

Self-assessed occupational health and working environment of female nurses, cabin crew and teachers

Running title: Health and working environment

Abstract

Aim: The aim of this study is to describe and compare the self-assessed occupational health among female nurses, cabin crew and teachers, in relation to their working environment.

Background: Similarities between the three occupations *i.e.* predominantly female and service oriented, render them interesting in comparison with respect to health and working environment.

Methods The participants were female Icelandic cabin crew, nurses and elementary school teachers. A questionnaire including items on socio-demographics, working environment (addressing work pace, job security, monotonous work, assistance, physically strenuous work and physical environmental factors) and a symptoms list was used for data collection. Factor analyses on the symptom list resulted in five symptom scales: Musculoskeletal, Stress and exhaustion, Common cold, Gastrointestinal and Sound perception scale. A total of 1571 questionnaire were distributed. The response rate was 65.7% - 69%, depending on occupation. Data were collected in 2002.

Results: Cabin crew reported worse gastrointestinal, sound perception and common cold symptoms than nurses and teachers. Cabin crew and teachers reported worse symptoms of stress and exhaustion than nurses ($p < 0.05$). As compared to teachers and nurses cabin crew reported less job security and more physically strenuous and monotonous work. Nurses were likelier to seek assistance from co-workers or patients as well as to take care of an older relative than teachers and cabin crew. Regression analysis found that within each occupation distress from environmental factors resulted in higher score on all the symptom scales.

Conclusions: Nurses experience less stress and exhaustion than teachers and cabin crew. In comparison to one or both of the other occupations nurses are more likely to assist each other with their work, experience job security, reporting physically complex work and take care of older relatives. This should be highlighted as positive aspects of nurses' work praised as displaying responsibility and interconnectedness of nurses'.

Key words: Occupational health, women's health, cabin crew, teachers, nurses

INTRODUCTION

In the Western world the labour participation of women outside the home increased markedly during the second half of the twentieth century; today in Iceland women make up 47% of the workforce (1). However, women are concentrated in particular sectors of the economy, mainly service-related jobs and selected areas of manufacturing (2). In Iceland, 85.2% of women as compared to 55.9% of men held service related jobs in 2002. Of the women 24.6% worked in the health and social services and 12.2% in education compared to 4.1% and 4.4% respectively of the male percentage (1). The majority of service related jobs are performed indoors and studies have associated some indoor environmental conditions with increased risk of non-specific, flu-like symptoms, e.g. headache, nausea, congestion, drowsiness, dizziness and general respiratory distress and impaired performance (3-5). Moreover features of the workplace that have documented effects on health include characteristics of the task itself (e.g. workload, pacing, deadlines and repetition), of the organization (e.g. decision control and job ambiguity), interpersonal relationships with co-workers and supervisors and physical and environmental hazards (6).

In this paper we study the self-assessed health of female nurses, cabin crew and elementary school teachers. These occupations are service-oriented and predominantly and traditionally female. Their member's meet the individual needs of their clients often in stressful situations and their clientele (passengers, students and patients) may request total attention at the same time as the worker is tending to multiple needs of other clients. The three occupational groups all work indoors, their work is physically strenuous, and nurses and cabin crew also work irregular hours. A number of studies have addressed the conflicting demands made on members of these

professions and their psychological and physical consequences. The emphases in these studies have, however, differed between these three occupations.

Among nurses and teachers, stress and stress symptoms, with a specific focus on identifying stressors and their associations with well-being, are highly studied variables (7-14). Depression (15,16), burnout (15,17,18), absenteeism (19,20) and violence (21,22) have all been associated with stress and stressful environment in the classroom. For nurses on the other hand, workload (23), leadership/management style (24), professional conflict (25), the emotional toll of caring (26), organizational and managerial characteristics of the work (11,27,28), lack of reward and shift work have been found to be major sources of stress (12,29).

It has been suggested that the indoor air in the class- room induces serious health threats for teachers due to special pollutant sources (like dust and particles of chalk) used in art rooms, science laboratories and vocational labs (4,30). Voice disorders, including symptoms of soreness, hoarseness, weak voice and sore throat are occupation-related symptoms that have been described among teachers and related to the classroom environment (31,32). On the other hand musculoskeletal symptoms have received similar attention among nurses and nursing personnel (33-35). Studies have addressed the health and well-being of cabin crew from a different perspective. There the focus has been on the association between cabin crew job duties and the cabin environment (36) and on cabin air quality and its health effects and radiation exposure with its effect on cancer incidence and reproductive outcome (37-41). We found few studies on symptom experience among cabin crew, but general complaints or symptoms reported in those studies include symptoms from upper and lower airways and from the musculoskeletal system (39,42,43); stress-related symptoms (44); psychological distress (45) and sources of stress (46); irritation of skin, eyes and

throat (39,42,47,48); digestive disturbances (49); sleeping problems (42,48) and infection (50).

The only study found where occupations were compared in a similar way as is done here is a study conducted by Whelan *et al.* (41) on prevalence of work-related symptoms between cabin crew and teachers. Their findings were that cabin crew reported significantly more chest illness than teachers (32.9% and 19.3% respectively) during three years prior to the study, but the prevalence of other respiratory symptoms e.g. wheezing, nose, throat, flu and cold symptoms, did not differ between the two occupations.

A recent multi-country study, conducted by the World Health Organization (51) on the international migration and mobility of nurses, found that inadequate working conditions are one of the main factors driving nurse migration. It seems important to describe these conditions and other factors related to the work of nurses. To compare these factors with other female dominated occupations, such as teachers and flight attendants, gives an even fuller description of the nurse's work.

Due to the gender distribution of members of these occupations as well as their service oriented work it is of interest to study their occupational environment.

Aim

The specific aim of the present study is to describe the self-assessed occupational health among female nurses, female cabin crew and teachers in relation to their working environment. Specific research questions are:

1. What is the difference in self-assessed occupational health between female nurses, cabin crew and teachers?

2. What is the difference in self-assessed working environment between female nurses, cabin crew and teachers?
3. What are the simultaneous effects of the working environment and social-demographics on self-assessed occupational health within the three occupational groups?

MATERIAL AND METHODS

Design

A correlation-descriptive design was used, with a postal questionnaire and one phone call reminder and one postal follow-up reminder. Data were collected in 2002.

