EVALUATION REPORT

International evaluation of Swedish work environment research

2006

SWEDISH COUNCIL FOR WORKING LIFE
AND SOCIAL RESEARCH

International evaluation of Swedish work environment research

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SWEDISH COUNCIL FOR WORKING LIFE AND
SOCIAL RESEARCH

Preface

In an amendment to the government assignments for 2005, the Swedish Council for Working Life and Social Research (FAS) was commissioned to analyse Swedish research in the area of occupational health, primarily chemical, physical and biological health risks and research on musculoskeletal disorders, including the association with mental stress. FAS was charged to undertake an inventory and evaluation of the research with special consideration for scientific quality and relevance as well as future research needs. The results were to be reported by 31 January, 2007 at the latest.

A Swedish reference group, set up by FAS, advised on various aspects throughout the evaluation process (for membership see Appendix I).

Professor Christer Hogstedt, National Institute of Public Health, chaired the reference group and coordinated the evaluation together with Ms Carin Håkansta and Ms Elisabeth Birke from FAS. Professor Olle Persson, Umeå University, assisted the international group with a bibliometrics analysis of published reports. Mr. Svante Sjöberg provided information on the history and present situation of Swedish funding of work environment research. Professors Staffan Skerfving and Hans Welinder, Lund University, submitted reviews of the history of Swedish occupational medicine and hygiene research. The library at the National Institute for Working Life (NIWL; Arbetslivsinstitutet) provided a listing of all relevant Swedish doctoral theses since 1941. Professor Jorma Rantanen, FIOH, contributed to parts of the evaluation.

This report, an important contribution to FAS' report to the government, was written by a group of international experts appointed by FAS in 2006. The group included: Professor David Wegman (Chair), Professor, Dean, School of Health and Environment, University of Massachusetts Lowell, USA; Associate Professor Alex Burdorf, University Medical Center Rotterdam, Netherlands; PhD Paul Oldershaw, UK Health and Safety Executive, Great Britain; Professor Brigitte Schulte-Fortkamp, Institute for Fluid Mechanic and Technical Acoustics of TU Berlin (ISTA), Germany; and Professor Eira Viikari-Juntura, Musculoskeletal Centre, Finnish Institute of Occupational Health, Helsinki, Finland.

A seminar with representatives from the international expert group was arranged 13 November 2006, for the Swedish reference group and others to discuss and comment on a draft version before finalizing the report. This report will be delivered on 24 November 2006 to the Minister for Employment together with a statement from the FAS Board commenting on some aspects of the report.

FAS would like to thank the international evaluation group, the Swedish reference group and all the participating researchers for their contributions to the successful completion of this evaluation.

Rune Åberg
Secretary General
Swedish Council for Working Life and Social Research

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Executive Summary

The Swedish Government has requested an analysis of Swedish Work Environment Research, WER, primarily in the area of chemical, physical and biological health risks, and research on musculoskeletal strain injuries and disorders but not on psychosocial work environment research.

Objectives of the International Evaluation

- To assess the scientific quality and to identify gaps, weaknesses and strengths of the targets of Swedish work environment research from an international perspective.

- To examine the relevance to society of the research regarding attention to and success in translating research into practice to protect the health of the Swedish workforce.

- To give a picture of the strengths, gaps, and weaknesses in Swedish work environment research system and identify future needs of national research within this area.

The International Evaluation Group, IEG, met in Stockholm in March 2006 to organize the review and in October 2006 for interviews and preparation of the draft report that was later finalized through correspondence. Seventy relevant research groups were identified and requested to provide evidence of their best research and products of knowledge transfer. This evaluation did not assess the individual research groups but rather, was more strategic in nature. Research material from the 60 research groups responding to the request was provided to the IEG between its two meetings for rating on originality, quality, and relevance. In October, interviews were carried out with researchers, and representatives of relevant agencies, employers and trade unions. A bibliometrics analysis was also performed in an independent effort to evaluate the quantitative contribution and the relative impact of Swedish research internationally.

***The Context of Swedish Work Environment*:** Sweden has a well developed national system for registration and surveys for working life, work environment, health and safety. The information system is constant, well standardized, well organized, and available for research. In spite of high quality and reasonable coverage of the data systems the picture still remains somewhat fragmentary. A well structured Swedish Working Life Profile presented in a user-friendly format is suggested.

The Structure and Funding of Swedish Work Environment Research: The structure for WER has, in recent years, become quite decentralized. Now WER is conducted in a variety of large and small units. Some of these units are integrated parts of the normal university structures, some are private organisations, some are part of the regional NIWL structure and the remainder outsourced from NIWL with uncertainty about long-term circumstances. This structure is not optimal and could probably be better coordinated to identify WER areas of highest concern and emerging issues. The absence of a coordinated structure may reflect the lack of transparent priorities of stakeholder needs for WER research.

The funding support for these units is also complex. A mix of support from core university funds, earmarked university funds, the National Institute for Working Life (NIWL), from

competitive research funding and increasingly contracts with Afa and private industry make for a diffuse and unclear system. There is little evidence of priority driven research funding, some of which would be desirable.

Evaluation of Research:

The goal of the evaluation of research on work environment was focused on determining whether Swedish work environment research (WER) is of international standard in quantity and quality, and of relevance for the Swedish society. A summary of the strengths and weaknesses identified by the IEG can be found in the full report.

Sweden was found to play a significant role in enhancing the international knowledge base for work environment research. Employing two different databases the bibliometrics assessment determined that Swedish researchers have, for over twenty years, contributed about 8% to the world production in scientific articles in occupational health and in ergonomics. Adjusted for country population, Sweden ranks number 1 in the world in these areas. Furthermore, as measured by citations, the quality of the Swedish research is above the world average. Finally, the analysis documented a considerable international collaboration in research, mostly focused on Nordic countries.

Research in all three WER areas examined was determined to have good quality, relevance, and a sufficient balance between new areas and developments in existing areas of study. However, changes in work environment research funding and structures of the research organisations may place this standing at some risk. The IEG has some concern that the current high level in quantity and quality of WER cannot be maintained without recognition of its importance and continuing support. It is of crucial importance to guarantee sustainability of the research community, by supporting recruitment of young researchers and providing opportunities for career development.

Investigations into Chemical and Biological Risks have been important with epidemiologic research utilizing exposure assessment effectively in a range of studies on chemical and biological exposures. Studies of cancer and asthma risks remain a successful area of attention and positive contribution. The development of exposure modelling is an area that could be strengthened to the benefit of all.

Research on Ergonomics and Musculoskeletal Disorders, MSD, has shown particular strength in the measurement and evaluation of physical loads at the workplace and applying this knowledge to design new workplaces. This research area is of great international importance and contributes to filling a gap in knowledge. Sweden is internationally one of the few actors in research into the pathophysiology of MSDs and is evaluated as having continued high productivity and extending to novel approaches. The application of this knowledge into the prevention of work-related MSDs was, however, limited to relatively few areas.

Research on Physical Factors has covered quite a diversity of physical factors, some quite impressive. Much work had direct practical relevance and an appreciation of the need for effective knowledge transfer was found.

The Swedish work environment research community has, for some time, been collaborating with international partners. This engagement is consistent with that of the other major contributors to work environment research in Western Europe and North America. More

international collaboration in some WER areas would benefit the international community as well as the Swedish WER community.

The demographic pattern of the research workforce responsible for work environment research and its sub-areas is rather striking. The leadership of this workforce is quite overbalanced by male research scientists while the younger workforce predominantly consists of women. Within the three main research areas, only "chemical and biological risks¨ has any research leader younger than 40 years of age. Most of the research leaders are between 55 and 59 years of age and 23 % are above 60. The implication of this trend could be serious for the sustainability as roughly half of all research leaders will retire within the next 10 years. While there appear to be an adequate number of doctoral students engaged in relevant studies, it is not apparent that current circumstances for these fields of research are attractive to scientists as they consider their long-term career objectives and opportunities.

The evidence of interchange of knowledge is quite uneven. This was evident with regard to structural/organisational shortcomings in successfully communicating stakeholders' needs to the research community. It also applies to the translation of scientific research into information widely available to the public and other stakeholders in order to bring research findings into practice. Some researchers have made great efforts to engage in knowledge transfer, ranging from the work by the Swedish criteria group for TLVs to the web-based information accessible to both professionals and the public. The social partners, however, expressed a greater need for knowledge transfer. There appears to be a gap between research and practice that needs further attention in Sweden.

The WER is largely relevant to policy considerations but could be supplemented by more attention to research related to surveillance of current working conditions in Sweden and to the identification of emerging risks. The communication of the research findings in a form useful for work environment policy needs and actions could be improved.

Recommendations

<u>Funding</u>

- In order to maintain the current high quantity and quality of WER, it is essential to maintain funds specifically dedicated to this research area and open for applications including both personnel and equipment. The amount of funds available through RALF, six years ago, should at least be reestablished.

- Duration of projects to be funded in open calls should provide options for funding up to five years. This will greatly enhance the possibility to conduct longitudinal epidemiological and intervention studies for which there is a high priority need.

- Rapid assessment processes should be established for smaller project plans to facilitate pilot studies with novel approaches and rapidly emerging issues.

- There is a need for better integration of different domains of knowledge in order to address multi-factorial work-related health problems. Interdisciplinary research projects should be encouraged through funding strategies**.**

Commission to examine the work environment research structure

- The complex state of research structure and financial support related to and coupled with the apparent lack of a systematic priority setting scheme for identifying those WER areas of highest concern lead to the recommendation to establish a high level commission. Such a commission should examine the organizational structure in support of WER, the setting of priorities and suggest the best funding options to deliver the most appropriate research**.**

Sustainable resources

- Research institutions should actively pursue career development of competent work environment researchers in order to guarantee sustainability. Such activities could include support to attract recent post-doctoral scientists early in their careers and means to stimulate mid-career researchers. Funding mechanisms in support of such activities should be encouraged.

Important research areas to be developed

- Research on exposure assessment modelling and related risk modelling needs to be strengthened. This includes research on exposure variability, which factors determine exposure patterns, and how this knowledge is applied in the design, conduct and interpretation of epidemiological studies and workplace interventions.

- More systematic intervention studies are needed. There is a major need for development of scientific methods for determining the efficacy and effectiveness of interventions. It is also recommended to pay more attention to the use of appropriate study designs and methods for exposure and outcome assessment in intervention studies along with economic evaluation techniques. Interdisciplinarity is likely to be important to achieve this objective.

- Research is needed on methods and strategies for the implementation of new scientific knowledge.

Basis for Priority Setting

- Research is needed to develop hazard surveillance systems that identify and monitor exposures at the workplace. The use of early indicators of risk, for example non-invasive biological techniques and self-assessment methods, appropriate to the modern structure of Swedish work should be considered.

- Using modern sampling methods government agencies need to take advantage of existing health data, hazard surveillance data and consider the structure of Swedish working life to prioritize WER needs. Information available internationally should be used and research leaders should be engaged in this effort.

- WER groups throughout Sweden should be encouraged to interact to minimize overlap and maximize use of available national research expertise.

Interchange of Knowledge

- The interchange of knowledge from stakeholders to researchers and the reverse should be improved. Means and methods should be developed for collaboration between the social partners, other user groups and the research community to design effective information transfer. Efforts at knowledge transfer need to be systematically assessed.

Social Responsibility

- Continued support for training and education of work environment research professionals in developing countries is encouraged.

Addendum

During the final preparations of this report the IEG was informed that the national budget proposal from the new government presented 16 October suggests a complete close down of the NIWL from 1 July 2007 and that preparations already have started for dismantling the institute, without any compensatory mechanisms or transfer of ongoing research projects. Although it was not our task to evaluate separate groups or institutions we have noted that NIWL, with a quarter of the total estimated budget for WER, represents the largest of all research centres and that the research at NIWL is of the same quality and relevance as the rest of Swedish WER evaluated. We have noted that the broad, multidisciplinary composition of researchers within NIWL offers excellent conditions for the type of new research areas we have suggested.

It is obvious that a decision from the parliament in line with the proposal will drastically diminish the resources for WER in Sweden unless earmarked compensation is given to the universities and/or to the funding agencies, e.g. FAS, in time for the NIWL researchers to apply for funding or new university positions.

I. Introduction

A. Aim and process of evaluation

In an amendment to the government assignments for 2005, the Swedish Council for Working Life and Social Research (FAS) was commissioned to:

> "analyse Swedish research in the area of occupational health, primarily chemical, physical and biological health risks, and research on musculoskeletal strain injuries and disorders including the interaction with mental stress. The task includes an inventory as well as an evaluation of carried out research. The evaluation will consider scientific quality of the research as well as its relevance to society. The task should also shed light and comment upon the future needs of national research within this area. The assignment results shall be presented no later than 31 January, 2007."

The aim of this evaluation was to assess the scientific quality and to identify gaps, weaknesses and strengths of parts of Swedish work environment research – c.f. the assignment - from an international perspective. Psychosocial work environment research should not be included, neither individual evaluation of researchers or research groups. Since most Swedish experts in the area were included in the evaluation themselves, international experts were required for an unbiased evaluation. Hence an international evaluation group (IEG) was appointed (see invitation letter in Appendix II).

To complement the conclusions drawn from the publication analyses and group interviews, short summaries were drafted from reports on the mapping of Swedish work environment research, the historical development of Swedish occupational medicine and hygiene research and the development of work environment research funding since 1985. In cooperation with Olle Persson, Umeå University, a bibliometrics analysis of published reports was also performed to get a better view of the productivity of Swedish research groups. Information on the structure and context of Swedish work environment research was prepared by the FAS secretariat.

B. Charge to the IEG

The international evaluation group met 30–31 March 2006 in Stockholm for meetings with FAS, the Swedish reference group and internal discussions on the future process and warranted support from the secretariat. Decisions were taken on the selection criteria for research groups/projects to be included in the evaluation, division of labour, whom to invite for interviews (Appendix IV), interview questions (Appendix V), the design of a bibliometrics study etc. It was decided that FAS should send a letter (Appendix III) to approximately 70 research groups that had reported in a previous survey that they performed research in the relevant areas, asking them for their best publications and other products of knowledge transfer from the past five years.

The FAS secretariat received research material from approximately 60 research groups, which was subsequently dispatched to the international evaluation group in May/June. By September the international group had read the material and graded them according to different criteria measuring the originality, quality, and relevance.

The group came together for a final meeting 2–6 October 2006. Interviews were carried out with researchers from different disciplines, the Swedish Work Environment Agency (SWEA), National Institute for Working Life (NIWL;Arbetslivsinstitutet), FAS, the Swedish Government Agency for Innovation Systems (VINNOVA), employers and trade union representatives (Appendix IV provides a full list of the interviewees). Representatives for the relevant ministries and the occupational health services were invited but did not attend. The international evaluation group also produced a draft report which was later finalized through correspondence.

