning the overall well-being of employees in which psychological and physical work environment are key elements (Box 1). The 2011 survey included a total of 46 questions on the psychosocial work environment. Of these, 29 questions

were derived from the second version of the Copenhagen Psychosocial Questionnaire (COPSOQII).^{38,39} The remaining questions were formulated by the human resources (HR) department, the management and employee representatives. The 2014 wave included 40 questions on the psychosocial work environment, of which 37 were also included in 2011. A complete list of items is provided in the Appendix (available as [Supplementary data](#) at *IJE* online). The dimensions of the physical work environment included in 2011 and 2014 were identical and covered by 26 items in the two waves.

Social capital

The data on social capital were collected by eight items covering elements of trust, justice and collaboration (Figure 3). These items reflect both horizontal (relations across employees at the same hierarchy level) as well as vertical components (i.e. relations that span hierarchies). The responses were re-computed into percentages and the social capital score was given by the percentage mean. Participants who responded to at least four of the eight items were included in the present analyses. Person mean imputation was performed for missing values by assigning the mean of the remaining responses to each individual. If the person responded to less than four of the eight items, the social capital score was computed as missing.¹⁴ We assessed social capital at the individual level (by applying each individual assessment) and aggregated the mean social capital score within each department. Department-

Box 1. Listing of individual level measures in the WHALE database

	2011	2014		2011	2014
Socio-demographic			Psycho-social work environment		
			Social capital		
Age	V	V	Trust regarding management	V	V
Sex	V	V	Justice	V	V
Profession	V	V	Collaboration	V	V
Institution/hospital	V	V	Work demands		
Department	V	V	Emotional	V	
Unit	V	V	Quantitative	V	V
The physical work environment					
Ergonomics			Stress and vitality		
Lifts, movements	V	V	Work-family imbalance	V	V
Potential for correct movement (variation, monotony)	V	V	Perceived stress	V	V
Indoor climate and noise			Perceived burn-out	V	
Temperature, air, cleaning	V	V	Organization and content		
Noise	V	V	Decision authority	V	V
Safety/transmission risks			Influence on work schedule	V	V
Chemical agents exposure	V	V	Skill discretion	V	V
Biological agents exposure	V	V	Management and collaboration		
Medicine exposures	V	V	Quality of leadership	V	V
Skin affections	V	V	Recognition	V	V
Necessary safety precautions	V	V	Social support	V	V
Work-related accidents			Role clarity	V	
Sufficient focus on accidents	V	V	Respect for differences	V	V
Specific conditions of importance for the risk of accidents	V	V	Predictability	V	V
Usage of precautionary equipment	V	V	Job satisfaction		
Sickness absence			Work environment	V	V
Related to work environment	V	V	Use of abilities	V	V
Specific environmental causes of absence	V	V	Future prospects	V	V
Pregnancy			Job as a whole	V	V
Degree of necessary work-environmental precautions	V	V	Offensive behaviours		
			Sexual harassment	V	V
			Threats and violence	V	V
			Bullying	V	V
			Professional quality		
			Explicit criteria for professional quality	V	V
			Satisfaction with quality of work	V	V
			Pride in work	V	V

level social capital was regarded missing if based on data from less than 50% of the eligible employees.

Other dimensions of the psychosocial work environment

The psychosocial work environment was measured according to dimensions of work demands (quantitative, emotional as well as work pace), organization and content (influence, possibilities for development/skill discretion), perceived stress and burn-out, work-family imbalance, management and collaboration (predictability, recognition, role clarity, social support and quality of leadership) and job satisfaction as well as exposure to sexual harassment, violence and bullying (Box 1; and Appendix).

Physical work environment

The physical work environment concerns ergonomics, indoor climate, noise, exposure to chemical or biological agents (e.g. transmission risk) and work-related accidents (Box 1).

What has it found? Key findings and publications

The overall mean level of social capital did only change marginally between the two surveys [67.4 (SD = 14.9) in 2011 and 68.3 (SD = 15.2) in 2014]. The Cronbach's alpha coefficient of the social capital scale was 0.83 for the 2011 survey and 0.85 for the 2014 survey.⁴⁰ In both waves, the social capital mean was on average evaluated slightly

ITEMS COVERING TRUST AND JUSTICE

To what degree...:
 ... can you trust the information that comes from the management?
 ... does the management trust the employees to do their work well?
 ... are conflicts resolved in a fair way?
 ... is the work distributed fairly?
 ... is your staff group respected by other staff groups in the workplace?

Response categories:
 A 7 point scale ranging from 1="Never/hardly ever" to 7="To a very high degree"

ITEMS COVERING COLLABORATION

To what degree...:
 ...are you and your colleagues good at coming up with suggestions for improving work procedures?
 ...do you and your colleagues take responsibility for a nice atmosphere and tone of communication?
 ...do you get help and support from your colleagues when needed?