Participants

The population of this study were all working female nurses registered with the Icelandic Nurses Association (INA), all female members of the Icelandic Cabin Crew Association (ICCA) with at least two years' working experience, and all female school teachers registered with the Association of Teachers in Primary and Lower Secondary Schools (ATPLSS). According to information from the ICCA, the cabin crew participating in this study worked on both domestic and international routes. The longest flight they have is about eight hours, while the most common length of time in the air is three hours. The aircraft type is Boeing 757 and on commercial flights the flying altitude is 37.000 – 39.0000 ft. Approximately 94% of the nursing work force in Iceland including nurses working in higher and middle management, are members of the INA, approximately 83% of all working cabin crew meeting the criteria are members of the ICCA and all working elementary school teachers, except for teachers working in upper and middle management, are members of the ATPLSS.

Procedure

In April 2002 a questionnaire was sent to all those who fulfilled the criteria of the study, with the exception of those who were on the board of the ICCA, as they had been involved in the preparation of the study and had scrutinized the questionnaire beforehand. In June all those who had not answered the questionnaire and could be reached, received a reminding phone call and in August the questionnaire was re-mailed to those not yet responding. A total of 371 cabin crew received a questionnaire and 255 (68.7%) returned it completed. A random sample of 600 nurses was taken from the registry of the INA of a total of 2312 nurses who met the criteria. The nurses' response rate was 65.7% (N=394). A random sample of 600 teachers was taken from the registry of the ATPLSS of a total of 3368 teachers who met the criteria. The teachers' response rate was 69% (N=415).

Instrument

Data were collected with a questionnaire called *Women's Health: A Questionnaire about Health, Well-Being and Working Conditions of Female Nurses/Cabin Crew/Teachers*. The questionnaire is divided into nine chapters: 1. Background and socio-demographic information (13-15 questions depending on the profession answering the questionnaire); 2. Reconciliation of work and family life (5 questions); 3. Health and lifestyle (17 questions); 4. Sleeping habits (19 questions); 5. Gynecology and reproductive life (20 questions); 6. Health prevention, symptoms, treatment (20 questions); 7. Work-related factors (5 questions); 8. Harassment in the workplace (7 questions) and 9. Working conditions (18 questions).

The questionnaire was based on a number of questionnaires that have been used in different studies in Iceland (10,52-55).

Ethical considerations

The National Bioethics Committee approved the study (VSN 01-26) and the Data Protection Commission was informed according to law. Participants were given written information and informed that all participation was voluntary, that all information would be treated confidentially and they were given the option of contacting the researchers if they had any questions.

Data analysis

In the analysis the emphasis was on demographics, working environment, and occupational health.

Demographic variables, including age in years, marital status (in cohabitation or not in cohabitation), number of children under the age of 18 in the custody of the participant, and caring for aged parents/relatives (very little or not at all/somewhat or very much) were assessed.

Working environment included questions on control of work pace, job security, the degree of physical monotony of the work, assistance from co-workers or clientele (students/passengers/patients) in performing work, physical difficulty of the work, physical exhaustion after work and ability to work comfortably and a list of 15 environmental risk factors developed by Kuorinka *et al.* (52) and Lindström *et al.* (54). Control of work pace was addressed with a five faceted question with responses being rarely or never (1), seldom (2), sometimes (3), often (4), very often or always (5). Participants were asked how secure they were of their job with responses ranging

from 1 to 4 with 1 indicating high security and 4 indicating low security. Degree of physical monotony/diversity of the work was assessed with responses being very diverse (1), rather diverse (2), rather monotonous (3) and highly monotonous (4). Assistance from co-workers or clientele was addressed by the question *Do you consciously try to reduce physical strain at work by asking others like passengers (other nurses, other teachers) to assist you?* Responses ranged from 1 to 4 with 1 indicating that they always do ask for assistance and 4 that they never do. Questions addressing physical difficulty of the work, physical exhaustion after work and ability to work comfortably were combined into one variable, labelled *Physical strenuous work* (Cronbach's α was 0.79). Higher score on this variable indicates less strenuous work. Participants were also asked to assess, by marking on a scale, if any of a list of 15 environmental risk factors had caused them distress often (1), sometimes (2) or never (3). Factor analyses were carried out in order to assess the environmental risk factors relevant to each occupation. Three factors emerged with eigenvalues greater than one, together accounting for 53.7% of the variance. A varimax rotation, using Kaiser normalization, was performed. The results are summarized in Table 1. Only one factor, *Physical environment scale*, is included in further analyses. Higher score on this scale indicates less distress caused by the environmental factors. Factor two was excluded since there was no theoretical link between the three items and the internal reliability of factor three was not acceptable.

(INSERT TABLE 1)

Occupational health was assessed using a list of 38 symptoms. This symptom list is based on symptom check lists that measure various health-related items (32,56). In

addition the ICCA suggested symptoms specific for cabin crew. Participants were asked to answer as to each symptom if they had never (1), sometimes (2), often (3) or constantly (4) experienced it during the last 12 months. In order to reduce the data for further analysis we started by carrying out factor analysis on the symptom list. Ten factors emerged with eigenvalues greater than one, together accounting for 54.2% of the variance. A varimax rotation, using Kaiser normalization, was performed. The results are summarized in Table 2.

(INSERT TABLE 2)

Factors were mostly interpreted based on factor loading above 0.4. Five symptom factors were easily interpretable and had satisfactory Cronbach's α . These were: *Musculoskeletal scale*, *Stress and exhaustion scale*, *Common cold scale*, *Gastrointestinal scale*, and *Sound perception scale*. Seventeen symptoms did not load highly on the interpretable factors. However symptoms that were of theoretical relevance and increased the internal consistency of each factor were included into relevant factor scales. By adding the symptoms increased urination, nausea or vomiting and fainting spells or dizziness into the *Stress and exhaustion scale*, its Cronbach's α increased from 0.8081 to 0.8240. Similarly, by adding the symptom stomach ache into the *Gastrointestinal scale* its Cronbach's α increased from 0.6844 to 0.6966. The number of symptoms in the *Stress and exhaustion scale* are therefore 11, not 8 as shown in Table 2, and in the *Gastrointestinal scale* 3 instead of 2 as shown in Table 2.