II. The Context of Swedish Work Environment

Labour accidents, work-related disorders and complaints – data sources and statistics

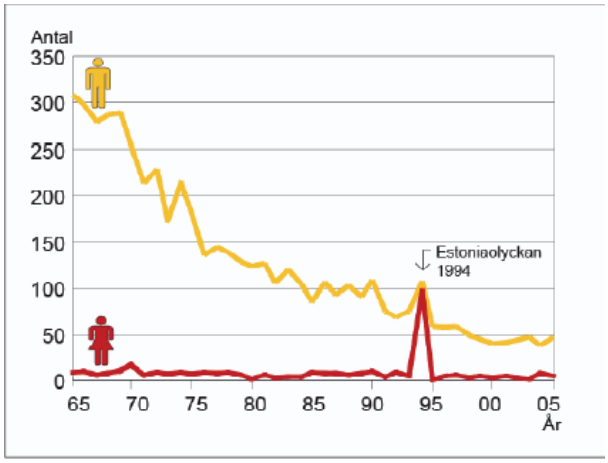
Relevant statistics information is available from several sources such as Statistics Sweden, Swedish Work Environment Authority (SWEA), Ministry of Industry, Employment and Communications, county councils, several research institutes etc. The most relevant ones are:

- ISA, the Swedish Information system for Occupational Accidents and Work-Related Disorders, a department in the Swedish Work Environment Authority that covers officially registered occupational injuries and work-related disorders
- The Work Environment Survey, financed by SWEA and conducted by Statistics Sweden. It is based on the respondents' own assessment of exposures, complaints and disorders

Accidents and disorders

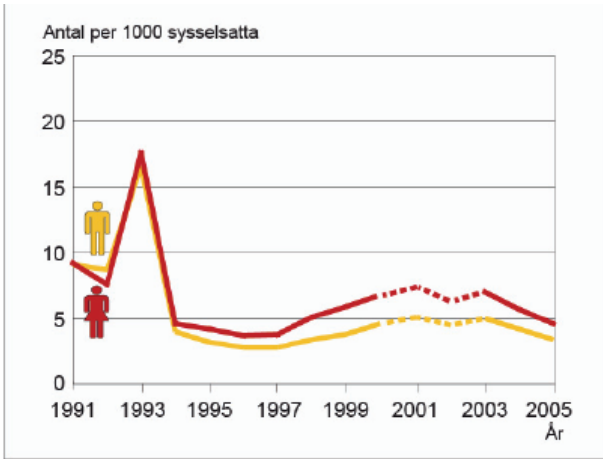
The number of occupational deaths among men in Sweden is less than a sixth of what it was in 1965, as illustrated by table 1. For women, the low number of occupational deaths has remained constant, except for 1994, when the ferry Estonia sank with hundreds of victims from the crew and conference participants which brought a peak in the death rate.

Figure II-1. Occupational deaths 1965–2005 (absolute numbers).
Yellow = men Red = women



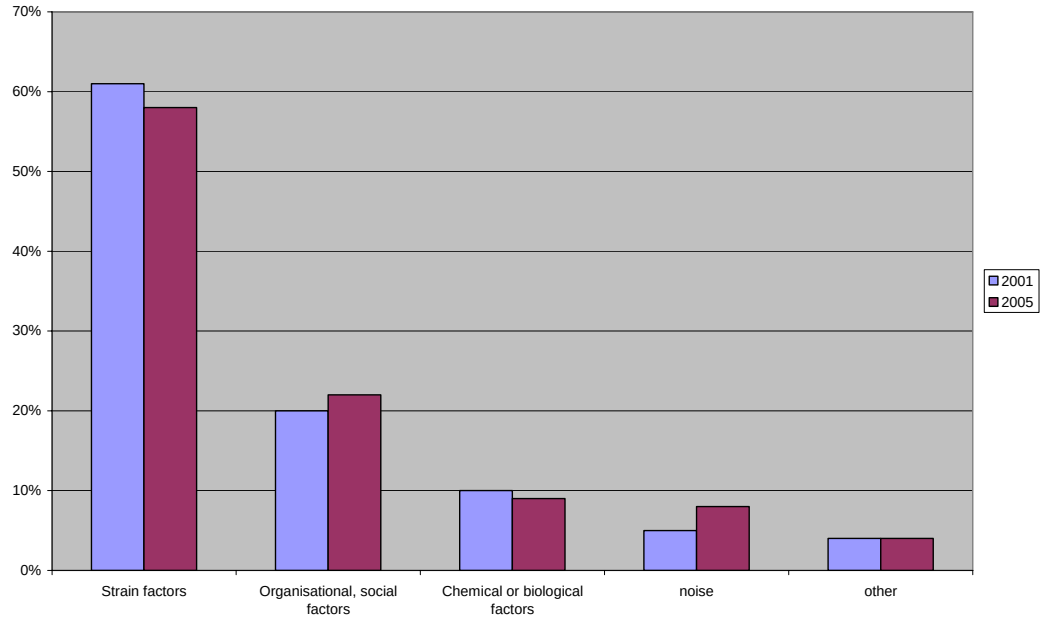
The number of self-reported occupational diseases has remained fairly constant over the past 15 years. The peak in 1993 and uncertain numbers in 2001–2003 (figure II-2) are due to changes of the compensation rules.

Figure II-2. Number of self-reported occupational diseases 1991–2005 (per 1,000 employees).



The factors reported to be associated with occupational diseases in Sweden have not changed much over the past five years (Figure II-3). Ergonomic factors such as monotonous or unusually strenuous movements, manual materials handling, or awkward work postures cause close to 60% of the reports. Organisational and social factors cause between 20 and 25%. Chemical or biological substances or products, noise and vibrations, and other factors all cause less than 10% of the reported occupational diseases. The leading diagnoses are musculoskeletal disorders, but the psychosocially related diseases show the most rapid growth

Figure II-3.
Underlying factors behind reported occupational diseases 2001 and 2005 (men and women).



Of the 20,787 occupational diseases reported in 2004, 56 per cent affected women and 44 per cent affected men. The rates of reported occupational diseases were 4 per cent per 1,000

gainfully employed men and 6 per cent per 1,000 gainfully employed women. A breakdown of occupational diseases reported in 2004 by branch of industry shows the highest frequency rate for men in the manufacturing industry of non-metallic mineral products: 12 cases per 1,000 employed. Among women, manufacturing of transport equipment showed the highest frequency: 22 cases per 1,000 employed.

Work environment survey and complaints

The Swedish Work Environment Survey, based on interviews with more than 14,000 Swedish employees, takes exposures and determinants of work environment into account from two different angles. One angle is based on questions regarding health complaints caused by work. Another angle is based on perceived exposure, i.e. whether the interviewees experienced occupational exposures and determinants, such as noise, dust, vibrations or strenuous work positions, during at least ¼ or half of their working time the past year.

Among the causes for work-related complaints, figures are particularly high for strenuous work positions and stress. There is also an increase in workers experiencing complaints caused by work in front of visual screens. The numbers of complaints are on average higher for women than for men. For instance, among workers experiencing stress, female complaints went up from 7% in 1997 to 12.1% in 2006, compared to 3.7% in 1997 and 7.4% in 2006 for men.

Regarding perceived occupational exposures in the work environment, few notable changes were detected in the 1990's except for the case of environmental tobacco smoke, which had a dramatic decline after 1998 – partly due to new legislation.

On the question whether workers can see or smell chemicals in the air ¼ or more of the working time, the overall number declined slightly from close to 30% in 1989 to around 20% in 2001, or 800,000 persons. About 370,000 persons reported such chemicals half their working time or more. Exposures to detergents and disinfection liquids are especially common; 8.3% of all men and 15.5% of all women in 2003, but as many as 66% of all female cleaners.

Dust exposure, or whether workers could see dust in the air, shows two trends. Around 1 million workers could see organic dust ¼ or more of their working time in 2003, which is no change to previous years. For inorganic dust, the number was 625,000 persons in 2001, while 240,000 did so during half or more of the working time. This is a slow overall improvement from 20% in 1989 to less than 20% in 2003.

Vibrations from hand held machines are a problem area in certain branches. Around 825,000 persons reported such work 1/4 or more of the working time in 2003 and around 185,000 persons half their working time or more. Two of the most problematic sectors show divergent trends; while such vibrations seem to be reducing among agricultural and forestry workers, there has been an increase among construction workers since 1989. From having had the same level just under 30 % in 1991, construction workers reached more than 40% in 2001.

Around a quarter of the work force, or 15.8% of women and 30% of men in 2003, experienced noise too loud for normal conversation. This figure has remained stable among men, while women 30–49 years experienced a 5% increase since the beginning of the 1990's. Women working as pre-school teachers perceive most noise, 54% in 2003. Among men

working as process operators in the wood and paper industry, the corresponding figure was 78%.

Remarks

Sweden has a well developed national system for registration and surveys for working life, work environment, health and safety. The information system is constant, well standardised, well organised, and available for research.

In spite of high quality and reasonable coverage of the data systems the picture still remains somewhat fragmentary. One may ask the question, whether the data could not be combined and presented in a well structured Swedish Working Life Profile, which could even be presented in a format that is user-friendly. Such profiles have been suggested during recent ILO discussions about a new convention or recommendation promoting occupational safety and health.

III. Structure and Funding of Swedish Work Environment Research and Actors

A. Overview of the structure of work environment research in Sweden

Development of the structure for work environment research

The evolution of work environment research and its application has been quite irregular. The early period – during and after World War II – was characterized by research embedded within the Swedish National Institute for Public Health (SNIPH), and the evolution of regional occupational medicine clinics. Over the 1970s and 1980s there was further development of regional attention to occupational health concerns with the development of a number of occupational medicine clinics as well as university institutions.

Since the beginning of the 1960s, the structure of government work environment institutions has undergone a series of changes. In 1965 certain units from the SNIPH and an institute of work physiology were combined into the National Swedish Institute of Occupational Medicine (NSIOM), which in 1971 was integrated as a Research Department into the National Board of Occupation Safety and Health (NBOSH today SWEA), responsible for enforcement of workplace regulations. In 1987 this Research Department was separated out of SWEA to become the Swedish National Institute of Occupational Health (SNIOH). In 1995 SNIOH was merged with the Centre for Work Life Research (Arbetslivscentrum, ALC) and parts of the Work Environment Fund (AMFO, cf below) to the National Institute for Working Life (NIWL). The much broader mandate for this institute somewhat disrupted the growth of traditional occupational health research. During the finalizing phase of writing this report, the new Swedish government suggested in the national budget proposal to close the NIWL from 1 July 2007 without earmarked substitution – see further below.

The Current Structure of Swedish Occupational Health

The Swedish Work Environment Authority (SWEA)

SWEA was formed in 2001 through the amalgamation of the ten districts of the Labour Inspectorate and the National Board of Occupational Safety and Health. The objective of SWEA is to reduce the risks of ill-health and accidents in the workplace and to ensure compliance with work environment and working hours legislation and also, in certain respects, with the Tobacco Act and the Environmental Code with regard to certain issues relating to genetic engineering and pesticides. The Authority is also required to furnish advice, respond to inquiries and publish information. SWEA is furthermore Sweden's "liaison office" in connection to citizens of other EU countries working in Sweden for a limited period (as a "posted worker"). Work environment inspections at workplaces in Sweden are carried out by inspectors from the SWEA; 440 inspectors are stationed in 10 districts and between them they carry out 38,000 inspections annually.

The authority's lay Board consists of the Director-General, as chairperson, and six members representing general knowledge of working life, all appointed by the Government. The Swedish Work Environment Act is applicable to all areas of working life and out of Sweden's almost 9 million inhabitants, approximately ,5.3 million come under this Act. SWEA supplements and articulates stipulations of the Work Environment Act, and attends to the transposition of EU legislation into Swedish law. To this end, SWEA issues regulatory

amendments and new rules for the working environment. Today there are some 130 Provisions relating to technical, chemical, organizational and psychosocial factors.

The National Institute for Working Life (NIWL)

NIWL was created in 1995 by a merger between the former National Institute of Occupational Health (NIOH), The Centre for Work Life Research (ALC) and parts of the Work Environment Fund (AMFO) as a national centre of knowledge and research for issues concerning working life. NIWL has since then undergone several reorganisations, particularly by setting up five new local branches and by outsourcing major parts of the former research resources for chemistry, toxicology, aerosols and lung disorders as well as ergonomics to different universities.

The Institute carries out research and development covering the whole field of working life, on commission from The Ministry of Industry, Employment and Communications. The goals of the NIWL are to contribute to:

- A good working life with well-functioning working conditions
- Increased knowledge of and in working life

Research and development are concentrated into three main areas: the labour market, work organisation, and work environment. Research is multidisciplinary and arises from problems and trends in working life. The Institute collaborates with the social partners, industry, universities and university colleges, with international partners and with others active in the field of working life.

The NIWL head office is located in Stockholm and it has local branches in Gothenburg, Malmö, Umeå, Norrköping, Östersund and Visby. NIWL has approximately 400 full-time employees and a total budget of 441 million SEK (2005). In 2001 55 millions were transferred from the Ministry of Industry, Employment and Communications to the Ministry of Education and Research and distributed to the universities that hosted the outsourced disciplines (see above).

Local safety work

“Employers and employees shall co-operate to establish a good working environment.” (Work Environment Act, chapter 3, section 1). The law makes the employer ultimately responsible for the working environment. But co-operation is also a key factor, and a number of institutions exist to facilitate local safety work. One is the safety committee (skyddskommitté). Safety committees must be set up in workplaces with more than 50 employees. The unions elect representatives to the committee representing all groups at the workplace.

The safety committee takes part in the company’s working environment activities in a broad sense and provides guidelines on how this work should be carried out. Safety delegates (skyddsombud) are the employees’ representatives in health and safety matters. They are elected for a period of three years by the local unions at workplaces with five or more employees. If there is no union at a workplace, the safety delegate is elected among the employees anyway. There are 96,000 safety delegates in Sweden. Large workplaces have several safety delegates, one of whom is elected “chief safety delegate.”

Safety delegates have a legal right of access to all information necessary to fulfil their duties. The employer must allow them the paid time needed for the job, and the necessary training. The local trade union organisation may appoint a “regional safety delegate” with the main duty to stimulate safe work practices in small companies without safety committees. There are 2140 such regional delegates.

Occupational health services

No law demands that companies provide occupational health services, OHS (företagshälsovård). The employer and employees are jointly responsible for this. The coverage of the Swedish work force is approximately 75%. Large companies mostly have their own built-in OHS while joint OHS centres provide services to small and medium-sized companies. Traditionally, an OHS team includes a physician, a nurse, a physiotherapist, an industrial hygienist or safety engineer and, in some cases, a psychologist. A recent trend is towards larger companies through mergers and voluntary collaboration with local satellite units.

The conditions for Swedish OHS changed in the beginning of the 1990’s when the subsidies from the government were abolished. For financing the OHS is depending on renewed contracts with public and private enterprises. The former research facilities within some of the larger OHS organisations have thereby disappeared and the former involvement in research has more or less ended.

University institutions and hospital based clinics of occupational medicine

The leading employer of occupational health researchers is NIWL. Other important research centres are Karolinska Institute (Stockholm), the Universities in, Gävle, Göteborg, Linköping, Lund, Stockholm, Umeå, Uppsala, the Royal Institute of Technology (Stockholm) and Chalmers University of Technology (Gothenburg). Some of those universities host outsourced groups from NIWL with, so far, guaranteed funding.