Response categories:
 A 5 point scale ranging from 1="Not at all" to 5="To a very high degree"

Figure 3. The eight items covering the social capital elements of trust, justice and collaboration.

higher among women compared with men, but it did not vary noticeably according to age (Table 2). The highest level of social capital was observed among medical doctors and dentists. In both waves, social capital scores were observed among Social and Health Service (SHS) helpers, medical secretaries and service-related staff. In 2014, biomedical laboratory technician and midwives also scored below average. The social capital level did not vary considerably between full-time vs part-time employees. Employees on standard terms had a social capital score considerably lower than the remaining employment groups; especially persons who were appointed on fixed terms (job activation, trainees, paid by the hour etc.) reported high levels of social capital. However, these types of employment constituted a very small proportion of the total number of employees. With regard to the seniority of employees, staff with less than 4 years of employment had

Table 2. Individually measured social capital according to socio-demographic characteristics of the cohort in 2011 and 2014

	2011		2014	
	N	Social capital mean (SD)	N	Social capital mean (SD)
Sex				
Women	22437	68 (14)	24043	69 (15)
Men	6322	66 (16)	6391	67 (16)
Age				
< 40 years	9905	68 (15)	10577	69 (15)
40–51 years	9832	67 (15)	9995	68 (15)
52+ years	9022	67 (15)	9862	68 (15)
Staff group				
Medical doctors and dentists	3429	70 (15)	3776	71 (14)
Nurses	8903	68 (14)	10156	69 (14)
SHS helpers	2585	65 (15)	2167	65 (15)
Biomedical lab technician	1508	67 (14)	1705	65 (15)
Midwives	308	68 (13)	447	66 (14)
Medical secretary	2133	65 (15)	2285	66 (15)
Other health staff	1664	68 (14)	1792	69 (14)
Social and pedagogical	1173	68 (15)	1187	68 (16)
Other administrative	3960	69 (15)	3560	70 (15)
Service-related	3033	63 (17)	3205	65 (17)
Monthly work hours				
Part time	10406	67 (14)	10977	68 (15)
Full time	18154	68 (15)	19457	69 (15)
Type of employment				
Standard terms	26318	67 (15)	28388	68 (15)
Paid on an hourly basis	26	73 (17)	31	76 (15)
Tenured	1274	69 (15)	973	70 (16)
Paid through funding	845	72 (15)	949	73 (14)
Trainee	35	73 (14)	63	73 (16)
Job activation	54	76 (12)	21	77 (16)
Seniority				
< 48 months	10454	68 (15)	8980	70 (15)
48–119 months	7793	67 (15)	9938	67 (15)
120+ months	10311	67 (15)	11516	68 (15)

higher levels of social capital compared with staff who had been employed for 4 years or more in 2014.

The intraclass correlations for social capital within departments were 0.11 in 2011 and 0.13 in 2014. In both waves, department-level social capital was higher among departments with fewer employees compared with larger departments and also in departments with (on average) younger compared with older employees (Table 3). Likewise, departments with fewer senior staff had higher social capital compared with departments with higher seniority. The department-level score did not vary according to sex distribution in 2011, but in 2014 departments with a larger share of women had a higher social capital compared with departments with fewer women. In 2014, the department mean social capital was slightly higher in departments with a larger share of full-time employees. The social capital means for type of department did not show any obvious patterns.

Previous findings

The cohort was assembled recently for research purposes, and thus previous findings are sparse. However, the 2011 survey was used for a study examining the impact of organizational changes on psychosocial work environment and voluntary non-disability early retirement in senior

employees (aged 60–64 years). This study found that senior employees who had experienced organizational change, in terms of change in management or reorganization of work units in the 2-year period preceding follow-up, were more likely to retire early than those who had not experienced such changes. Also, early withdrawal from the labour market was related to poor psychosocial work environment measured in the 2011 survey. For instance, low scores on factors such as organizational justice, quality of management and social capital were associated with a higher rate of early retirement.³⁷

What are the main strengths and weaknesses?

A major strength of the database is the relatively large sample size, and the two rounds of questionnaire measurements separated in time allow for analyses of effects of changes over time for various dimensions of the psychosocial work environment. As mentioned previously, the structure of the database makes it possible to determine dimensions of the psychosocial work environment on different aggregate organizational levels. Compared with a measure solely based on perceptions of the work environment as measured individually, the aggregate level may better reflect the theoretical concept of social capital. The

Table 3. Department-level social capital according to socio-demographic characteristics of the cohort in 2011 and 2014

	2011		2014	
	N	Social capital mean (SD)	N	Social capital mean (SD)
Department size				
Small (N < 20)	80	71 (9)	115	75 (10)
Medium (N = 20–99)	169	68 (6)	107	71 (7)
Large (N = 100+)	120	67 (4)	138	68 (5)
Sex distribution, % females				
< 70%	104	68 (8)	110	70 (8)
70–84%	145	69 (5)	133	70 (6)
85+ %	120	68 (5)	117	72 (9)
Department mean age				
< 40 years	27	73 (6)	80	74 (8)
40–44 years	155	68 (5)	138	70 (7)
45+ years	184	67 (7)	142	70 (8)
Full-time employees, %				
< 65	168	68 (5)	181	70 (7)
65+	201	68 (7)	179	72 (9)
Average seniority				
< 84 months	66	70 (7)	99	75 (7)
84–131 months	191	69 (5)	170	70 (7)
132+ months	112	67 (7)	91	70 (9)
Department type				
Patients	199	69 (8)	243	71 (7)
Non-patients	137	70 (9)	117	72 (9)