In order to detect significant differences between the occupational groups with regard to the study variables, analysis of variance was performed. Regression models

were used to estimate the simultaneous effects of the working environment variables and social-demographics on health indicators within the three occupational groups.

Independent variables were included into the equation using the “enter method”.

The analysis of data was performed using the Statistical Package for the Social Sciences 7.5.1 software (57).

RESULTS

Socio-demographics

The mean age of the sample, number of children and other characteristics of the sample, including mean scores of the variables under study and significant differences between the three occupational groups, are summarized in Table 3. While looking at the data presented in Table 3 as well as in Table 4 it should be kept in mind that there is an inverse relationship between scores on the *Physical environment scale*, the *Physical strenuous work scale* and the *Work pace* variable as compared to the other working environment variables and to the symptom subscales. On average the participants were in their early forties, cohabited (90% of flight attendants and 92% of teachers and nurses ($\chi^2(2)= 0.226;p.=n.s.$) and had two children.

(INSERT TABLE 3)

Twenty seven percent of nurses, 21% of teachers and 23% of flight attendants took some care of an elderly relative. The difference was not significant ($\chi^2(2)= 2.286$).

Difference in self-assessed occupational health between the three occupational groups

The groups assessed their health differently as the significant difference between the occupational groups in four out of the five symptom scales reflects (Table 3). Cabin crew scored significantly higher on the *Gastrointestinal scale* and the *Sound perception scale* than nurses and teachers, and nurses scored significantly lower on the *Stress and exhaustion scale* than cabin crew and teachers. Cabin crew scored significantly higher than teachers and nurses on the *Common cold scale*, with teachers also scoring significantly higher than nurses on that scale.

Difference in self-assessed working environment between the three occupational groups

There was a significant difference between the occupational groups with regard to all the working environment variables (Table 3). Cabin crew were significantly more likely than nurses and teachers to report less job security, discomfort from their physical working environment, and they found their work physically more strenuous than the other groups. Cabin crew found their work more monotonous than teachers, who differed significantly from nurses who were the occupational group reporting greatest complexity in their physical work. Nurses were significantly more likely than cabin crew and teachers to consciously try to reduce physical strain by asking co-workers or patients to assist them. Teachers were however more likely to ask for help than cabin crew and were significantly more likely to be able to control their work pace than both nurses and cabin crew.

Simultaneous effects of the working environment variables and social-demographics on health indicators within the three occupational groups

In Table 4 the self-assessed symptom scales were regressed on the working environment variables and social-demographic characteristics (the bivariate correlations between the scores on the symptom scales and the working environment variables and social-demographic characteristics variables are shown in Appendix 1). This was done separately for each group. Therefore, while Table 3 shows comparison between the occupational groups, Table 4 shows the effect of the environmental variables and the socio-demographics within each occupational group.

INSERT TABLE 4

For all the occupations there was a positive relationship between experiencing their physical environment badly and assessing their symptoms worse. This applied to all five symptom subscales after the other independent variables had been taken into consideration.

The occupations differed somewhat with respect to the effect of the other working and socio-demographic variables. Nurses that reported physically strenuous work on the average also assessed their musculoskeletal symptoms and gastrointestinal symptoms worse than nurses who found their job less strenuous, net of the other independent variables. Older nurses were more likely than younger nurses to report worse musculoskeletal symptoms and gastrointestinal symptoms, while younger nurses were likelier than the older ones to report symptoms of common cold. Finally among nurses there was a positive relationship between reporting the work physically monotonous and scoring higher on the *Sound perception scale*.

Teachers reporting physically strenuous work also assessed their musculoskeletal, stress and exhaustion and common cold symptoms worse than teachers who found their job less strenuous, controlling for the other independent variables. Older teachers were more likely than younger teachers to report worse sound perception and musculoskeletal symptoms while younger teachers were likelier than the older ones to report symptoms of common cold and of stress and exhaustion. Taking care of older relatives had negative effect on stress and exhaustion and not living in cohabitation also had negative effect on stress and exhaustion as well as on musculoskeletal symptoms among teachers.

Finally, cabin crew reporting physically strenuous work assessed their musculoskeletal and stress and exhaustion symptoms worse than cabin crew who reported their job less strenuous, controlling for the other independent variables. Older cabin crew were more likely than younger cabin crew to report worse musculoskeletal symptoms while younger cabin crew were likelier than the older ones to report common cold and gastrointestinal symptoms. Finally, cabin crew with fewer children reported worse musculoskeletal symptoms than cabin crew with more children and reporting the work to be physically monotonous had negative effect on gastrointestinal symptoms.

DISCUSSION

A major finding of this study is that nurses tend to assess their working environment in somewhat more positive way and report less severe symptom experience than cabin crew and teachers. Most notable, in comparison to the other occupations, nurses report their job as physically diverse, they work as a team, as reflected in the finding

that they seek assistance from others in their work environment, and they experience less stress and exhaustion. The finding that nurses scored significantly lower than cabin crew and teachers on the *Stress and exhaustion scale* came as a surprise, since a number of studies have reported on the stressful and exhausting aspect of the work done by nurses (11,26,27,29) and internationally there are repeated reports on the stressfulness of the nurse's job (12). This has resulted in conclusions regarding the troubled and stressful work environment of nurses. Overly negative portraits of the nurses job may result in fewer young people entering the nursing profession, thereby adding to the international crisis of nurse's shortage described vividly recently (58). Our study, however, compares nurses with two other female dominated occupations and finds that nurses are doing better. This should be highlighted and nurses told about the positive aspects of their work. Keeping this in mind it can not be disregarded that studies on stress among nurses have reported different levels of stress among them depending on workplace i.e. hospital vs. community health and on position managerial vs. staff nurse. It is suggested that besides the nursing itself, organizational and managerial characteristics influence the stress nurses experience at work (24,25, 28). In this analysis we did not differentiate between the different workplaces of participants and the positions they held. It is therefore possible that the more varied work places and positions nurses held, in comparison to both teachers and cabin crew may have influenced the findings. Still, it should be highlighted that this also reflects the reality for these occupations, which is that the work opportunities for nurses in general are much more varied than for teachers and cabin crew. Additionally, the daily team work of nurses, with other nurses and other professionals, may serve as a buffer against stress and exhaustion.