Work environment problems requiring expert studies are referred from the occupational health services to clinics for occupational medicine at the regional hospitals (yrkesmedicinska kliniker). Most clinics collaborate closely with departments of occupational and environmental health at the local university. There are clinics for occupational medicine in Gothenburg, Linköping, Lund, Stockholm, Sundsvall, Umeå, Uppsala and Örebro.

Private research institutes

There are also some private sector research organisations in the work environment field: STFI-Packforsk AB, the Swedish Environmental Research Institute (IVL), and the Industrial Research and Development AB (IVF).

B. Overview of the financing of work environment research in Sweden

The IEG information on the financial development and funding of work environment research is based upon translations from a report in Swedish by Svante Sjöberg. We understand that the method had been to collect available material from the funding institutions, select the figures connected to research, and to delimit the material to the work environment area. It has usually not been possible to separate funding for psychosocial research from the areas of research for which the IEG was asked to review. In many cases the estimations are crude and not giving exact numbers. However, the report should indicate funding trends and the volume of research resources during the studied period.

Table III-1. Estimated annual budgets for work environment research including psychosocial research 1986–2005 (in millions; 2005 SEK).

Funding source	**1986**	**1996**	**2000**	**2002**	**2005**
ASF/ AMFO/ RALF	110	100	68	-	-
FAS	-	-	-	47	30
Other research foundations	20	30	34	34	35
VINNOVA	-	-	-	16	2
NBOSH/NIOH/NIWL	204	205	127	70	68
Universities	10	20	35	105	105
EU	-	-	4	5	5
Other sources including county councils, insurance companies, industry,	20	25	25	30	45
Total	364	380	293	307	290

During the period from 1973–1994, the main source of funding for applications was the Work Environment Fund (Arbetsmiljöfonden or AMFO) and its predecessors, financed through employers' fees, which also financed the SNIOH. Employers and trade unions had significant influence over the funding priorities of AMFO and were also represented on the boards of AMFO and SNIOH. AMFO represented a substantial investment in work environment research at a level and intensity unmatched by any other nation in the Western world.

Since 1995, several reorganizations have taken place (cf IIIA). Today the government and the parliament control all directives and priorities related to state-financed research funding. The largest governmental source for open, competitive funding of work environment research is FAS. The dominant actor directly funded to carry out work environment research (receiving the largest portion of the budget dedicated for work environment research) is NIWL.

Table III-1 indicates that available resources for research in the work environment area have diminished considerably since the 1980s, and particularly after 1996, due to the reorganisation of and a new instruction for NIWL in 1995 and the split of the successor of AMFO, the Swedish Council for Worklife Research (Rådet för arbetslivsforskning, RALF), into FAS and the Swedish Government Agency for Innovation Systems (VINNOVA) in 2001. The reduction in work environment research resources is said to primarily have taken place in the non-psychosocial area, which is also indicated by the number of doctoral theses presented from the

different subcategories of work environment research, cf table V-3. (below) The total amount in 2005 was estimated to be 275 million SEK.

In FAS the work environment research area has decreased in proportion to other areas within FAS due to a decline in the number of applications and special priorities of research centers and programs in social sciences and public health. Moreover, some requests for project proposals made by FAS, e.g. intervention research, have resulted in a limited number of applications.

Table III-2. Categories and number of grants awarded by RALF and later FAS (1999–2005).

Year	Chemical risks	Physical risks	Strain and stress	Strain disorders
1999	31	9	20	
2000	24	9	33	
2001	19	3		4
2002	9	4		2
2003	8	1		4
2004	7	3		5
2005	7	2		3

Funds from VINNOVA to the work environment research of concern for the evaluation have almost disappeared, while other areas in work life research have become more prominent. However, technical or workplace innovations that would address the work environment would have a potential for funding.

The drastic reduction in funding from 1996 to 2000 within NIWL was due to less priority for non-psychosocial work environment research and to some extent by reclassifying psychosocial research from the time of NIOH to work organisation research in NIWL.

The substantial reduction in funding from FAS and VINNOVA compared to the funding from RALF before the split means that much less funding is available for open competition. In the case of VINNOVA it seems to be a conscious decision not to make this kind of research a priority and, for FAS, the number of applications has diminished proportionally to the awarded funding. The “success rate” for applications seems to be around 15% of all applications and several of the interviewed researchers indicated that they found it easier to get funding from other sources, e.g. insurance companies.

A significant displacement has occurred through the transfer of 55 million SEK from the Ministry of Industry, Employment and Communication and NIWL to the Ministry of Education and Research and certain universities for financing of the outsourced groups from NIWL. This money is “informally”, i.e. without contracts, earmarked for work environment relevant research and has been respected so far according to the interviews. In some cases there is a special, advisory board for the outsourced, former NIWL groups. During the transfer period one-time grants were awarded the outsourced groups in addition to the annual budget for the first year. However, the future for this earmarked funding within the universities is not clear.

In comparison to the 1980s, the considerable overview and programme activities carried out by AMFO have ceased to exist, as well as most of the earlier extensive information activities and a large part of the educational programmes.

In summary, some of the developments may have been positive, but the reduction in total funding of the research area and repeated reorganizations of relevant agencies and their research objectives suggest some uncertain understanding or agreement about the national support of research in this area, funded from three different ministries and several public funds. The proposal to close NIWL drastically underscores this uncertainty.

IV. Evaluation of the Structure Relevant to Funding Swedish Work Environment Research

The evaluation carried out by the IEG is based on written background material (Apendix V) and interviews with representatives of funding agencies, SWEA, NIWL, the social partners and researchers (Appendix I and II). While the IEG recognises that we spoke to a selected sample, we believe that it represents a fair and consistent view on the rationale and structure of the funding system.

FAS

FAS allocates most of its resources to researcher-initiated research via a number of different funding instruments. FAS is tasked with initiating primary and needs-driven research. The primary research through open calls is based on evaluation of the scientific quality of the proposals received through a priority committee whose members are primarily scientists. Depending on the number of applications and the financial resources available, highly regarded research will be funded. Some flexibility exists for funds to be moved from one of FAS' seven research areas to another in order to ensure scientific quality of all research projects. The selection process used by FAS with a strong focus on the scientific content of the applications was regarded by some researchers as a disadvantage for those making proposals for applied research.

In general, the open competition represented in the FAS open calls rewards the highest quality research and is to be commended. It was puzzling, however, that available funds are allocated on the basis of applications received and not on a prior determination of the relative importance of the seven research areas. There is a mechanism that allows for applications that are not successful within each one of the seven areas to be considered further – judged against those in all the other areas in a second level review. On the other hand, we did not learn of ongoing strategic assessments within FAS to consider work environment research for needs-driven allocation of resources. The absence of such considerations runs the risk of losing necessary support for highly specialized expertise in the evaluated research areas. In addition, the IEG noted that many WER teams were quite small. For these groups, without core funding or opportunity for longer-term (greater than 3-year) funding, it would appear prudent to given consideration to targeting some funds in a needs-driven manner. For all groups, a greater range in funding forms would seem desirable. Small, shorter-term grants would seem a valuable tool to permit exploration of novel hypotheses where data are needed before potential can be assessed. Alternatively, longer-term grants (five years) might be offered in select areas to promote stability and development of stronger cores for strategic areas.

We have noted that the funding arrangements are in transition with the creation of Centres of Excellence with long-term funding which will reduce the proportion of funding available for open competition. We see the benefits of this re-allocation in terms of sustainability, capital investment in selected areas, and strengthening capacity building through investment in education and career development. This approach, where appropriate, will facilitate multidisciplinary research with a high impact and a rapid response to emerging issues.

The IEG is of the opinion that these Centres of Excellence should not only provide research of international quality, but also opportunities for education in core disciplines where we were advised that there are shortages, e.g. occupational hygiene.

VINNOVA

VINNOVA's main aim is to contribute to long-term economic growth and sustainable development in both economic and social terms. Work environment issues are not specifically addressed, but may be embedded in applications submitted to targeted funding calls. While it might be expected that VINNOVA would be a useful source of funding for applied work environment research, the experience of researchers is that the primary determinant of a successful application is its contribution to productivity at societal level. That is why VINNOVA, in general, was not regarded as a possible source of funding for work environment research.

We could not identify a strategy to include work environment considerations into the development of new products and processes. The IEG was concerned that important new areas of industrial development with potentially high impact on future working life were not receiving adequate consideration. One example cited was nanotechnology, which is attracting massive global investment and whose success is much linked to an understanding and control of any potential health risks.

National Institute for Working Life, NIWL

We recognised the great importance of NIWL and its regional departments for work environment research in Sweden. NIWL is undergoing a prolonged period of change, one element being a transfer of research areas to universities with guaranteed funding for an uncertain period of time (possibly 5 years). These changes have diminished the research that is the concern of this evaluation since the days of NIOH, i.e. before 1995 and the new political directives. We received evidence of a desirable shift from researcher-based projects to needs-based research contributing to a strategic plan, based upon evidence collected in trend analyses, user hearings and other inputs. This will facilitate a better direction and accountability of research activities, albeit if NIWL continues to exist.

Occupational medicine clinics and university-based research groups

We noted priorities and research activities that were triggered by cases presented at occupational medicine clinics. This situation demands a multidisciplinary approach to research and presents important challenges, particularly in acquiring scarce expertise and appropriate access to expensive instrumentation. The strong ties between clinics and university-based research groups give at the same time a particular strength of the Swedish occupational health system to identify the early emergence of work-related disease. The fact that many WER groups are small, however, makes it difficult for them to obtain and maintain adequate equipment for research, particularly with respect to advanced and expensive new technologies.

Other funding

We noted that Afa (the labour market insurance company owned by the social partners) was a large source of funding for applied projects where there was agreement between the social partners. This route has the advantage of addressing practical concerns. We see this funding

route as having much relevance for intervention research and research that requires access to workplaces.
Other encountered sources of funding were county councils, business enterprises, environmental funds, European funds, and a variety of other, smaller sources.

Stakeholders

We explored with a range of stakeholders their expectations and whether these were met. Concerns were expressed by the social partners as to their limited influence on priority setting, with the specific example of the need for interventions studies and applied research. SWEA exemplified the position of a client of research and expressed concerns that its needs might not be met by the current research system.

Comments

Overall, we did not find a clear definition of the aims of work environment research funding nor identified priorities of stakeholders against which to judge its provision. We did not find evidence that the existing survey data available in Sweden was being effectively used as a key source to inform priorities in funding and research activities or against which to measure its contribution to better working conditions.
The IEG was not able to gain a sufficient overview of the overall available funding and whether this met the stated needs, there being an absence of a clear evidence-base against which to judge the performance of the system. However, in some areas, the increasingly lower success rate of applications for support from FAS has lead to a shift towards these other sources of funding. In addition, it was suggested by some NIWL funded researchers that uncertainty about long-term committed funding was leading them to seek alternative funding driven more by priorities not necessarily related to work environment research needs. Other researchers suggested expecting to realign funding from public to private sector sources. While this has some advantages it carries significant risk of leading to research that is focused more on limited problem-solving investigations than to fundamental or systems-based research relevant to risks in the evolving modern work environments.

V. Evaluation of Research

The goal of the evaluation of research on work environment was focused on evaluating whether Swedish work environment research (WER) contributions were of international standard in quality, quantity, and relevance. The approach to this evaluation was organized into seeking response to several questions:

- Does the WER address gaps in the international research, significantly enhance the knowledge base or mainly repeat the research elsewhere?
- Does WER pay adequate attention to engaging with the international research community?
- Do WER efforts include knowledge distribution, and knowledge implementation in addition to knowledge development?
- Does the research and its transfer provide a good basis for policy decisions, strategies and activities to promote a good work environment?
- Does the structure in support of work environment research appear appropriate and optimal?

A. Evaluation of Scientific Production in Work Environment Research

A bibliometrics analysis has been performed to evaluate two core aspects of the scientific production in Swedish work environment research:

- the quantitative contribution of Swedish research to the international literature
- the relative impact of Swedish articles in the international literature.

This analysis was performed on two different databases: (1) an inventory of publications as reported by research groups to the National Institute for Working Life in Stockholm, and (2) the Web of Science database on publications in selected journals included in the Science Citation Index. The first database was used to describe the overall productivity of Swedish research in different fields as well as the contribution to the top journals in medical research. The second database was used to evaluate the quantity and quality of Swedish research relative to other countries.

Publications from Swedish research groups

The database from NIWL contains 1,166 publications by Swedish groups in work environment research during the period 2001-2005. It has to be noted that this database relies on self-reports by the research groups and, thus, may not represent the complete scientific production. However, a cross-evaluation with the database Pubmed showed a strong correlation for scientific articles published in the international literature.

In the 5 year-period 2001–2005, primarily journal articles (71%) and reports (16%) were reported, but also 39 PhD-thesis and 12 Licentiate-thesis. About 78% (n = 647) of all articles were published in scientific journals in the English language. The analysis of most frequently used keywords and major fields shows that with respect to total scientific output the areas of ‘chemical and biological health risks’ and ‘ergonomics’ are far more productive than the area of ‘physical health risks’. Important sub-fields in the area of ‘chemical and biological health risks’ are cancer, exposure assessment (including biological monitoring), respiratory disorders, and toxicological studies. Important fields in the area of ‘ergonomics’ are

musculoskeletal disorders, psychosocial risk factors, physical load, and occupational physiology.

These 647 English publications were published in 215 different scientific journals of which 10 journals in occupational health and ergonomics captured 36% of all publications (see table 4.1). These ten journals were the ones thought best able to capture the most representative reports related to WER. It is worth noting that the researchers included in this evaluation also published in other well-known journals such as Lancet, British Medical Journal, Epidemiology, Spine, American Journal of Epidemiology, Environmental Health Perspectives, International Journal of Cancer, Allergy, Pain, and the Journal of the National Cancer Institute.

International comparison of quantity of Swedish research

The Web of Science database on publications in the Science Citation Index was used to evaluate the relative contribution of Swedish authors to scientific articles published in peer-reviewed journals. According to the database from NIWL 36% of all publications appear in 7 occupational health journals with the highest impact factor in the subject category 'Public, Environmental and Occupational Health' and 3 ergonomics journals with the highest impact factor in the subject category 'Industrial Engineering' from the Journal of Citation Reports. It has to be kept in mind that these 10 journals will not reflect the position of Swedish research in some specialized fields, such as noise, indoor climate, cold environments, ionising radiation, cancer, and respiratory disorders, since key publications in these fields often appear in specialist journals where work-related issues compromise a small minority of total publications.

This bibliometrics analysis does not permit a structured evaluation according to the three areas distinguished in this evaluation: chemical and biological risks, ergonomics and musculoskeletal disorders, and physical factors. The latter area will certainly be underrepresented in the selected 10 journals.

The impact factor and associated rank in the subject category illustrates that occupational health journals have a rather modest position relative to journals on epidemiology, environmental health, or public health. Within the subject category 'Industrial Engineering' ergonomics journals have a much better rank although a lower impact factor. The impact factor is a strongly criticized measure of the overall quality of a journal, but it is used by many researchers to select journals for submission of their scientific work. Hence, the bibliometrics analysis in the 10 journals will also not capture any shift among research groups to publish in high quality journals outside the domain of occupational health or ergonomics.