possibility of linking the database to a wide range of other registers enables analyses of the effects of social capital and psychosocial work environment on various outcome measures such as sickness absence, specific health outcomes, socioeconomic outcomes and mortality at the individual level as well as, for instance, patient perceptions on an aggregate level. Also, when addressing questions of associations between variables collected in the same questionnaire, problems of common method bias may arise in that employees who report low levels of social capital may also tend to report low on specific outcomes of interest. This creates a non-causal association between the two parameters.³⁴ Such bias is avoided by merging the cohort with other data resources. The possibility of aggregating the individual answers to the questionnaire at the department level, and thus assigning the average value of the exposure of interest to all employees in that unit, also reduces the common method bias. Another strength is the multiplicity of professional groups represented in the data. The sparse literature on social capital in health care systems suffers from under-representation of specific staff groups. The majority of previous studies have focused on either physician or nurse social capital.^{2,23–31} Yet other occupational groups such as administrative staff, social and health service helpers and service-related personnel, who constitute a large proportion of all hospital employees, may be just as important in terms of efficiency and quality of care.⁴¹ Also, as mentioned previously, the productivity and quality of care in a health care unit are highly dependent on cooperation between staff groups, so a focus confined to a specific profession seems inadequate.

The included items on social capital were derived from the validated COPSOQII.¹⁴ The questionnaire included elements of trust, justice and collaboration and as described previously, reflecting both horizontal and vertical components, which are considered key in the measurement of workplace social capital.³³ The theoretically appropriate level at which social capital is measured has been much debated in the past decades.³² It has been argued that neither individual nor contextual measurements suffice; given the collective dimension of social capital (i.e. beyond social networks and support), the individual approach in isolation would only yield effects of perceptions of social capital, whereas a strictly ecological approach does not eliminate the residual compositional confounding by individual characteristics.^{33,42} Therefore, it has been argued that the analysis of health effects of social capital calls for a multi-level methodological framework in which the individual responses and their outcomes are nested within a workplace unit.^{32,33} The nature of the data collected for the WHALE study enables analyses of this type.

Weaknesses

First of all, the cohort measurements of work environment and well-being were self-reported secondary data that were not initially collected for research purposes. Thus, the measurements inherently suffer from some degree of misclassification. However, in a prospective design, the misclassification of exposures will be independent of the outcome measurements. In addition, the secondary nature of the data, being elaborated and collected within the HR setting of the region, entails some important weaknesses in that important aspects of the psychosocial work environment were omitted. Specifically, within each domain of the psychosocial work environment examined, a lower number of items were generally applied compared with the number of items within the same domain in the COPSOQII. However, regarding this as an issue of missing data, multiple imputation procedures may be applied to give an impression of the presumed loss of information. Such validation procedures are currently being implemented into the database.⁴³ Further, the database does include several dimensions of the psychosocial and physical work environment and the possibility of linkage between several registers, but information on lifestyle factors has not yet been collected.

The participation rates were high in both surveys, but the analysis comparing participants with non-respondents showed variances according to sex, age and profession. Most notably, medical doctors and dentists were under-represented among respondents. These details must be taken into account by carefully considering a link between exposures and outcomes of interest in future studies. The possibilities of addressing longitudinal changes in exposure are challenged by a high rate of turnover of staff and changes in the organization (splitting or merging of departments) over time. However, the period between the two surveys, i.e. from 2011 to 2014, was relatively stable with regard to re-organizations.

Can I get hold of the data? Where can I find out more?

Anonymized data are available to other investigators through collaborative agreements. Please contact Dr Naja Hulvej Rod [nahuro@sund.ku.dk].

Supplementary Data

Supplementary data are available at *IJE* online.

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Profile in a nutshell

- The WHALE study involves an ongoing prospective, observational cohort to collect data on physical and psychosocial work environment embedded within the Capital Region of Denmark.
- The baseline data were collected in 2011 among all employees in the region ($N=35\,894$) and a response rate of 81% was obtained. A follow-up questionnaire was distributed among all employees in 2014 ($N=37\,720$) with a response rate of 84%. Another wave will be conducted in 2017.
- The dataset comprises a broad range of questions concerning the overall well-being of employees, in which psychosocial and physical work environment are key elements. The 2011 survey included a total of 44 questions on the psychosocial work environment and 26 on the physical work environment. Analyses of various outcomes are possible through linkage with a database on patient satisfaction as well as register data on sickness absence, physical and mental health outcomes, socioeconomic outcomes and prescription of medicine.
- The structure of the database makes it possible to determine dimensions of the work environment on different aggregate organizational levels. Also, multiple professional groups are represented in the data.
- Any researcher interested in collaborating with the WHALE study should contact Dr Naja Hulvej Rod [nahuro@sund.ku.dk].

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Conflict of interest: None declared.

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