However the findings regarding stress and exhaustion in teachers and cabin crew cannot be overlooked. The working environment of teachers and cabin crew has been described as highly stress provoking. Concerns in the working environment of cabin crew are violent passengers, the responsibility that the cabin crew bears during flight (50) and the increasing dread of terrorist attack. Cabin crew are responsible for safety and are the ones having to handle emergencies that can occur during a flight, be it a medical problem, violent passengers, a fire, a terrorist attack etc. (59). There are no published Icelandic studies on sources of stress among cabin crew, but a qualitative Italian study of female cabin crew found isolation and solitude, interaction with passengers, and lack of protection by employers with respect to workplace exposure and air rage, to be sources of stress among them (46). Our study was conducted one year after the terrorist attack of September 11, 2001 and it should be noted that Icelandair was the first foreign airliner granted permission to enter USA air space after the attack. These factors may contribute to the high score on the *Stress and exhaustion scale* among the cabin crew.

Among teachers studies on sources of stress have focused on burnout and violence (15,17,21). In modern societies demands made by parents and society in general are constantly increasing and are becoming unrealistic given the resources the teacher has (18,60). The findings of an Icelandic study indicate that sources of burnout and stress are found in the working environment and relate to role conflicts, professional isolation, lack of support, ineffective teaching aids, student disciplinary and behavioural problems, inadequate working conditions and general lack of respect for the teacher's role (60). A German study found that besides high numbers of pupils in one class, teachers regard destructive and aggressive behaviour of pupils as the primary stress factor (61). All of these factors may contribute to the high score on the

Stress and exhaustion scale among teachers. However further research is needed in order to clarify factors in the working environment of different occupations that may contribute differently to stress productions in member of the occupations.

Another major finding of the study is that in comparison to nurses and teachers, cabin crew members assess their health worse and experience their working environment as more demanding. They report a higher score than teachers and nurses on the *Physical environment scale* and on three out of the five symptom subscales i.e. the *Common cold scale*, the *Gastrointestinal scale* and the *Sound perception scale*, and higher score than nurses on the *Stress and exhaustion scale*. In comparison to the other occupations, cabin crew are also more likely to experience less job security, their work as being more physically strenuous and monotonous, and are less likely to seek assistance from their co-workers or from passengers. In comparison to teachers, cabin crew experience less control of work pace. To explain the differences found between cabin crew and nurses and teachers, one must look at the cabin environment and the responsibility cabin crews have in the air. Cabin crew worldwide, as well as in Iceland, have repeatedly asked questions about their working environment and its effect on their health (62). Prevalence of various respiratory symptoms, hearing impairment and gastrointestinal symptoms has been reported among cabin crew (43,49,50), though the associations with the cabin crew environment have not been validated. Our findings indicate that the cabin environment might affect general well-being. Cabin environment is in many aspects unique and has been described as a cocktail of problems, the major ones being the continual air recirculation which prevents flushing of contaminants from the aircraft's internal environment, humidity, carbon dioxide, ozone levels, various chemical contaminants and cabin pressure (50). Studies on cabin crew health and comfort in airline cabins (36, 63) indicate that

various complaints and symptoms reported by cabin crew appear to be associated with their job duties and the cabin environment. However a relationship between complaints and possible exposure to the cabin environment has not been proven and the complaints can be attributed to other factors (36). Our study does not include objective measurements of the working environment of our participants or of their health status. We are, however, comparing women in three occupations and the cabin crew differs from the other two occupations. The most likely explanations for the difference are cabin air quality, cabin pressure, humidity and possibly disruption of circadian rhythm and longer flights, as these have all been suggested as causative in symptom production among cabin crew (36,49). Nevertheless, more studies are needed in order to confirm this.

A third major interesting finding is that within each occupation the physical environment and, to a different extent, the experienced physical strain had the most significant effect on symptom reporting. This finding indicates that across occupations the physical environment and bodily comfort are highly rated when it comes to providing a healthy environment for workers.

Finally our finding that teachers report higher respiratory distress than nurses supports theories about the influence of the classroom environment on respiratory symptoms, but the indoor air in the class room has been suggested to induce serious health threats with special pollutant sources used in art rooms, science laboratories and vocational labs (pollutants like dust and particles of chalk) (4,30). It can also be speculated that the closeness to school children may predispose teachers to common cold symptoms. For example, it is known that school children are carriers of certain pathogens and that nasal carrier of specific pathogens like *Streptococcus pneumoniae* are presumed to play a role in the transmission of it to adults (64,65). Finally, it

should be mentioned that two of the symptoms that loaded on to the *Common cold scale*, i.e. soreness and hoarseness, relate to the voice of the teacher. This would be consistent with the findings of a number of studies that have confirmed that teachers are at high risk for disability from voice disorders (31,32).

The main weakness of this study is the well-known limitations of questionnaires with possible bias from rating behaviour, and the possibility of recall bias (66). This limitation may especially be at work here since in Iceland nurses in general have greater knowledge of postal questionnaires than the other two occupations, which might account for the difference found between them and the other occupations. Another limitation is the number of participants, but less than 70% of the samples of each occupation responded despite extensive methods in order to improve response rate.

CONCLUSION AND RECOMMENDATION

The study highlights difference in self-assessed occupational health and working environment among three groups of working women. Nurses seem to assess their health and working environment in a more positive light than teachers and cabin crew. In particular nurses reported less stress and exhaustion, greater complexity with their physical work, more cooperation with their co-workers and being better able to control their work pace. Thus it seems that teachers and cabin crew deserve special attention in further studies. However, within each occupation the physical working environment and how physically strenuous the work was found to be had a negative effect on the occupational health assessment net of the other independent variables. It is recommended that employers take these factors into account when they conduct workplace risk assessment.