Table V-1. Journals Selected for the Bibliometrics Analysis.

Journal	**Impact factor 2005**	**Rank 2005**
Subject category 'Public, Environmental and Occupational Health'		
Occupational and Environmental Medicine	1.93	34/99
Journal of Occupational and Environmental Medicine	1.89	38/99
Scandinavian Journal of Work, Environment & Health	1.82	40/99
International Archives of Occupational and Environmental Health	1.48	52/99
American Journal of Industrial Medicine	1.31	57/99
Annals of Occupational Hygiene	1.14	61/99
American Industrial Hygiene Association Journal	0.83	79/99
Subject category 'Industrial engineering'		
Ergonomics	0.93	5/33
Applied Ergonomics	0.73	12/33
International Journal of Industrial Ergonomics	0.53	16/33

Articles with at least one Swedish author contributed about 8% to the world production in occupational health and in ergonomics. Figures V-2a (occupational health) and V.2b (ergonomics) show the relative contribution of articles with a Swedish author, expressed by average number of articles per year per 1 million inhabitants) in the period 2002–2005. In occupational health Sweden ranks number 2 in the world and in ergonomics Sweden ranks number 1 in the world.

Figure V.2a. Productivity in *occupational health* journals by country for 2002–2005.

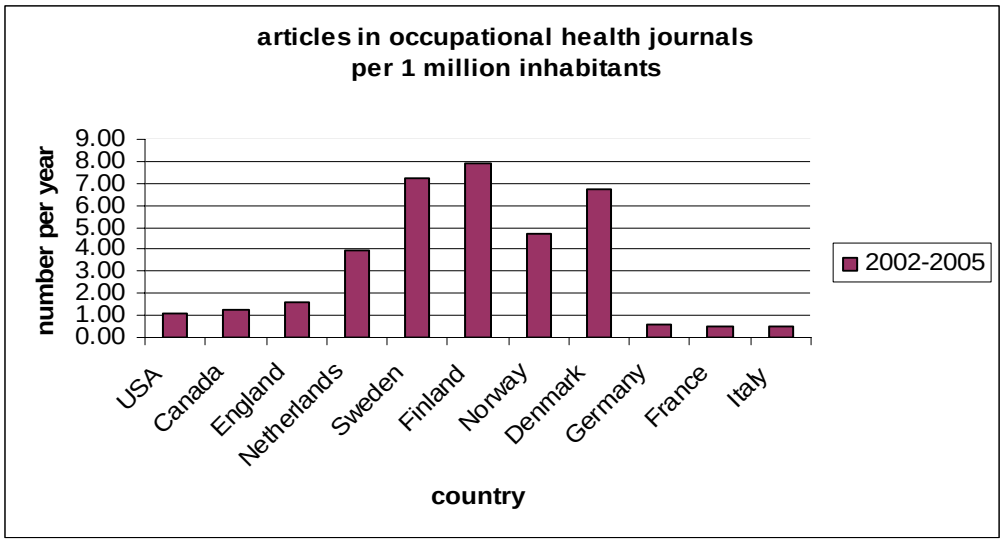
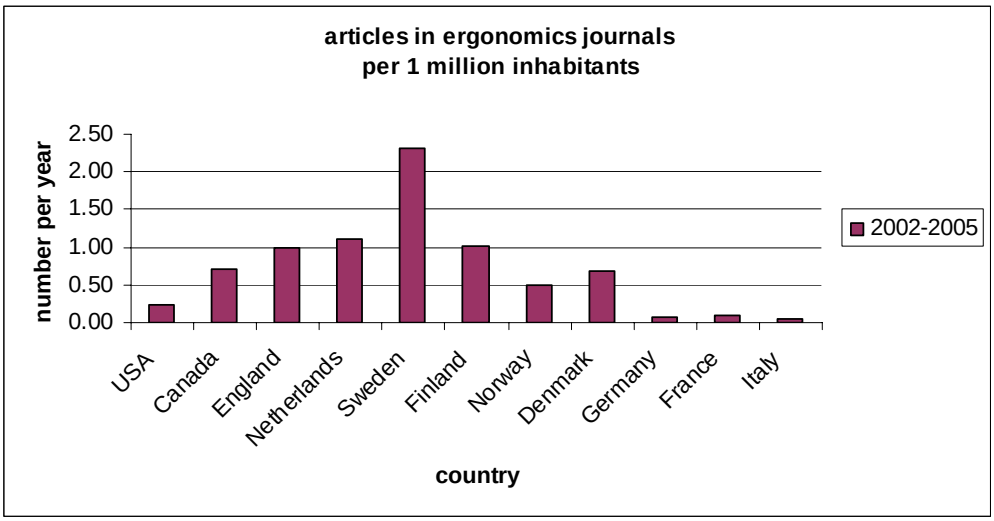


Figure V.2b. Productivity in *ergonomics* journals by country for 2002–2005.



A trend analysis was performed on publications of Swedish research in occupational health and ergonomics. Table V.2 shows that, in the past 20 years, the market share of Sweden in the total scientific output has remained remarkably stable.

Table V.2. Proportion (%) of Swedish and other countries research in 10 selected occupational health and ergonomics journal over time (percentage of all papers in which a given country occurs)

Country	**1986–1990**	**1991–1995**	**1996–2000**	**2001–2005**
USA	38.5	38.4	37.8	35.7
England	10.8	9.7	10.7	12.3
Sweden	8.5	8.0	8.2	8.3
Canada	6.4	6.4	6.3	6.1
Netherlands	3.3	3.9	4.7	7.6
Finland	3.7	4.3	4.4	4.3
Japan	2.8	4.1	3.5	2.8
Germany	0.5	2.5	4.8	5.1
France	1.9	2.9	3.6	3.8
Italy	2.6	2.9	3.7	2.9
Denmark	2.2	2.2	2.8	3.6
Australia	1.5	2.0	2.2	3.3
Norway	1.1	1.8	2.1	2.3

One metric to measure the overall quality of scientific publications is their citation rate: the number of citations per article per year. Although this metric has attracted severe criticism, it is one of the few available metrics that allows a cross-country comparison. The comparison in this evaluation report is again based on the articles published in the selected journals as described before, but citations may be from other journals as well.

In the past 5 years Swedish articles were cited on average 3,5 times, which ranks Sweden among the top 5 countries. Thus, Swedish articles attract an above average number of citations, suggesting that the quality of the Swedish research is above the world average.

The collaboration index shows that on average 28% of the authors on Swedish articles are from another country. An additional analysis showed that 38% of all publications with at least one Swedish author have at least one author from another country, most often USA (24%), Denmark (21%), Finland (21%), Germany (18%), France (16%), Norway (14%), and the Netherlands (13%). This is a clear illustration of the international collaboration of research in Sweden.

Table V.3. International collaboration and citation rate (impact) of publications in occupational health and ergonomics journals by country (2001–2005).

Country/Territory	Collaboration index	Mean number of citations per article
USA	1,13	3,6
England	1,14	2,9
Sweden	1,28	3,5
Canada	1,24	2,8
Netherlands	1,27	3,8
Finland	1,30	3,1
Japan	1,19	3,3
Germany	1,34	3,1
France	1,29	2,4
Italy	1,24	2,5
Denmark	1,33	3,7
Australia	1,23	2,1
Norway	1,30	3,1

Note: citations to internationally co-authored papers have been fractionalized

Conclusions

Swedish researchers contribute about 8% to the world production in scientific articles in occupational health and in ergonomics. Adjusted for country population, Sweden ranks number 1 in the world in this area. In the past 20 years the market share of Sweden in the total scientific output has remained stable around 8%. As measured by citations, the quality of the Swedish research is above the world average. There is a considerable international collaboration in research, mostly focused on Nordic countries.

B. Evaluation of the quality of Swedish Work Environment Research

The international evaluation group was asked to review research contributions in a select sub-set of work environment: chemical/biological factors, ergonomics and musculoskeletal disorders, and physical factors. These areas, of course, are not uniquely distinct from other workplace risks but they are reasonably coherent and have a long history of attention in Sweden. The assessment was focused on a relatively limited time period (five years) which by necessity is constrained by the fact that many studies in process are not yet published and that the published literature represents work undertaken over a rather large time interval.

The majority of groups active in work environment research were asked to submit examples of their best research publications for direct inspection by the evaluation group. In response,

the researchers submitted 2-10 research publications. The total number of submissions was 244 with 103 addressing chemical or biological subjects, 91 ergonomics and musculoskeletal disorders, and 50 physical factors. The evaluation was organized so that each paper was read by two members of the review team and assessed with respect to a) the overall contribution and the degree to which the work filled critical gaps or were pioneering efforts; b) the contribution to methodology and/or the use of existing data or unique Swedish population resources; c) attention to exposure assessment and applications (or potential) for intervention. Consideration was given to the standing of journals in which research was published as well as to publications that contributed through organized review or assessments of the published literature for an expanded understanding of selected focus areas.

B.1 Chemical and Biological Risks

1. Description of research area

There continues to be substantial attention among Swedish work environment scientists directed towards the study of chemical and biological risks. Advances in exposure assessment are seen as important and recent publications report on new metrics and approaches to exposure assessment for application in epidemiologic studies. Also notable are studies directed at developing biomonitoring methods that are relevant to guiding and evaluating control efforts with special attention to exposures related to dermatitis and dermal uptake. There is also attention to developing biomarkers for non-invasive detection of outcomes, some of which could be useful for population studies. Population studies remain a strength with studies presented that examine important work risks including particularly work-related respiratory conditions, cancer and dermatitis. These efforts are enhanced by efforts to better characterize background population incidence and prevalence of respiratory and skin conditions. Finally, there is evidence of attention to the study of effectiveness of control efforts for work risks. These have primarily been observation studies designed to systematically assess the impacts of changes in work exposures in a given industry commonly examining change in exposure to carcinogens.

Members of the research community who responded to the NIWL survey on Swedish working life research (2005/2006) provided their vision of important future research areas. Highlighted were research on skin exposure (methods and knowledge); user-friendly methods for exposure control and assessment; biomarkers; nanotechnology; and cross-scientific research particularly the combination of epidemiology with molecular biology and occupational hygiene.

2. Evaluation of contributions

Among the scientific publications reviewed, the IEG found particular importance in the developments around biomonitoring, dermal exposure for specific chemical substances, and attention to improvements in retrospective exposure assessment for epidemiologic studies. Important advances have been made in advancing understanding about exposures related to conditions important to the Swedish workforce including attention to agricultural workers and those in the service industries. These efforts include investigations to identify the biological risk factor(s) that cause farmer’s lung as well as determining the agents that are most worrisome regarding dermatitis among hairdressers and dental technicians. The application of retrospective exposure assessment methodologies is state-of-the-art in studies of cancer and respiratory disease. Biomarker exploration was appreciated in several studies

and attention to the understanding of mechanisms of airways disease associated with organic acid anhydrides is promising.

Epidemiologic examination of large Swedish cohorts was included in several submissions demonstrating high quality work in general. These efforts ranged from primarily descriptive cross-sectional assessments to an extended follow-up of a unique Swedish cohort. A descriptive study of the relationship between type of disability and type of occupation contributes to a better understanding of disability and potentially disability trends. The follow-up of the important cohort of organic solvent exposed individuals provides greater appreciation of the long-term neurocognitive effects of these historical exposures. In addition, application of biomarkers in population studies begins to reveal deeper understanding of risks for cancer and asthma.

Although no formal experimental studies of intervention were presented, there are valuable systematic examinations of settings where exposure has been reduced, for example asbestos and organic solvents. Technology has also been designed for innovative application in promoting intervention on a task-specific basis by using video exposure monitoring to make evident exposure sources and the impact of improved controls.

In addition to the formal scientific investigation there were valuable contributions of a different sort. For example, Swedish investigators have played an important role in developing an internationally relevant statement on the occupational burden of respiratory disease (ATS statement). On a different scale, Swedish investigators have shown innovation in working with investigators in developing countries to adapt advanced exposure assessment technology for use in local circumstances. Examples include the application of video exposure monitoring and an assessment of dermal exposure to pesticides.

3. International impact and collaboration

Swedish research on cancer risks has high standing internationally, especially through the approach to exposure assessment in risk studies. In addition, the investigations on dermal exposure assessment methods and the study of the relationship of exposures to dermatitis are notable. The long-standing work in occupational asthma has been important and the international collaboration in this area is well recognized. Continued attention to organic solvent exposure impacts on the neurological function demonstrates not only the specific value of this research beyond Sweden’s borders, but provides a model for the type of longitudinal cohort investigations for which Sweden is appropriately recognized as an international leader.

4. Summary assessment

The epidemiologic studies in this area have utilized exposure assessment effectively in a range of studies on chemical and biological exposures. Studies of cancer and asthma risks remain a successful area of attention and positive contribution. Experience in these epidemiologic investigations and related exposure assessment expertise has been less focused on the development of exposure modelling than on application of existing models to epidemiologic research.

B.2 Ergonomics and Musculoskeletal Disorders

1. Description of research area

The approaches to exposure characterisation include the development of strategy and measurement techniques for the assessment of physical exposures, using instruments ranging from questionnaires to video recordings, specific posture measurement devices, and electromyography. Analyses have been carried out to describe the physical and psychosocial factors in traditional and modern occupations and by gender. Lately, a system approach has been applied to assess the exposure determinants to model the exposure. Traditional and new production systems have been evaluated with this approach.

Prevalence and incidence of local musculoskeletal pain were the most commonly used outcomes in epidemiological studies in this area. A community-based sample was used to assess physical and psychosocial risk factors for neck and shoulder disorders. Other studies assessed individual and work-related factors associated with seeking medical advice due to low back and neck disorders, and factors affecting the course of symptoms and disability after a pain episode. A prospective study looked at risk factors for musculoskeletal pain among computer users.

Some groups explored the mechanisms of muscle pain by looking at inflammatory factors in work-related myalgia or the increase in such factors after various types of physical exercise in subjects with diagnosed work-related myalgia. Several research groups used electromyography to look at patterns of recruitment of muscle fibres.

Rather few studies addressed sick leave and disability due to musculoskeletal disorders (MSDs). These included a qualitative approach to factors that make people go on sick leave and enhance them to return to work. Other studies looked at the effects of musculoskeletal disorders on productivity and direct costs related to MSDs.

Among the few workplace intervention studies, a randomized study looked at the effects of giving feedback to workers and supervisors of workplace ergonomics and psychosocial data. Other trials assessed the effects of different types of exercises combined with cognitive approaches on neck and back disorders. Some studies compared work tasks and work load factors as a consequence of technical development, which can be considered as a description of the effects of a natural intervention.

In the survey conducted by NIWL, new areas that were emphasised included methods to be used in the assessment of the outcome of interventions, development of tools to design better production systems, and the need for randomised controlled trials in the work-place setting. Better understanding of pathophysiology in the development of the disorders and better diagnostic tools were called for. A stronger connection between research in ergonomics and industry was seen as beneficial.

2. Evaluation of contributions

The developed measurement techniques of exposure are in general of high international quality. Research into the design of measurement strategies for postural load is of high international quality and utilises a large international network. A promising area is production ergonomics, in which a production system is linked to physical exposures on individual workers.