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REFERENCES

1. Statistics of Iceland. (2003) *Landshagir. Statistical yearbook of Iceland*. 2003, Statistics Iceland, Reykjavík, 85-88
2. Doyle L. *What makes women sick. Gender and the Political Economy of Health* 1995, MacMillan Press Ltd, London, 152-176..
3. Reecer M. When students say school makes them sick, sometimes they are right. *The American School Board Journal* 1988; 175: 17-21.
4. Grubb D. Diamantes T. Is your school sick? Five threats to healthy schools. *Clearing House* 1998; 71: 202-207.
5. Mendell MJ, Fisk WJ, Kreiss K, Levin H, Alexander D, Cain WS, Girman JR, Hines CJ, Jensen PA, Milton DK, Rexroat LP, Wallingford KM. Improving the health of workers in indoor environments: Priority research needs for a national occupational research agenda. *American Journal of Public Health* 2002; 92: 1430-1440.
6. Killien MC. Women's work women's health. In *Handbook of Clinical Nursing Research* (Hinshaw AS, Feetham SL, Shaver JLF eds). 1999, Sage Pub Inc, California, 459-483.
7. Pithers RT, Soden R. Scottish and Australian teacher stress and strain: A comparative study. *The British Journal of Educational Psychology* 1998; 68: 269-279.
8. Pithers RT, Soden R. Person-environment fit and teacher stress. *American Educational Research Journal* 1999; 41: 51-61.

9. Griffith J, Steptoe A, Cropley M. An investigation of coping strategies associated with job stress in teachers. *The British Journal of Educational Psychology* 1999; 69: 517-531.
10. Biering P. *Könnun á vinnuálagi og starfsánægju hjúkrunarfræðinga (A study on workload and job satisfaction among Icelandic nurses)*. 2000, Rannsóknastofnun í hjúkrunarfræði, Háskóli Íslands, Reykjavík: 59 – 77.
11. Lee I, Wang H. Perceived occupational stress and related factors in community nurses. *The Journal of Nursing Research* 2002; 10: 253-260.
12. McVicar A. Workplace stress in nursing: A literature review. *Journal of Advanced Nursing* 2003; 44: 633-642.
13. Reglin G, Reitzammer A. Dealing with the stress of teachers. *Education* 1998; 118: 590-596.
14. Santos SR, Carroll CA, Cox KS, Teasley SL, Simon SD, Bainbridge L, Cunningham M, Ott L. Baby boomer nurses bearing the burden of care: A four-site study of stress, strain, and coping for inpatient registered nurses *The Journal of Nursing Administration* 2003; 33: 243-250.
15. Abel MH, Sewell J. Stress and burnout in rural and urban secondary school teachers *The Journal of Educational Research* 1999; 92: 287-298.
16. Schonfeld IS. An updated look at depressive symptoms and job satisfactions in first-year women teachers. *Journal of Occupational and Organizational Psychology* 2000; 73: 363-371.
17. van Horn JE, Schaufeli WB, Greenglass ER, Burke RJ. A Canadian-Dutch comparison of teachers' burnout *Psychological Reports* 1997; 81: 371-382.
18. Baldursdóttir AÞ. Kennarar og kulnun (Teachers and burnout). *Uppeldi og menntun* 2002; 11: 171-189.

19. Norton MS. Teacher absenteeism: A growing dilemma in education. *Contemporary Education* 1998; 69: 95-100.
20. Aronsson G, Gustafsson K, Dallner M. Sick but yet at work. An empirical study of sickness presenteeism. *Journal of Epidemiology and Community Health* 2000; 54: 502-509.
21. Kelder SH, Orpinas P, McAlister A, Frankowski R, Parcel GS, Friday J. The students for peace project. A comprehensive violence – prevention program for middle school students. *American Journal of Preventive Medicine* 1996; 12: 22-30.
22. Escobar-Chaves SL, Tortolero SR, Markham C, Kelder SH, Kapadia A. Violent behavior among urban youth attending alternative schools. *The Journal of School Health* 2002; 72: 357-362.
23. Sveinsdóttir H, Biering P, Ramel, A. Occupational stress, job satisfaction, and working environment among Icelandic nurses: A cross-sectional questionnaire survey. *International Journal of Nursing Studies*, In Press , available online 19 December 2005.
24. Stordeur S, D'hoore W, Vandenberghe C. Leadership, organizational stress, and emotional exhaustion among hospital nursing staff. *Journal of Advanced Nursing* 2001; 35: 533-542.
25. Sveinsdóttir H & Biering P. Vinnuálag og starfsánægja hjúkrunarfræðinga í heilsugæslu (Workload and job satisfaction among nurses in community health). In. *Framtíðarsýn innan heilsugæslunnar (Vision of the future within the health care)*, (Sveinsdóttir H, Nyysti A, eds). 2001, Háskólaútgáfan & Rannsóknastofnun í hjúkrunarfræði, Reykjavík: 202-215
26. Payne N. Occupational stressors and coping as determinants of burnout in female hospice nurses. *Journal of Advanced Nursing* 2001; 33: 396-405.

27. Gray-Toft P, Anderson JG. Stress among hospital nursing staff: Its causes and effects. *Social Science & Medicine* 1981; 15: 639-647.
28. Snelgrove SR. Occupational stress and job satisfaction: A comparative study of health visitors, district nurses and community psychiatric nurses. *Journal of Nursing Management* 1998; 6: 97-104.
29. McGowan B. Self-reported stress and its effects on nurses. *Nursing standard : Official Newspaper of the Royal College of Nursing* 2001; 15: 33-38.
30. Jónsdóttir V. Hugsa þarf betur um raddheilsu kennara (We need to think more about teachers vocal health). *Ný menntamál* 1997; 1: 15-18.
31. Smith E, Lemke J, Taylor M, Kirchner HL, Hoffman H. Frequency of voice problems among teachers and other occupations. *Journal of Voice: Official Journal of the Voice Foundation* 1998; 12: 480-488.
32. Williams NR. Occupational groups at risk of voice disorders: A review of the literature. *Occupational Medicine* 2003; 53: 456-460.
33. Daraiseh N, Genaidy AM, Karwowski W, Davis LS, Stambough J, Huston RL. Musculoskeletal outcomes in multiple body regions and work effects among nurses: The effects of stressful and stimulating working conditions. *Ergonomics* 2003; 46: 1178-1199.
34. Engkvist I, Hjelm EW, Hagberg M, Menckel E, Ekenvalt L. Risk indicators for reported over-exertion back injuries among female nursing personnel. *Epidemiology* 2003; 11: 519-522.
35. Gunnarsdóttir HK, Rafnsdóttir GL, Helgadóttir B, Tomasson B. Psychosocial risk factors for musculoskeletal symptoms among women working in geriatric care. *American Journal of Industrial Medicine* 2003; 44: 679-684.

36. Nagda N, Koontz MD. Review of studies on flight attendant health and comfort in airliner cabins. *Aviation, Space, and Environmental Medicine* 2003; 74: 101-109.
37. Ballard T, Lagorio S, De Angelis G, Verdechia A. Cancer incidence and mortality among flight personnel: A meta-analysis. *Aviation, Space, and Environmental Medicine* 2000; 71: 216-224.
38. Nicholas JS, Copeland MS, Duce FE, Friedberg W, O'Brien III K. Galactic cosmic radiation exposure of pregnant flight crew members. *Aviation, Space, and Environmental Medicine* 2000; 71: 647-648.
39. Pierce WM, Janczewski JN, Roethlisberger B, Janczewski MG. Air quality on commercial aircraft. *American Society of Heating, Refrigerating and Air-Conditioning Engineers* 1999; 41: 26-34.
40. Rafnsson V, Hrafnkelsson J, Tulinius H. Incidence of cancer among commercial airline pilots. *Occupational and Environmental Medicine* 2000; 57: 175-179.
41. Whelan EA, Lawson CC, Grajewski B, Petersen MR, Pinkerton LE, Ward EM, Schnorr TM. Prevalence of respiratory symptoms among female flight attendants and teachers. *Occupational and Environmental Medicine* 2003; 62: 929-934.
42. Haugli L, Skogstad A, Hellesøy OH. Health, sleep and mood perceptions reported by airline crews flying short and long haul. *Aviation, Space, and Environmental Medicine* 1994; 65: 27-34.
43. Lindgren T, Andersson K, Dammstrom BG, Norback D. Ocular, nasal, dermal and general symptoms among commercial airline crews. *International Archives of Occupational and Environmental Health* 2002; 75: 475-83.

44. MacDonald LA, Deddens JA, Grajewski BA, Whelan EA, Hurrell JJ. Job stress among female flight attendants *Occupational and Environmental Medicine* 2003; 45: 703-714.
45. Ballard TJ, Romito P, Lauria L, Vigiliano V, Caldora M, Mazzanti C, Verdecchia A. Self perceived health and mental health among women flight attendants. *Occupational and Environmental Medicine* 2006; 63: 33-38
46. Ballard TJ, Corradi L, Lauria L, Mazzanti C, Scaravelli G, Sgorbissa F, Romito P, Verdecchia A. Integrating qualitative methods into occupational health research: A study of women flight attendants. *Occupational and Environmental Medicine* 2004; 61: 163-166.
47. Eng WG. Survey on eye comfort in aircraft: 1. Flight attendants. *Aviation, Space, and Environmental Medicine* 1979; 50: 401-404.
48. Smolensky MH, Lee E, Mott D, Colligan M. A health profile of American flight attendants. *Journal of Human Ergology* 1982; 11: 103-119.
49. Enck P, Muller-Sacks E, Holtmann G, Wegmann H. Gastrointestinal problems in airline crew members. *Zeitschrift fur Gastroenterologie* 1995; 33: 513-516.
50. Boyd C, Bain P. 'Once I get you up there, where the air is rarified': Health, safety and the working conditions of cabin crews. *New Technology, Work and Employment* 1998; 13: 16-28.
51. World Health Organization, International Council of Nurses, Royal College of Nursing UK. International Nurse Mobility: Trends and Policy Implications. Internet (retrieved 07.11.2004): http://www.icn.ch/PR22_03.htm
52. Kuorinka I, Jonsson B, Kilborn A, Vinterberg H, Biering-Sørensen F, Andersson G, Jörgensen K. Standardized Nordic questionnaire for the analysis of musculoskeletal symptoms. *Applied Ergonomics* 1987; 18: 233-237.

53. Benediktsdóttir B, Tómasson K, Gíslason Þ. Einkenni breytingaskeiðs og meðferð þeirra hjá 50 ára íslenskum konum (Menopausal symptoms and their treatment among 50 year old Icelandic women). *Læknablaðið* 2000; 86: 501-507.
54. Lindström K, Elo A-L, Skogstad A, Dallner M, Gamberale F, Hottinen V, Knardahl S, Ørhede E. *User's Guide for the QPSNordic. General Nordic Questionnaire for Psychological and Social Factors at Work*. TemaNord 2000, 603. Nordic Council of Ministers, Copenhagen.
55. Sveinsdóttir H. "Premenstrual syndrome: A myth or reality in women's lives?" *A community study on premenstrual experiences in Icelandic women*. 2000, Umeå University Medical Dissertations New Series No 657, Umeå, Sweden.
56. Mitchell ES, Woods NF, Lentz MJ. Recognising PMS when you see it: Criteria for PMS sample selection. In. *Menstruation, health and illness*. (Taylor DL, Woods NF, eds), 1991, Hemisphere, Washington D.C.: 89-102.
57. SPSS Inc. *SPSS for Windows. User's Guide* 10.0 ed., SPSS Inc., 1999, Chicago.
58. International Council of Nurses (2004). *The Global Shortage of Registered Nurses: An Overview of Issues and Actions*. Geneva: International Council of Nurses: Internet (retrieved October 17 2005
<http://www.icn.ch/global/shortage.pdf>)
59. Bor R, Russell M, Parker J, Papadopoulos L. *Managing Disruptive Passengers: A Survey of the World's Airlines*. London: Psychology Department, London Guildhall University. 2002, available from:
<http://www.skyrage.org/PDF/ACADEMIC/RBor.pdf> 15. (15. March 2004)