Although most cross-sectional studies on the determinants of MSDs among working populations had good quality, only a few prospective studies have been conducted that give new insight into the effects of physical and psychosocial risk factors and their combinations.

In research into pathomechanisms of MSDs, research areas of high relevance for occupational health include the effect of physical and psychosocial exposures and work patterns on motor recruitment. The methods to analyse the electromyographic signal have been developed to a high level. The role of inflammatory factors in muscle myalgia is a novel area of research that has a potential to increase our understanding of the development of the disorders and provide insight for prevention. It has also the potential of providing methods for early identification of MSDs. It is recognised that Sweden is one of the few countries in the world conducting research in this area.

The qualitative approach using the Illness Flexibility Model to look at factors driving those with spinal pain to sick-leave and back to work was assessed as highly innovative and methodologically qualified. An emerging research area was identified: assessing direct and indirect costs of MSDs, which is important in evaluating the cost-effectiveness of interventions.

The few intervention studies that used a randomised design were in general of high quality. Most of them looked at the effects of various types of physical exercise and cognitive techniques on neck and low back disorders. Among the few studies in the workplace setting was a cluster-randomised trial that addressed the effects of a short feedback discussion of ergonomics and psychosocial working environment data to individual workers, supervisors, or the work group as a whole.

Interviews among the researchers in this area provided evidence of a lively debate concerning differing concepts of the proper design and nature of intervention studies. These ranged from the view that such studies should only be accepted if they were randomized controlled trials applying interventions decided in advance at one extreme to following and documenting a naturally occurring development in industry at the other extreme. The broad spectrum of methodologies appropriate to the range of study types seems to be well represented in the Swedish research community in this area.

3. International impact and collaboration

Research in the measurement and evaluation of physical loads is of high international quality and has established an extensive international collaborating network. Sweden has a strong tradition in research into the pathophysiology of MSDs, and continues to produce research of internationally high quality.

4. Summary assessment

Strong areas of research include the measurement and evaluation of physical loads at the workplace and applying this knowledge to design new workplaces. This research area is of great international importance and contributes to filling a gap in knowledge. The use of this knowledge has, however, been limited in observational epidemiological and intervention studies. Sweden is internationally one of the few actors in research into the pathophysiology of MSDs. This area was assessed to have continuing high productivity and is extending to

novel approaches. The application of this knowledge into the prevention of work-related MSDs was, however, limited to relatively few areas.

B.3 Physical factors

1. Description of areas

In the area of physical risks we received papers broadly covering the key areas of: temperature extremes; fatigue; sleeplessness and temperature; electromagnetic radiation including potential health risks of mobile telephones as a major issue and of public concern, noise effects ranging from physical health risk to annoyance, speech and noise, noise and performance, classroom acoustics, and low frequency noise. Several papers addressed health risks of vibration. Examples were brought to our attention of scientific work being converted into guidance and other interventions, particularly in the area of electromagnetic radiation as a matter of public briefing.

In the survey on Swedish working life research conducted by NIWL in 2005–2006, noise was the most frequently mentioned area for future research on physical factors. There was interest expressed in the electromagnetic fields and the health effects of new technology. Several groups mentioned the problem of combined exposures research into which requires cross-discipline cooperation. Among the cited examples were: stress and physical exposures; stress injuries and heart disease; noise and vibrations, and UV radiation and chemical exposures. Another area of importance is climate and vision.

2. Evaluation of contributions

The overall quality of this work is of good standard, addressing continuing important concerns and representing high scientific challenge. The studies use standard methodologies adapted to particular circumstances and related to current problems in modern societies. We did not note any innovative approaches, but established procedures were well applied.

Swedish expertise on thermal environment has been developed over several years and was represented by several high quality papers related to standards and worker protection. The assessment of possible cancer risks from the use of mobile telephones, a major health concern, has been a well-researched target in Sweden as represented in the research reviewed by the IEG. Research on the effects of low frequency noise on performance of sensitive subjects builds competently upon the strength of this Swedish work over several years.

The research on health risks of cold environments and on health risks of mobile telephones are clearly of high importance in Sweden, and are the research is also well targeted to international concerns about both. Many aspects of noise and its effects are being researched in Sweden and particularly address health risks and life quality. Classroom acoustics, a major international issue, is being well investigated. Work on understanding the effects of low frequency noise fills important gaps in national and international knowledge. We noted the effort to understand and control the risks in non traditional workplaces, particularly in teaching, and in call centres.

Health effects due to thermal environments, noise and vibration, and low frequency noise are clearly important and were well investigated. Aspects on measurement strategies, whole body and hand–arm vibration syndromes including neurological effects were well performed.

3. International impact and collaboration

An excellent example of international collaboration was observed between leading researchers from 5 different countries (Sweden, UK, Netherlands, Belgium, and Finland) in developing temperature limit values for cold touchable surfaces. This contribution to international standard setting has had a high impact. We particularly noted the collaborations between several research groups to explore the hypothesis that there are patients with perceived electrical hypersensitivity. This joint working permitted the use of a range of investigative techniques.

In the interviews with work environment researchers, the IEG was informed that EU funding success experiences of some of the researchers was proving to be important in the sustainability of the research. In one instance this had been proceeding well for ten years.

4. Summary assessment

There is quite a diversity of research in the field concerning physical factors, some quite impressive. However, the research reviewed covered a wide range of topics and it is difficult to determine how well the aspects of these factors most relevant are being addressed in total. Much work had direct practical relevance. We found an appreciation of the need for effective knowledge transfer.

C. Evaluation of the Relevance of the Research for the Swedish work environment

1. Stakeholders

Evaluation of relevance is discussed below from the point of view of funding and enforcement, ministries, trade unions and employers, and is based on data from and interviews with the stakeholders.

SWEA continues to benefit from the criteria documents which incorporate literature reviews and assessments of exposure-response for guidance in controlling work exposures. SWEA, however, has identified a need for more research in order to become more proactive, e.g. epidemiological studies on the effects of some common chemicals and especially mixed exposures. Also human factors and work organisation were recognised as areas needing more research. SWEA has no official forum for continued discussion of research priorities.

A clear message was expressed from both the trade unions' and employers' representatives that they are not well informed about on-going research projects. There is information in publications, brochures and websites, but the social partners have difficulties in finding the essentials and how to use these in practice. They expressed a multitude of research needs, including functioning of respiratory protective equipment in real work situations, how to deal with electrical sensitivity, how to handle the directive of electromagnetic fields, etc. Practically oriented interactive workshops between researchers and workers to communicate research results were commended.

The assessment of relevance is affected by the notion that the different stakeholders use partly different sources of data to identify problems and follow trends in work environment

and health. There is no established mechanism for stakeholders to organize and communicate to the research scientists what are the needs for knowledge transfer.

Unavailability of representatives from the Government and the occupational health services prevented the assessment of the roles of those stakeholders in the setting of priorities.

2. Knowledge transfer

Work environment research addresses existing and potential future risks to the work force in the rapidly changing world of work. It often provides knowledge that can be effectively extrapolated to be informative about risks for the general population. It can have great relevance to human health and wellbeing and also to industrial development and economic growth. The wide "stakeholder" group needs to be considered in prioritizing and defining research and in gaining the greatest value from the activity. The IEG sought examples from the research community of how these issues were being addressed. We especially looked for effective means of ensuring that research activity led to practical outcomes. We have to clearly point out that we cannot refer to any evaluation of implementation or any end user's ranking. We did not receive any such evaluations or rankings.
Research groups were asked to submit a maximum of 3 examples of the application or communication of knowledge. In the areas of ergonomics and musculoskeletal disorders, chemical and biological risks, and physical factors several contributions were identified, for example, articles in vocational journals, brochures, leaflets, websites, conferences and workshops, education and training, standards, and guidelines.

Several products in the chemical and biological risks area have been brought to our attention. Most products were designed for the direct users, e.g. risk assessment for hairdressers in magazines and as training tools for apprentices. Concerned with exposure assessment, some groups provided information through workshops addressing the indirect user, e.g. companies and manufactures. An American Thoracic Society -Statement on the burden of occupational factors was directed at professionals. A notable example of a high impact product was the use of visualisation techniques where measured exposure levels were superimposed on a video of work activity. Application of these techniques in work settings indicated effective communication to managers and to line workers of source of risk as well as impact of controls.

In the area of ergonomics and musculoskeletal disorders several useful products were submitted to illustrate transfer of knowledge into practice. Most products were aimed at direct users and some to the general public. A website containing information on various areas in agriculture was considered well structured and containing in-depth information on important technical, ergonomic, and environmental protection aspects. In collaboration with two research groups in production ergonomics, a tool was developed for designers, encompassing aspects of production and material flow together with physical risk factors for the worker. Development of a patented welding visor is an example of a product with producer(s) and end-users as target groups.

In the physical factors area products were submitted with respect to direct and indirect users. Examples provided to us included international standards addressing the public input to the setting of regulations, electronic information about cold touchable surfaces, direct practical advice for the reduction of risks like radiofrequency exposure, and brochures in voice training

for teachers with respect to gender differences. The complex issue of health risks related to mobile phone use was helpfully described in a leaflet for a wider public audience.

The committee recognized the many different approaches by the research community in disseminating the results of its work, but notes that clear performance indicators for societal impact are generally lacking.

VI. Sustainability of the Research Workforce

A. Demographics on Researchers & Practitioners in Core Disciplines

According to an inventory of Swedish working life research by NIWL, approximately 70 research groups reported that they were active in research on chemical, physical, biological health risks, and ergonomics and musculoskeletal disorders. Ergonomics and musculoskeletal disorders and the combination groups have more manpower in their groups than groups doing research on chemical and biological health risks (table VI-1).

Table VI-1. Number and share of research leaders and fulltime equivalents (FTEs) and average share.

Sub categories	Number of research leaders	Share	Number of FTEs
Physical health risks	16	23 %	92
Chemical and biological health risks	25	36 %	136
Ergonomics and musculoskeletal disorders	15	21 %	166
Combinations	14	20 %	174
Total	70	100 %	568

A closer look at the employees in the 70 research groups (table V-2) reveals a fairly good gender balance as a total, but not in the senior professional categories. However, although men dominate the professor and associate professor posts, a female dominance among the doctoral candidates may indicate an upcoming structural change.

Table VI-2. Summary distribution of professional categories and gender in the 70 research groups, number of fulltime equivalents (FTEs) and average share.

Professional categories	**Percentage**		
	Women **(291.7)**	Men **(276.5)**	Total **(568.2)**
Professors	2	17	9.2
Associate professors	10	17	13.5
Doctors/research associates	20	21	20.4
Doctoral candidates	39	26	32.5
Research assisting personnel	21	15	17.9
Others	8	5	6.5
Total	**100**	**100**	**100**

() = FTE estimates

B. Assessment of Sustainability

The demographic pattern of the research workforce responsible for work environment research and its sub-areas is rather striking. The leadership of this workforce is quite overbalanced by male research scientists while the younger workforce predominantly consists of women. A comparison of 63 research leaders in occupational health (Figure V-1) shows that age is an issue. Within the three main research areas, only “chemical and biological risks¨ has any research leader younger than 40 years of age. Most of the research leaders are between 55 and 59 years of age and 23 % are above 60. The implication of this trend could be serious for the sustainability as roughly half of all research leaders will retire within the next 10 years.

A review of the doctoral theses completed since 1941, on the other hand, presents good evidence that there continues to be interest in and development of research scientists in all three areas of concern to the evaluation task (Table V-3). This is particularly so for the areas of chemical/biological and ergonomic/musculoskeletal disorders research. Some concern is evident for problems associated with physical hazards. Attention to noise and vibration may be adequate but examination of climate extremes, ionizing and non-ionizing radiation, however, are not well represented and overall, advanced training in research related to exposure assessment and control is possibly inadequate.

Interviews with representatives of a number of research groups, in addition, raised concern about the long-term sustainability for these research areas. While there appear to be an adequate number of doctoral students engaged in relevant studies, it is not apparent that current circumstances for these fields of research are attractive to scientists as they consider their long-term career objectives and opportunities. This may be a consequence of insufficient stable funding to attract post-doctoral research scientists to fill available positions but may also be due to the very decentralized structure of work environment research (70 units), which could suggest uncertainty about sufficient long-term support for a dedicated career. FAS offers each year 1-2 post doc salaries during two years for the evaluatied disciplines, which was by no means considered sufficient.

The funding situation described elsewhere in this report is instructive concerning the difficulty in identifying opportunities for on-going funding of research that can be expected to continue well into the future.

Figure VI-1. Age structure of 60 Swedish research leaders in different work environment fields.

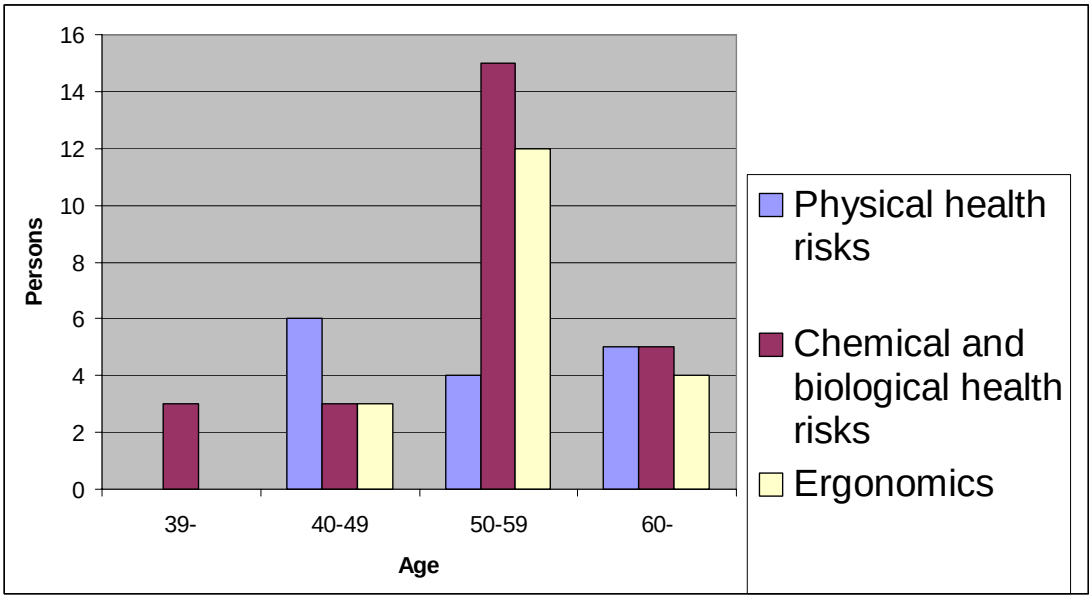


Table VI-3. Swedish doctoral theses in work environment sciences 1941–2005.