60. Travers CJ, Cooper GJ. *Teachers under pressure. Stress in the teaching profession*. 1996, Routledge, London, 187-199.
61. Bauer J, Stamm A, Virnich K, Wissing K, Müller U, Wirsching M, Schaarschmidt U. Correlation between burnout syndrome and psychological and psychosomatic symptoms among teachers. *International Archives of Occupational and Environmental Health* 2006, 79, 3, 199-204.
62. National Research Council. *The Airliner Cabin Environment and the Health of Passengers and Crew*. 2002, National Academies Press, Washington D.C.
63. Lindgren T, Norbäck D. Health and perception of cabin air quality among Swedish commercial airline crew. *Indoor Air, Supplement* 2005, 15, 10, 65-72.
64. Ridgway EJ, Tremlett CH, Allen KD. Capsular serotypes and antibiotic sensitivity of *Streptococcus pneumoniae* isolated from primary school children. *The Journal of Infection* 1995; 30: 245-251.
65. Sherertz RJ, Reagan DR, Hampton KD, Robertson KL, Streed SA, Hoen HM, Thomas R, Gwaltney J. A cloud adult: The *Staphylococcus aureus*-virus interaction revisited. *Annals of Internal Medicine* 1996; 124: 539-547.
66. Toomingas A, Alfredsson L, Kilbom A. Possible bias from rating behavior when subjects rate both exposure and outcome. *Scandinavian Journal of Work & Environmental Health* 1997; 23: 370-7

Table 1 Factor analyses of items indicating environmental risk factors: brief item description and factor loading.

Items	Factor 1	Factor 2	Factor 3
Factor 1 - Physical environment			
Stuffy air	0.79	0.20	0.06
Dry air	0.75	0.32	0.06
High temperature	0.70	0.24	0.03
Uncomfortable odour	0.63	0.12	0.34
Close quarters	0.61	0.37	0.26
Too much cold	0.52	0.47	0.19
Static electricity	0.51	0.29	0.30
Noise	0.49	0.36	0.21
Draft	0.45	0.24	0.35
Factor 2			
Burns caused by ventilated ovens	0.23	0.84	0.11
Ventilated ovens	0.19	0.83	0.21
Dust and dirt	0.37	0.43	0.391
Factor 3			
Sticky floors	0.13	0.14	0.76
Smoking	-0.00	0.14	0.64
Slippery floor	0.32	0.33	0.60
Lighting	0.30	0.09	0.33
Eigen values	6.134	1.264	1.188
Percentages of variance	38.3	7.9	7.4
Cronbachs	.84	.74	.36

Extraction Method: Principal Component Analysis Rotation Method:
Varimax with Kaiser Normalization.

Loadings in bold indicate items contributing to each factor

Table 2 Factor analyses of symptoms: Brief item description and factor loading for the five factors that are used in data analysis.

Items	F.1	F.2	F.3	F.4	F.5
Musculoskeletal symptoms (F.1)					
Pain or stiffness in arms or legs	0.82	0.11	0.01	0.06	0.02
Swollen or painful muscles or joints	0.78	0.16	0.02	0.07	0.02
Difficulty with feet and legs when standing for long periods	0.68	0.07	0.02	0.12	0.10
Backache	0.64	0.19	0.13	0.08	0.05
Persistent numbness/tingling in some body part	0.64	0.22	-0.02	0.01	0.03
Stress and exhaustion symptoms (F.2)					
Headache	0.35	0.29	0.31	0.18	0.02
Depression	0.10	0.76	0.03	0.06	0.03
Anxiety or tension	0.15	0.70	0.06	0.10	0.05
Tiredness	0.46	0.63	0.09	-0.02	0.04
Rapid mood changes	0.1	0.60	0.15	0.13	0.08
Periods of severe fatigue or exhaustion	0.47	0.59	0.08	-0.01	0.11
Much sweat or trembling	0.12	0.39	0.00	0.13	-0.07
Fever, chills and aching all over	0.31	0.36	0.23	0.23	-0.03
Common cold symptoms (F.3)					
Cough	0.01	0.09	0.74	0.12	-0.02
Cold or flue	0.04	0.07	0.74	0.06	0.07
Soreness	0.08	0.10	0.73	-0	0.11
Hoarseness	0.01	0.04	0.58	-0.03	-0.05
Hay fever or sinus trouble	0.09	0.13	0.38	0.05	0.35
Gastrointestinal symptoms (F.4)					
Constipation	0.14	0.15	0.06	0.82	0.03
Trouble digesting food	0.16	0.23	0.12	0.66	0.14
Sound perception symptoms (F.5)					
Hearing impairment/loss of hearing	0.04	0.07	-0.01	0.01	0.81
Ringling or buzzing in ears	0.11	0.06	0.17	0.09	0.8
Eigen values	7.885	2.350	1.951	1.635	1.514
Percentages of variance	20.22	6.02	5.00	4.19	3.88
Cronbachs α	.8195	.8081	.7099	.6844	.6599

Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.

Loadings in bold indicate items contributing to each factor

Table 3 Comparison by use of analyses of variance between the occupational groups with socio-demographic characteristics, symptom scales and working environment variables.

	Cabin crew			Teachers			Nurses			Possible	ANOVA
	N	Mean	SD	N	Mean	SD	N	Mean	SD	Range	
<i>Socio-Demographic characteristics</i>											
Age in years	254	40.9	10.6	406	43.3	10.0	379	43.6	9.6	21 – 70	F(2,1036)=6.470;p=0.002
Children 1=0, 2=1, 3=2, 4=3	253	2.1	1.0	406	2.2	1.1	392	2.2	1.0	1 – 4	F(2,1048)=0.715;n.s.
<i>Symptom subscales</i>											
Gastrointestinal scale	233	4.8	1.7	369	4.3	1.5	351	4.4	1.5	3 – 12	F(2,950)=9.393;p<0.001
Sound perception scale	240	3.6	1.3	371	2.7	1.1	355	2.5	1.1	2 - 8	F(2,963)=60.968; p<0.001
Stress and exhaustion scale	221	17.4	4.1	328	17.3	4.5	331	16.1	3.6	11 – 44	F(2,877)=10.110; p<0.001
Common cold scale	232	9.1	2.2	359	8.6	1.9	343	7.9	1.9	5 – 20	F(2,931)=24.965; p<0.001
Musculoskeletal scale	232	9.1	3.0	357	8.5	3.2	348	8.6	3.1	5 – 20	F(2,934)=2.991;n.s.
<i>Working environment variables</i>											
Physical environment scale	209	17.1	3.9	364	21.5	3.6	337	21.5	4.1	9 – 27	F(2,907)=107.422;p p<0.001
Physically strenuous work	245	6.4	1.6	398	8.5	1.7	381	8.3	1.8	3 – 12	F(2,1021)=130.377; p<0.001
Work Pace	253	2.8	1.3	412	3.2	1.7	386	2.9	1.2	1 - 5	F(2,1048)=9.022; p<0.001
Job Security	252	2.3	0.6	413	1.7	0.7	389	1.6	0.6	1 - 4	F(2,1051)=89802; p<0.001
Physically monotonous work	252	2.5	0.6	410	2.1	0.8	386	1.9	0.7	1 - 4	F(2,1045)=35.053; p<0.001
Seek assistance	253	2.5	0.8	406	2.2	0.7	379	1.7	0.7	1 - 4	F(2,1035)=87.622; p<0.001

Note: There is an inverse relationship between scores on the Physical environment scale, the Physical strenuous work scale and the Work pace variable as compared to the other working environment variables and to the symptom subscales. Therefore higher scores on these variables indicate less discomfort from the environment, less strenuous work and greater control over work pace.

Table 4 Work environment indicators regressed on symptom scales and socio-demographic characteristics within occupational groups.

Independent Variables	Dependent Variables														
	Musculoskeletal scale			Stress and exhaustion scale			Common cold scale			Gastrointestinal scale			Sound perception scale		
	Nurses	Teachers	Cabin crew	Nurses	Teachers	Cabin crew	Nurses	Teachers	Cabin crew	Nurses	Teachers	Cabin crew	Nurses	Teachers	Cabin crew
<i>Working environment variables</i>															
Physical environment scale	-0,13**	-0,12*	-0,13*	-0,21**	-0,27**	-0,23**	-0,07*	-0,14**	-0,10*	-0,07**	-0,08**	-0,08*	-0,05*	-0,08**	-0,05*
Physical strenuous work	-0,60**	-0,53**	-0,63**	-0,16	-0,61**	-0,65**	0,00	-0,15*	-0,16	-0,18**	-0,07	-0,13	-0,03	-0,01	-0,07
Work Pace	0,12	-0,04	0,16	-0,12	0,06	0,02	-0,09	-0,12	-0,12	0,01	-0,06	-0,07	0,02	-0,04	-0,09
Job security	-0,10	0,06	-0,47	0,65	0,53	0,03	0,13	-0,03	0,15	0,10	0,08	-0,22	-0,20	-0,07	0,00
Physically monotonous work	0,17	0,25	0,39	0,35	0,05	0,64	0,11	-0,07	0,10	0,10	0,19	0,35*	0,21*	-0,08	0,11
Seek assistance	-0,29	0,34	-0,42	-0,49	-0,13	-0,43	-0,06	-0,03	0,28	-0,10	0,02	-0,20	-0,17	-0,03	0,18
<i>Socio-Demographic characteristics</i>															
Age	0,06**	0,02	0,06**	-0,04	-0,09**	-0,05	-0,03*	-0,03**	-0,05*	-0,01	-0,02	-0,03*	0,02**	0,02*	-0,01
Take care of elderly	0,35	0,53	-0,13	-0,20	1,30*	-0,38	0,03	0,01	0,51	-0,05	0,06	0,20	0,02	-0,17	0,07
Cohabitation	-0,13	-0,87*	0,84	-0,67	-1,66*	-0,70	-0,51	-0,34	-0,15	0,16	-0,40	-0,23	0,03	0,00	-0,13
Children	0,27	-0,01	-0,42*	0,37	0,29	0,01	0,14	0,12	-0,02	0,00	0,06	-0,15	0,02	-0,04	-0,06
Adjusted R ²	.169	.150	.252	.153	.197	.154	.063	.151	.123	.094	.080	.123	.056	.046	.059
Constant	13,29**	14,09**	13,17**	24,41**	31,95**	28,69**	11,39**	15,23**	12,57**	7,47**	7,55**	9,06**	3,13**	4,53**	4,97**
N	394	415	255	394	415	255	394	415	255	394	415	255	394	415	255

* $p < .05$; ** $p < .01$ (two-tailed test)

Note: The table reports unstandardized regression coefficients from ordinary least squares regression.

Note: There is an inverse relationship between scores on the Physical environment scale, the Physical strenuous work scale and the Work pace variable as compared to the other working environment variables and to the symptom subscales

Appendix 1

Pearsons Correlations between Work environment variables, socio-demographic characteristics and the symptoms scales.

	Sound perception scale			Stress and exhaustion scale			Common cold scale			Gastrointestinal scale			Musculoskeletal scale		
	Nurses	Teachers	Cabin crew	Nurses	Teachers	Cabin crew	Nurses	Teachers	Cabin crew	Nurses	Teachers	Cabin crew	Nurses	Teachers	Cabin crew
<i>Working environment variables</i>															
Physical environment scale	.153**	.224**	.253**	.363**	.343**	.335**	.233**	.346**	.258**	.297**	.267**	.267**	.286**	.214**	.272**
Physical strenuous work	.120	.139*	.173*	.265**	.185*	.241**	.125	.219**	.127	.288**	.173*	.133	.294**	.136	.254**
Work Pace	-.032	-.040	-.144*	-.210**	-.074	-.113	-.112	-.134*	-.132*	-.161**	-.119*	-.192**	-.164**	-.162**	-.121
Job security	.051	.037	-.069	-.144**	-.121*	-.069	-.014	.003	-.128	-.113*	-.039	-.046	-.026	-.036	.017
Physically monotonous work	.124*	.000	.106	.061	-.034	.199**	.026	-.077	.122	.046	.076	.239**	-.003	.049	.114
Seek assistance	-.065	-.051	.089	-.086	-.010	-.102	-.007	.029	.116	-.045	.004	-.061	-.038	.060	-.097
<i>Socio-Demographic characteristics</i>															
Age	.114*	.124*	-.021	-.204**	-.172**	-.146*	-.1889**	-.176**	-.213**	-.109**	-.087	-.138*	.098	.119*	.260**
Children	-.019	-.065	-.079	.115*	.060	-.024	.079	.070	-.010	.027	.009	-.100	.012	-.049	-.266**

Note: There is an inverse relationship between scores on the Physical environment scale, the Physical strenuous work scale and the Work pace variable as compared to the other working environment variables and to the symptom subscales