	1941–1950	**1951–1960**	**1961–1970**	**1971–1980**	**1981–1985**	**1986–1990**	**1991–1995**	**1996–2000**	**2001–2005**	**+Dev[1]**
C_{epi}	4	2	4	6	11	16	19	12	11	2
C_{oh}				1	8	13	10	11	9	
C_{derm}			1		1	4	2	1	2	
$Ph_{noise, epi}$		1		1	1			2	3	
$Ph_{noise, oh}$							1			
$Ph_{vibration, epi}$				1		2	1	2	4	
$Ph_{vibration, oh}$							2	1		
$Ph_{light, epi}$				1			1			
$Ph_{light, oh}$							2			
$Ph_{climate, epi}$						1			4	2
$Ph_{climate, oh}$										
$Ph_{rad, epi}$						1			1	
$Ph_{rad, oh}$									1	
E_{epi}		1		1	4	3	13	7	13	
E_{exp}	1				1	1	2	5	6	1
E_{phys}	2	4	3	5	3	2	6		2	
Psychosoc		1	1	4		8	7	5	20	1
Injury						2	4	2	3	1
Total	**7**	**9**	**9**	**20**	**28**	**52**	**70**	**48**	**79**	**7**

[1] Number of theses by doctoral students from developing country included in the 5-10 year tabulations

Explanations:

C	Chemical and biological risks
E	Ergonomics
Ph	Physical risks
epi	Epidemiology/registers clinical, intervention
oh	Occupational hygiene, toxicology
derm	Skin exposures/dermatitis
exp	Ergonomic exposures
rad	Radiation and electromagnetic field
phys	Physiology, biomechanics
Psychosoc	Psychosocial and rehabilitation
+ Dev	Developing country

VII. Summary Evaluation and Recommendations

A. Overall evaluation

The goal of the evaluation of research on work environment was focused on determining whether Swedish work environment research (WER) is of international standard in quantity and quality, and of relevance for the society. The international evaluation group (IEG) formulated several fundamental questions:

Does WER address gaps in the international research, significantly enhance the knowledge base or mainly repeat the research elsewhere?

Sweden plays a significant role in enhancing the international knowledge base for work environment research. The bibliometrics analysis provided direct evidence of the high standing of research when compared with other leading nations in the major work environment journals. In the judgement of the IEG, Swedish work environment research can be located among the top three in the world. In several areas, outstanding contributions were identified. Research in all three WER areas examined was found to have good quality, relevance, and a sufficient balance between new areas and developments in existing areas of study.

Changes in work environment research funding and structures of the research organisations may place this standing at some risk. The IEG has some concern that the current high level in quantity and quality of WER cannot be maintained without recognition of its importance and continuing support. To guarantee sustainability of the research community, it is of crucial importance to support recruitment of young researchers and provide opportunities for career development.

Does WER pay adequate attention to engaging with the international research community?

The Swedish work environment research community has, for some time, been collaborating with international partners. This engagement is consistent with that of the other major contributors to work environment research in Western Europe and North America. More international collaboration in some WER areas would benefit the international community as well as the Swedish work environment research community.

Do WER efforts include knowledge distribution and knowledge implementation in addition to knowledge development?

The evidence of knowledge transfer is quite uneven both in terms of translation of scientific research into information widely available to the public and other stakeholders and in terms of taking the research findings into practice. Some researchers have made great efforts to engage in knowledge transfer, but the social partners expressed a greater need for this transfer. There appears to be a gap between research and practice that needs further attention in Sweden.

Does WER and its transfer provide a good basis for policy decisions, strategies and activities to promote a good work environment?

The WER is largely relevant to policy considerations but could be supplemented by more attention to research related to surveillance of current working conditions in Sweden and to the identification of emerging risks. The communication of the research findings in a form useful for work environment policy needs and actions could be improved.

Does the structure in support of work environment research appear appropriate and optimal?

The structure for WER has, in recent years, become quite decentralized. Now WER is conducted in a variety of large and small units. Some of these units are integrated parts of the normal university structures, some are part of the regional NIWL structure and the remainder outsourced from NIWL with uncertainty about long-term circumstances. This structure is not optimal and needs to be better coordinated. The absence of a coordinated structure suggests inadequate prioritization of research needs.

The funding support for these units is also complex. A mix of support from core university funds, earmarked university funds, NIWL, from competitive research funding and increasingly contracts with Afa and private industry make for a diffuse and unclear system. There is little evidence of priority driven research funding, some of which would be desirable.

B. Strengths and Weaknesses

The IEG has evaluated the strengths and weaknesses of Swedish WER, which are summarised in the table below. It represents key issues identified and discussed during the evaluation.

Strengths	Weaknesses
Extensive well-kept registers and survey systems that provide data on trends in health outcomes for priority setting and a well organized basis for epidemiologic studies Well-functioning networks between researchers, social partners and authorities, providing the opportunity for good access to workplaces and information of current and emerging problems Existence of funding organisations that clearly identify WER in their objectives Research covers a wide range of important work environment issues and provides depth in knowledge that appears relevant to the Swedish work environment	Clear priorities for WER are not evident and effective priority setting does not appear to be in place Existing survey data on work environment issues are not well utilized to drive priorities in funding WER Inadequately developed hazard surveillance systems and systematic horizon-scanning for emerging work environment risks of concern Insufficient multidisciplinary research and need to better develop networks among and across WER disciplines along with other disciplines of work-life Project funding covering 3 years or less limits effective studies in some highly

Strengths	Weaknesses
Sweden is making a large contribution to the global knowledge base in WER as demonstrated in the bibliometrics analysis Excellent expertise in respiratory disorders, cancer epidemiology ergonomics, climate, and electromagnetic field research providing international leadership in these areas Close collaboration between university departments and occupational medicine clinics presents unique opportunities for relevant research Good opportunities for doctoral education with constant high production of PhD theses in WER Good access to an open research structure Strong competence in measuring exposures in all areas of work environment risks studied	required areas, such as longitudinal epidemiological and intervention studies Insufficient research funding mechanisms organized specifically to promote development of the work of young scientists undertaking their own research Funds have been reducing for open-call researcher-initiated projects that might threaten both innovation and the sustainability of research in this area Long evaluation processes of research applications inhibit rapid response to emerging WER problems Age structure of research leadership a threat to sustainability of WER Insufficient attention to the study of intervention effectiveness Insufficient research directed to exposure modelling and its role in understanding exposure-risk relationships Knowledge interchange between stakeholders and researchers needs strengthening

C. Recommendations

Funding

1. **In order to maintain the current high quantity and quality of WER, it is essential to maintain funds specifically dedicated to this research area and open for applications to include both personnel and equipment. The amount of funds available through RALF, six years ago, should at least be re-established.**

   The bibliometrics analysis of Swedish WER demonstrated a high production of good quality. The evaluation of the quality of submitted research contributions by the IEG confirmed the good quality of research in established as well as in new areas. This high profile of WER in Sweden can only be maintained with due recognition and visibility in allocation of resources within research organisations.

There are several uncertainties about the future of funding for WER. The most important of these are the reduction in support of NIWL as well as the stability of research funds that have been reallocated from NIWL to the universities. The IEG raises concern as to the absorption of support for WER into larger research structures (for example, Vinnova) addressing all aspects of working life and/or adjacent domains. The IEG strongly recommends FAS to continue and expand its programme in WER.

The overview of WER finances shows that public funding through open calls by FAS accounts for only approximately 10% of the total budget available for WER. The IEG is of the opinion that this small proportion of 'free money' hampers the development of innovative, novel research. Hence, the IEG strongly recommends establishing a more appropriate level of funding through open calls with at least the amount of funds available through RALF, six years ago.

2. **Duration of projects to be funded in open calls should provide options for funding up to five years. This will greatly enhance the possibility to conduct longitudinal epidemiological and intervention studies for which there is a high priority need.**

   The current structure of the funding has a large impact on design and content of research projects. In some areas projects cannot be carried out successfully within a time frame of 3 years. Epidemiological studies to characterize exposure-response relationships most often require a longitudinal design and the latency period between first exposure and incidence of disease may dictate follow-up periods that exceed 3 years. Furthermore, with a three year maximum grant duration, intervention studies can only be carried out for risk factors with short-term effects. The IEG recommends FAS consider more flexibility in the acceptable duration of projects eligible for funding.

3. **Rapid assessment processes should be established for smaller project plans to facilitate pilot studies with novel approaches and rapidly emerging issues.**

   The current structure of funding agencies relies strongly on well-established procedures for submission and appraisal of applications through extensive peer review process and prioritizing. Given the standard time interval between application and final decision, strong consideration should be given to establishing a fast track procedure for projects of short-term duration. The IEG notes that sometimes rapidly emerging issues require a rapid response of researchers that is not possible in the regular funding process. This mechanism could also be considered for seed grants that allow researchers for a limited period of time to investigate the potential use of novel approaches in larger, well-designed studies or to develop pilot data for the early and conceptual stages of projects that address new hypotheses.

4. **There is a need for better integration of different domains of knowledge in order to address multi-factorial work-related health problems. Interdisciplinary research projects should be encouraged through funding strategies.**

Work-related health problems are often multi-factorial in nature that call for input in research projects from different disciplines. The IEG has noted that Swedish WER has established national and international collaborative networks, but collaboration across different disciplines should be improved. Funding agencies should actively encourage applications on interdisciplinary research and establish mechanisms to fund these collaborative proposals from different programmes.

Commission to examine the work environment research structure

The complex state of research structure and financial support related to and coupled with the apparent lack of a systematic priority setting scheme for identifying those WER areas of highest concern lead to the recommendation to establish a high level commission. Such a commission should examine the organizational structure in support of WER, the setting of priorities and suggest the best funding options to deliver the most appropriate research.

The examination of the extensive materials submitted, accompanied by interviews with both researchers and other interested parties, revealed a very complex state of research structure and financial support related to WER. This fact coupled with the apparent lack of a systematic priority setting scheme for identifying those WER areas of highest concern make it uncertain how or whether the current structure and funding of WER are organized in the best way to serve the needs of Swedish working life. We suggest that a full understanding of the priorities and the level of resources (both personnel and financing) necessary to address these priorities is essential. To achieve this understanding the most efficient and effective way would be to establish a high level commission with representatives from the government, the social partners, funding agencies and members of the research community.

Sustainable resources

Research institutions should actively pursue career development of competent work environment researchers in order to guarantee sustainability. Such activities could include support to attract recent post-doctoral scientists early in their careers and means to stimulate mid-career researchers. Funding mechanisms in support of such activities should be encouraged.

The demographic development in many research groups showed that most research leaders are above 55 years of age and will retire within the next decade.

The lack of possibilities for career development will not only affect research capacity but also discourages excellent students from considering a career in work environment research. This raises serious concerns about the sustainability of WER. During the interviews with research leaders this was singled out as one of the most urgent problems to be addressed. An active approach is required to identify and recruit future research leaders and to support and supervise their personal development towards a senior position with full responsibility for acquisition, research, and management of a research group. Funding agencies should establish

appropriate means to support active career development e.g., grants for sabbaticals and study trips.

Important research areas to be developed

1. **Research on exposure assessment modelling and related risk modelling needs to be strengthened. This includes research on exposure variability, which factors determine exposure patterns, and how this knowledge is applied in the design, conduct and interpretation of epidemiological studies and workplace interventions.**

   In all three areas of WER techniques and methods for measurement and evaluation of exposure are well developed. However, the IEG has observed that in epidemiological and intervention studies the focus is on application of existing exposure assessment method and that there is less attention to methodological development in exposure strategies and exposure modeling. In recent years statistical techniques have become available that allow simultaneous evaluation of the magnitude of variance components as well as determinants of this variability. These techniques are powerful instruments in the design of measurement strategies in epidemiological studies and in implementation of control and prevention strategies to reduce hazardous exposure. Incorporation of advances in biomarker research will benefit this work as well. The IEG recommends targeted research in this area to further improve the quality of epidemiological and intervention studies.

2. **More systematic intervention studies are needed. There is a major need for development of scientific methods for determining the efficacy and effectiveness of interventions. It is also recommended to pay more attention to the use of appropriate study designs and methods for exposure and outcome assessment in intervention studies along with economic evaluation techniques. Interdisciplinarity is likely to be important to achieve this objective.**

   The IEG has observed that research is mainly focused on risk identification, occurrence of health problems in different occupational groups and workplaces, and characterization of exposure-response associations. Research into the effectiveness of interventions is less well developed. The IEG acknowledges that intervention studies are difficult to conduct, but with the growing understanding of exposure-response associations a shift is needed towards intervention research. Therefore, we recommend a substantial increase in resources being allocated to intervention studies. Insight is needed in the use of appropriate study designs, varying from natural experiments to quasi-experimental designs and randomized controlled trials. Development is required in strategies to better characterize exposure patterns and health outcomes in intervention studies and methods embedded in intervention studies to evaluate whether the underlying etiological hypotheses of their association can be corroborated. A special area of attention is economic evaluation of workplace interventions designed to reduce work environment risks. Available economic evaluation techniques and methods should be adapted specifically for use in work settings and, where necessary appropriate new methodologies should be developed.

3. **Research is needed on methods and strategies for the implementation of new scientific knowledge.**

   In the evaluation of the relevance of WER for the Swedish work environment practice several interesting examples of knowledge transfer were presented. During interviews with researchers and stakeholders various barriers and problems for implementation of effective interventions were mentioned that exemplify the gap between research and practice. There is a great need for communication of research findings and access to these findings. However, even when companies and stakeholders are reasonably well informed on effective interventions, the actual application of scientific knowledge to improve working conditions is strongly influenced by behavioral, organisational, economic, and technical constraints. The IEG recommends initiating and funding research projects that develop generalisable methods and strategies for facilitating the implementation of interventions that have been effective in reducing work-related risks.

Basis for Priority Setting

1. **Research is needed to develop hazard surveillance systems that identify and monitor exposures at the workplace. The use of early indicators of risk, for example non-invasive biological techniques and self-assessment methods, appropriate to the modern structure of Swedish work should be considered.**

   Systematic ongoing hazard surveillance has not been present for the Swedish work environments for some period. At the same time there has been dramatic evolution of working life in Sweden with many classical industries being replaced by work environments more oriented toward service functions, many of these reliant on modern information technology and systems. The limited data describing risks from physical, chemical, biological or ergonomic hazards in the current mix of Swedish work environments makes it difficult to target appropriate research and intervention activity. There are a variety of non-invasive methods, recently developed, that have potential for application in surveillance systems. There needs to be research into the most appropriate and cost-efficient systems that are sufficiently representative to provide the necessary guidance for policy makers and practitioners along with research on the best indicators to be used in these systems.

2. **Using modern sampling methods government agencies need to take advantage of existing health data, hazard surveillance data and consider the structure of Swedish working life to prioritize WER needs. Information available internationally should be used and research leaders should be engaged in this effort.**

   There are data available from the Work Environment Survey and from ISA that has been insufficiently used and could be further developed for priority setting. There is, however, a lack of regularly collected exposure data to be used for surveillance. Existing data have some limitations but better and more complete analysis of these has the potential to provide a first order understanding of the distribution of risk and adverse health outcomes on a regional and national level. In spite of high quality and

reasonable coverage of the data systems the picture still remains somewhat fragmentary. A well structured Swedish Working Life Profile presented in a user-friendly format is suggested. For example, registry data could be complemented and strengthened by appropriate use of modern sampling methods. Well targeted national and other surveys can be utilized to monitor problems and assess gaps in the registration systems. This applies particularly to the severe under-reporting of accidents and diseases.

This could be used, along with data available from other nations with a similar mix of industry types or relevant exposures, to develop an initial set of priorities for research. Continuous improvement of the systems is encouraged in order that the priorities be evidence-based at the best possible level. Care needs to be taken that evidence informs the priority setting process but that sufficient flexibility in funding is maintained to allow for new areas of research in the fast changing work environment to be addressed.

3. **WER groups throughout Sweden should be encouraged to interact to minimize overlap and maximize use of available national research expertise.**

   There are quite a variety of research groups in each of the research areas we evaluated. These vary in size and are spread rather widely through Sweden. This brings benefits to the different regions but also presents challenges with respect to efficient and effective cross-group collaboration and appropriate allocation of resources. Some of these groups have found effective ways to interact to identify priority research needs, to orient leadership of the research targets identified and to promote effective combinations of specialized expertise. Platforms for interactions and methods to support development and continuation of research networks should be facilitated, where necessary by some targeted funds.

Interchange of Knowledge

The interchange of knowledge from stakeholders to researchers and the reverse should be improved. Means and methods should be developed for collaboration between the social partners, other user groups and the research community to design effective information transfer. Efforts at knowledge transfer need to be systematically assessed.

Evidence suggests that stakeholders' needs are not effectively communicated to the research community. Knowledge transfer requires specific structure and content of different forms of communication that should depend, only in part, on the scientist responsible for the research. As a rule, research scientists are highly skilled in developing new knowledge and publishing this knowledge in the scientific literature. However, scientists are not specifically trained in determining stakeholder needs nor in translation of their knowledge into forms that are most useful for the social partners or specific user groups. It is essential to develop a structure that enables those who are experts in knowledge management and transfer specific to each of the interested user groups and stakeholders to collaborate with the research scientists in order to design effective information transfer.

Social Responsibility

Continued support for training and education of work environment research professionals in developing countries is encouraged.

Sweden has an enviable record of engagement with developing nations in research and research training relevant to these nations' needs. Representative of this work are the PhD theses presented to Swedish research faculties by students from these nations. Given the leadership of Sweden in work environment research there is a social responsibility to continue these efforts.

Addendum

During the final preparations of this report the IEG was informed that the national budget proposal from the new government presented 16 October suggests a complete close down of the NIWL from 1 July 2007 and that preparations already have started for dismantling the institute, without any compensatory mechanisms or transfer of ongoing research projects. Although it was not our task to evaluate separate groups or institutions we have noted that NIWL, with a quarter of the total estimated budget for WER, represents the largest of all research centres and that the research at NIWL is of the same quality and relevance as the rest of Swedish WER evaluated. We have noted that the broad, multidisciplinary composition of researchers within NIWL offers excellent conditions for the type of new research areas we have suggested.

It is obvious that a decision from the parliament in line with the proposal will drastically diminish the resources for WER in Sweden unless earmarked compensation is given to the universities and/or to the funding agencies, e.g. FAS, in time for the NIWL researchers to apply for funding or new university positions.

VIII Sammanfattning (Executive Summary in Swedish)

Sveriges regering har givit FAS i uppdrag att utvärdera svensk arbetsmiljöforskning inom områdena kemiska, fysikaliska och biologiska hälsorisker och belastningsergonomi men inte av psykosocial arbetsmiljöforskning.

Målsättningarna för den internationella utvärderingen:

- Att bedöma den vetenskapliga kvaliteten samt att identifiera luckor, svagheter och styrkor i svensk arbetsmiljöforskning ur ett internationellt perspektiv.
- Att analysera forskningens samhällsrelevans, dvs. genomförande av och framgång med att förmedla vetenskap till praktik i syfte att skydda den svenska arbetskraftens hälsa.
- Att kartlägga styrkor, luckor och svagheter inom organiseringen av den svenska arbetsmiljöforskningen samt att identifiera framtida forskningsbehov.

Den internationella utvärderingsgruppen (IEG) träffades i Stockholm i mars 2006 för att organisera utvärderingen och i oktober 2006 för intervjuer och rapportskrivning, som senare slutfördes per korrespondens. 70 relevanta forskningsgrupper hade identifierats och ombads skicka in sina bästa forskningsalster samt dokumenterad kunskapsförmedling. Utvärderingen skulle inte analysera individuella forskargrupper utan vara mer strategisk till sin natur. Forskningsmaterial från de 60 forskargrupper som svarade på utskicket levererades till IEG mellan de två mötena för bedömning enligt kriterierna originalitet, kvalitet och relevans. I oktober genomfördes intervjuer med forskare och representanter från relevanta organisationer, arbetsgivare och fackföreningar. En bibliometrisk analys genomfördes också i ett försök att oberoende analysera svensk forsknings kvantitativa bidrag och relativa betydelse internationellt.

Svensk arbetsmiljöinformation: Sverige har ett välutvecklat system av register och enkätundersökningar för arbetsliv, arbetsmiljö, hälsa och säkerhet. Informationssystemen har funnits under många år, är väl standardiserade, välorganiserade och tillgängliga för forskning. Trots att datasystemen har hög kvalitet och ganska bra täckning är den totala bilden något fragmentarisk. Vi föreslår att en välstrukturerad svensk arbetslivsprofil tas fram i ett användarvänligt format.

Arbetsmiljöforskningens struktur och finansiering: Arbetsmiljöforskningen har decentraliserats under senare åren och genomförs numera av många stora och små enheter. Vissa enheter är integrerade i den normala universitetsstrukturen, vissa ingår fortfarande i Arbetslivsinstitutets (ALI) regionala struktur, medan andra har utlokaliserats från ALI till universitet och högskolor med ovisshet om framtida finansiering. Denna struktur är inte optimal och skulle sannolikt kunna samordnas på ett bättre sätt. Bristen på samordnad struktur kan bero på avsaknaden av tydliga forskningsprioriteringar.

Finansieringen av dessa enheter är också komplicerad. En blandning av finansiering genom ALIs och universitetens basanslag, öronmärkta universitetsanslag, forskningsanslag sökta i öppen konkurrens samt allt fler kontrakt med AFA och det privata näringslivet gör systemet diffust och oklart. Forskningsfinansieringen förefaller inte baseras på tydliga prioriteringar, vilket skulle vara önskvärt.

Utvärdering av forskningen

Syftet med utvärderingen av den svenska arbetsmiljöforskningen var att bedöma om den håller internationell standard med avseende på kvalitet, kvantitet och samhällsrelevans. I den fullständiga rapporten redovisas en sammanfattning av de styrkor och svagheter som IEG fann.

Sverige bedöms ha haft en väsentlig roll i utvecklingen av den internationella arbetsmiljöforskningen. Den bibliometriska studien visade, genom att använda två olika databaser, att svenska forskare under de senaste tjugo åren bidragit med omkring 8 % av världsproduktionen av vetenskapliga artiklar om arbetshälsa och ergonomi. Justerar man siffrorna efter befolkningsmängd rankas Sverige som etta i dessa områden. Artiklar med svenska författare citeras mer än genomsnittligt. Analysen fastställde slutligen att Sverige i stor utsträckning har internationellt forskningssamarbete, framförallt med andra nordiska länder.

Forskningen inom alla de tre utvärderade forskningsområdena bedömdes ha god kvalitet, relevans och en god balans mellan nya områden och utveckling av etablerade forskningsområden. Fortsatta förändringar inom finansierings- och organisationsstrukturer kan hota denna situation. IEG befarar att den nuvarande höga nivån på arbetsmiljöforskningens kvalitet och kvantitet riskeras om man inte beaktar forskningens vikt och bibehåller stödet till den. För att garantera en hållbar utveckling av forskarsamhället är det av stor vikt att rekrytera unga forskare och att erbjuda möjligheter till karriärutveckling.

Forskningen om kemiska och biologiska hälsorisker har varit viktig, särskilt epidemiologisk forskning som effektivt använder sig av exponeringsbedömningar i en rad studier. Utvecklingen av exponeringsmodeller är emellertid ett område som skulle kunna förstärkas. Studier av cancer- och astmarisker fortsätter att vara framgångsrika forskningsområden.

Forskningen inom belastningsergonomi har visat särskild styrka vad gäller mätning och utvärdering av fysisk belastning i arbetslivet och i att tillämpa denna kunskap vid utformningen av nya arbetsplatser. Detta forskningsområde har stort internationellt värde och bidrar till att fylla kunskapsluckor. Sverige är en av få nationer med forskare som ägnar sig åt belastningsskadors patofysiologi och bedöms hålla fortsatt hög produktivitet och använda sig av nya infallsvinklar. Tillämpningen av denna kunskap för att förebygga arbetsrelaterade belastningsskador har emellertid varit begränsad till relativt få fall.

Forskningen om fysikaliska faktorer har omfattat många olika faktorer och delvis varit imponerande. Många fynd har direkt praktisk användning och ett behov av effektivare kunskapsförmedling framhålls.

Svenska forskare har sedan länge samarbetat internationellt på liknande sätt som andra arbetsmiljöforskare i Västeuropa och Nordamerika. Utökat internationellt samarbete inom vissa arbetsmiljöområden skulle främja omvärlden såväl som svensk arbetsmiljöforskning

Demografiskt sett uppvisar arbetsmiljöforskarna ett anmärkningsvärt mönster. Forskningsledarna har en klar manlig dominans medan den yngre delen av arbetskraften till största delen består av kvinnor. Inom de tre huvudområdena uppvisar endast ¨kemiska och biologiska hälsorisker” någon enda forskningsledare under 40 år. De flesta forskningsledarna är mellan 55 och 59 år och 23 % är över 60 år. Följderna av detta åldersmönster kan bli

allvarliga för forskningens hållbarhet eftersom ca hälften av forskningsledarna går i pension inom de närmaste tio åren. Även om det verkar finnas tillräckligt många forskarstuderande inom huvudområdena är det inte självklart att förhållandena kommer att vara tillräckligt attraktiva för unga forskarna för att välja en långsiktig forskarkarriär inom ett av dessa.

Omfattningen av kunskapsutbytet mellan forskning och praktik förefaller ganska ojämn. Det framgår tydligt av bristen på strukturer för användargrupperna att förmedla kunskapsbehov till forskarna. Det gäller också förmedlingen av forskningsresultat till praktiker och andra användargrupper så att de kan leda till praktiska förbättringar. Några forskare har lagt ner mycket arbete på kunskapsöverföring, alltifrån arbetet som görs av den svenska kriteriegruppen för hygieniska gränsvärden till Internetsidor med praktisk vägledning för yrkesverksamma och allmänheten. De intervjuade representanterna för arbetsmarknadens parter menade emellertid att det finns ett stort behov av ökad överföring. Det verkar finnas en klyfta mellan forskning och praktik i Sverige som borde ses över.

Den arbetsmiljöforskning som bedrivs är till största delen relevant men skulle kunna kompletteras med utveckling av vetenskapliga metoder för kontinuerlig övervakning av svenska arbetsförhållanden och med metoder för riskbedömning. Förmedlingen av forskningsresultat skulle kunna förbättras så att den blir mer användbar för arbetsmiljöstrategiska behov och praktiska förbättringar.

Rekommendationer

Finansiering

- För att kunna behålla den nuvarande höga kvantitativa och kvalitativa nivån på arbetsmiljöforskningen är det viktigt att särskilda medel anvisas till denna för ansökningar, som omfattar såväl personal som utrustning. Det förefaller lämpligt att åtminstone återgå till den storleksordning på sökbara medel som fanns från RALF för sex år sedan.

- Det bör vara möjligt att söka medel för 5-åriga projekt. Detta skulle avsevärt öka möjligheterna att utföra nödvändiga longitudinella, epidemiologiska studier och interventionsstudier.

- Snabba bedömningsrutiner bör kunna tillämpas för skisser till mindre projekt, för att underlätta pilotstudier med nya infallsvinklar och för snabbt uppkomna frågor.

- Integrationen mellan olika kunskapsområden bör förstärkas för att kunna studera multifaktoriella, arbetsrelaterade hälsoproblem. Finansieringsstrategier bör uppmuntra interdisciplinära forskningsprojekt.

Kommitté för analys av arbetsmiljöforskningens struktur

- En kommitté bör tillsättas på hög nivå för att analysera och utvärdera arbetsmiljöforskningens organisationsstruktur, hur prioriteringar ska utarbetas och vad de bästa finansieringsalternativen är för att bidra till den lämpligaste forskningen.

Hållbara resurser

- Forskningsinstitutioner bör aktivt stödja karriärutveckling för kompetenta arbetsmiljöforskare så att hållbarhet garanteras inom deras forskningsområden genom att stödja post doc-forskare tidigt i karriären och även att stimulera forskare mitt i karriären. Finansieringsmekanismer som stödjer sådana aktiviteter bör uppmuntras.

Forskningsområden som bör utvecklas

- Forskning kring modeller för mätning av exponeringar och relaterade riskmodeller behöver förstärkas. Detta omfattar forskning om exponeringarnas variabilitet, vilka faktorer som bestämmer exponeringsmönstren och hur denna kunskap kan tillämpas på design, utförande och tolkningar av epidemiologiska studier och arbetsplatsinterventioner.

- Det behövs fler systematiska interventionsstudier. Det finns ett stort behov av att utveckla vetenskapliga metoder som fastlägger interventioners effektivitet och verkningsgrad. Användningen av lämplig studiedesign, metoder för exponeringar och resultatbedömningar tillsammans med ekonomiska utvärderingsmetoder bör uppmärksammas. Tvärvetenskaplighet är sannolikt viktigt för att nå dessa resultat.

- Vetenskapliga studier av metoder och strategier som främjar tillämpningen av ny vetenskaplig kunskap behövs (implementeringsforskning).

Prioriteringsgrunder

- Forskning behövs för att utveckla system för övervakning av risker som identifierar och följer exponeringar på arbetsplatsen. Dessa system bör överväga användning av tidiga riskindikatorer, till exempel sådana icke-invasiva biologiska metoder och självskattningar som kan vara lämpliga för modernt svenskt arbetsliv.

- Myndigheterna bör använda sig av moderna urvalsmetoder för insamling av hälso- och exponeringsdata för att kunna prioritera behoven av arbetsmiljöforskning med beaktande av den svenska arbetslivsstrukturen. Internationell kunskap bör utnyttjas och forskningsledare bör delta aktivt i dessa processer.

- Samarbete mellan olika forskningsgrupper inom arbetsmiljöområdet bör uppmuntras för att minimera överlappning och maximera utnyttjandet av forskningsexpertisen.

Kunskapsutbyte

- Utbytet av kunskap från användargrupper till arbetsmiljöforskare och vice versa bör förbättras. Hjälpmedel och metoder behöver utvecklas för att arbetsmarknadens parter, andra användargrupper och forskarsamhället ska kunna ha ett effektivt kunskapsutbyte. Kunskapsutbytet bör systematiskt analyseras.

Socialt ansvar

- Fortsatt stöd till kursverksamhet och utbildningar för arbetsmiljöforskare i utvecklingsländer bör uppmuntras.

Tillägg

Under slutsammanställningen av denna rapport fick IEG information om att den nya regeringens budgetförslag, som presenterades den 16:e oktober, föreslår en total nedläggning av Arbetslivsinstitutet från den första juli 2007, och att förberedelserna för nedläggningen redan har börjat utan någon fortsatt finansiering eller överföring av pågående forsknings-projekt. Även om det inte varit vår uppgift att analysera enskilda grupper eller forsknings-institut så har vi noterat att ALI, med en fjärdedel av den uppskattade budgeten för arbetsmiljöforskning, är det största av alla svenska forskningscentra och att forskningen vid ALI har lika hög kvalitet och relevans som övrig svensk arbetsmiljöforskning analyserad av IEG. ALI har en bred, multidisciplinär sammansättning av forskare, vilket erbjuder mycket bra förhållanden för den typ av nya forskningsområden som vi har föreslagit.

Det är uppenbart att ett riksdagsbeslut i enlighet med förslaget skulle leda till en dramatisk minskning av de resurser som finns tillgängliga för arbetsmiljöforskning i Sverige, såvida inte öronmärkt kompensation ges till universiteten och/eller till finansieringsinstituten, dvs. FAS, i så god tid att ALI-forskare kan ansöka om forskningsanslag eller nya universitetstjänster.

Appendix I

Members of the Swedish Reference Group

Maria Albin, Swedish Society of Medicine, Section for occupational and environmental medicine, and Lund University

Sven Bergström, FAS Board, and LO

Anna Dahlman-Höglund, Swedish Society for Occupational and Environmental Hygienists, and Occupational and environmental medicine, Gothenburg University

Eric Jannerfeldt, Confederation of Swedish Enterprise

Bengt Järvholm, FAS Board, and Occupational and environmental medicine, Umeå University

Bertil Remaeus, Swedish Work Environment Authority

Eva Vingård, FAS Board, and Occupational and environmental medicine, Uppsala University

Torgny Wännström, FAS Board, and Afa Insurance

Appendix II

Letter of invitation to researchers for the International Evaluation Group

This letter is an inquiry regarding your interest in taking part in an evaluation of Swedish work environment research.

The Swedish Council for Working Life and Social Research (FAS) supports basic and applied research within the areas of working life, public health and welfare. FAS is also responsible for evaluation of and information about research in these areas. At the request of the Swedish Government FAS has carried out evaluations of the following research areas: labour law, international migration and ethnic relations, social work, youth studies, public health research and health economics. FAS has now been commissioned by the Government to carry out an evaluation of occupational health research in Sweden.

FAS has developed a general model for these evaluations, which includes the following components:

a) definition of the research area to be evaluated
b) descriptive overview of the development of the research area (to be carried out by a senior Swedish scholar)
c) inventory of research funding agencies, research groups and relevant research publications (sometimes including bibliometrics)
d) establishment of a Swedish advisory group with the task to assist the council concerning area definition, methods for the evaluation, international evaluators and identification of relevant research groups
e) questionnaire surveys to research group leaders/researchers and (sometimes) other concerned groups asking for opinions on present and future directions of research, relevance, potentials and difficulties etc
f) recruitment of a small group of international scholars to carry out the scientific evaluation and to participate in hearings with researchers, consumers of the research findings and other relevant groups
g) presenting the preliminary conclusions from the international group and the evaluation secretariat to researchers, consumers of the research findings and other relevant groups
h) compiling the final report and present it to the Board for final acceptance
i) hand over to the government, usually the minister concerned.

The area of concern has been defined in the task from the government as “to analyze Swedish research in the area of occupational health[2], primarily chemical, physical and biologic health risks and research on physical musculoskeletal disorders including the association with mental stress.The task involves inventory as well as evaluation of carried out research.The evaluation shall consider scientific quality as well as the relevance to the society of the research”. The report shall be delivered to the government no later than 1 February 2007.

[2] The exact translation of the Swedish word ”arbetsmiljö” would be ”work environment” but as the task is restricted to health risks the term ”occupational health” seems more adequate in English.

A Swedish reference group has been set up for the evaluation consisting of the following members: Senior Research Officer Kenneth Abrahamsson, FAS, Asoc. Prof Maria Albin, Lund University, Mr Sven Bergström, Swedish TUC, Res. Officer Elisabeth Birke, FAS, (secretary), PhD Anna Dahlman-Höglund. Gothenburg University, Dr Eric Jannerfeldt, Swedish Employers, Professor Bengt Järvholm, Umeå University, Deputy Director General Bertil Remaeus, Swedish Work Environment Agency, Professor Eva Vingård, Uppsala University, Professor Rune Åberg, FAS and CEO Torgny Wännström, Afa. Professor Christer Hogstedt, National Institute of Public Health, has accepted to chair the reference group and to coordinate the task. The reference group has had one meeting in which some preliminary plans for the evaluation were drawn up.

The aim of the evaluation is to make an assessment of the scientific quality of the research and to identify gaps, weaknesses and strengths of Swedish occupational health research from an international perspective. No individual evaluation of researchers or research groups shall be performed. Since most Swedish experts in the area would be included in the evaluation themselves, international experts will be required in order to achieve an unbiased evaluation. We are currently planning to have a group of six experts to carry out the evaluation. The Swedish reference group has suggested that we ask you if you would be willing to become a member of this evaluation group. In accordance with our informal correspondeance we would also like you to chair the group, which will involve chairing the meetings and also to be responsible for the final report from the international group, including probably drafting the summary chapter.

The exact procedure for the evaluation will of course to a large extent be a matter for the evaluation group to decide. The inventory mentioned above will result in a broad description of current research and research groups in Sweden. This description will make a basis for the selection of research groups and research included in the evaluation. We plan to discuss criteria for selection of research groups/projects to be included in the evaluation as well as material to be collected in consensus with the evaluators at a meeting in the early spring of 2006. At this time the evaluators could perhaps also agree on some division of labour (with regard to sub areas) between themselves.

The remaining time schedule for the evaluation looks like this: we plan to have the inventory material collected and presented by the end of February 2006. The evaluation group would then be able to read the material and get together in Stockholm 20–21 March for meetings with the Swedish reference group and internal discussions on the future process and warranted support from the secretariat.

We plan for a final meeting in the second half of October 2006, when the evaluators should spend 4–5 days together here in Stockholm to interview researchers and other groups (c.f. point f in the model described above) and finalize the report based upon drafts that the evaluators deliver in advance. We think it would be a fruitful working mode for each evaluator to be responsible for one or more chapters with a final chapter, containing a summary and conclusions, coauthored by the whole group.

We would very much like to hear from you whether you have the interest and possibility to take part in the evaluation described above. We would appreciate to hear your thoughts on this evaluation project and your response to our inquiry at your earliest convenience and no later than December 10, 2005.

We sincerely hope that you can formally accept this invitation and the terms specified.

If you would like to discuss something with me by telephone my number is +46 8 775 40 71 and e-mail address rune.aberg@fas.se. Elisabeth Birke, who will act as secretary to the evaluation project, can be reached at +46 8 775 40 90 or elisabeth.birke@fas.se, Christer Hogstedt is available at +46 8 5661 3602 or christer.hogstedt@fhi.se

With best wishes,

Rune Åberg
Professor, Secretary General

Appendix III

Letter of request to Swedish research leaders

Additional request: Evaluation of Swedish occupational health research (assignment commissioned to FAS by the Swedish government in 2005)

In an amendment to the government assignments for 2005, the Swedish Council for Working Life and Social Research (FAS) has been commissioned to ¨analyse Swedish research in the area of occupational health, primarily chemical, physical and biological health risks, and research on physical musculoskeletal disorders including the association with mental stress. The task includes an inventory as well as an evaluation of carried out research. The evaluation will consider scientific quality of the research as well as its relevance to society. The task should also shed light and comment upon the future needs of national research within this area. The assignment results shall be presented no later than 31 January, 2007.¨ FAS has appointed Professor Christer Hogstedt to coordinate the assignment with the assistance of Elisabeth Birke and Carin Håkansta.

An international evaluation group, consisting of six scholars from Finland, the US, Great Britain, Germany and the Netherlands, is responsible for the evaluation of Swedish research in the areas outlined by the government. Some of this work will be done through interviews but the main focus will be on publications from the various research groups. It is therefore of great importance that we receive a selection of your best publications as soon as possible according to the following selection criteria:

I.
Please submit peer-reviewed scientific papers in English (published since January 1, 2001) that you judge are of the highest scientific quality with respect to filling gaps in knowledge or enhancing current understanding in the relevant scientific area.

- 1-2 papers for groups of less than 5 fulltime equivalent researchers
- 1-5 papers for groups of 5-20 fulltime equivalent researchers
- 1-10 papers for groups of >20 fulltime equivalent researchers

II.
We seek examples of the application or communication of scientific knowledge. Please describe between 1 and 3 outputs designed to bring such knowledge to the broader community of stakeholders (developed or produced since January 1, 2001). Indicate by appropriate letter (a.- e.) which category below best fits this output and describe, in English, (in 50 words or less) its relevance or benefit. Examples of such products include those that are related to the focus of this evaluation and that

a. provide evidence of implementation for prevention or control of occupational hazards
b. are designed to communicate scientific information to occupational professionals or other stakeholders,
c. lead to guidelines or regulations for occupational health,
d. lead to product development for the protection or promotion of health of the workforce.
e. other

Where appropriate you are welcome to submit documentation supporting the description.

Please send ten paper copies of every one of your selected publications and/or other products to:

Carin Håkansta
FAS
Box 2220
103 15 Stockholm

Also, please send the reference data (authors, title and journal) for submitted publications electronically to Carin Håkansta at carin.hakansta@fas.se If possible; please also send PDF-versions of the particular publications.

Please submit the material before5 May 2006. If you have any questions, please do not hesitate to contact Carin at carin.hakansta@fas.se or 08-775 4072 (working Wednesdays and Thursdays).

On behalf of the international evaluation group,

Best regards,

David Wegman
Professor,Dean, School of Health and Environment, University of Massachusetts Lowell, USA
Chair person

CC: Alex Burdorf, Associate Professor in Occupational Health, University Medical Center Rotterdam, Netherlands
Paul Oldershaw, PhD, UK Health and Safety Executive, Great Britain
Jorma Rantanen, professor, Finnish Institute of Occupational Health, Finland
Brigitte Schulte-Fortkamp, professor, Institute for Fluid Mechanic and Technical Acoustics of TU Berlin (ISTA), Germany
Eira Viikari-Juntura, professor, Musculoskeletal Centre, Finnish Institute of Occupational Health, Finland

Appendix IV

Interviews performed 3–5 October 2006

Tuesday 15.15-17.00	Funding agencies + NIWL Rune Åberg, FAS Kenneth Abrahamsson, FAS Mats Engwall, VINNOVA Marianne Törner, NIWL
Wednesday 08.30-10.00	Bertil Remaeus, SWEA
Wednesday 13.15-15.00	Employers, Trade unions Sven Bergström, LO (blue collar confederation) Hans Kotzan, SIF (white collar union) Björn Hammar, Teknikföretagen (employers organization)
Wednesday 15.15-17.00	Research ergonomics Kerstin Ekberg, University of Linköping Tommy Hansson, University of Gothenburg Staffan Skerfving, Occupational medicine, Lund Jørgen Winkel, NIWL, Gothenburg Eva Vingård, Occupational medicine, Uppsala Research chemical/biological risks Maria Albin, Occupational medicine, Lund Gunnar Johanson, IMM, Karolinska Institute, Stockholm Ingvar Bergdahl, Occupational medicine, Umeå Jan-Olof Levin, NIWL, Umeå Carola Lidèn, Occupational medicine, Stockholm Håkan Westberg, Occupational medicine, Örebro
Thursday 10.15-12.00	Research physical risks Ann-Beth Antonsson, IVL (private institute) Ulf Landström, NIWL, Umeå Ingvar Holmér, Lunds technical university Magnus Svartengren, Karolinska Institute, Stockholm The ”technological” group Jörgen Eklund, University of Linköping Mikael Forsman, NIWL, Gothenburg Svend Erik Mathiassen, University College, Gävle Gunnar Rosén, NIWL, University College of Dalarna

Appendix V

Interview questions

Questions to funding agencies (FAS etc)

1. What is the basis for setting priorities in funding and is the process transparent?
2. What is the input of stakeholders?
3. Do you feel that there are substantial gaps in knowledge needed to set these priorities and how might these gaps been filled?
4. Over what time period do you establish priorities and how are these priorities and long-term view communicated?
5. Is there communication between funding agencies in order to seek an adequate balance across all areas and different types of funding (projects, programmes, personal grants)? How is the balance arrived at between areas and types?
6. How do you evaluate outcome of funded research (quantity, quality, does the project meet the aims, dissemination, and relevance for science and for society)?
7. How do you monitor the trends in occupational health and the benefits of research?
8. How do you identify strategic areas for continuing support (infrastructure)?

Questions for occupational health services

1. In what ways are you involved in setting priorities for SWER research?
2. Do you feel that your scientific needs are met? If not, in what respect?
3. How well is the scientific output from the research community communicated in a way that meets your needs?
4. How does the research community bring emerging research concerns to your attention?
5. Are you actively engaged in conducting research?
6. Do you have sufficient resources to take full advantage of the output of the scientific community?
7. How do you monitor the trends in occupational health and the benefits of research?
8. What research developments in the past five years have you been able to use to enhance worker health or prevent work-related disease?

Questions for the Ministries

1. Do you have the information you need for setting priorities in research in general and on emerging issues in particular?
2. Does your ministry have sufficient input in setting the priorities ?
3. How do you judge value for money?
4. How do you arrive at decisions about the available money for reseach ?
5. Are you satisfied with the structures in place (with funding agencies) to determine priorities for research?
6. What concerns do you have about the infrastructure of research in occupational health?
7. What is your view about collaboration at the level of the EU ?

Employers, Trade Unions and Afa

1. In what ways are you involved in setting priorities for SWER research?
2. Do you feel that your scientific needs are met? If not, in what respect?

3. How well is the scientific output from the research community communicated in a way that meets your needs?
4. How does the research community bring emerging research concerns to your attention?

Questions for the researchers

The IEG is seeking a richer understanding of your research environment and experience. We look forward to discussing a number of issues with you to achieve this objective. Below we have identified several areas that we believe are important but we hope to have a discussion that covers topics that are most important to your research area as well.

Do you have a strategy for determining research needs? If so, how was this strategy developed?

Are you maximizing the knowledge base that your unit has in carrying out your research activities? Can you identify what obstacles there are to better utilizing your capacity and achieving your objectives?

Is your group or research environment sufficiently interdisciplinary to accomplish your research goals? If not, what is the expertise that you need and how might it be made available?

What methodological impediments exist for you to undertake research that you think is of high priority?

Are there serious problems in occupational health in your areas of expertise for which you have sought funding but have not been able to develop adequate interest in support from funding agencies?

What mechanisms do you use to recruit young researchers and promote their careers? How do you promote gender equity in this process?

What efforts have you made to translate your research findings into practical outputs? Have these been successful or what impediments have you encountered?

What opportunities have you taken for international collaboration? In what way have these activities proved useful for your research or other outputs?

What opportunities have you taken to seek international funding? What has been your experience in these efforts?

The Swedish Council for Working Life and Social Research initiates and supports basic and applied research with a view to improving our knowledge about working life, public health and welfare.

SWEDISH COUNCIL FOR WORKING LIFE
AND SOCIAL RESEARCH

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Prospect Communication

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