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*Toward a Better Working Life*

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**International Evaluation of the Finnish  
Institute of Occupational Health (1997-2003)**





## Summary

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Marilyn A. Fingerhut, Frank van Dijk, Erik Dybing, Lars Hagmar, Kari Hemminki, Joachim Lambert, Thomas Schneider, Hannu Uusitalo, Gunnela Westlander: *Toward a Better Working Life. International Evaluation of the Finnish Institute of Occupational Health (1997-2003)*. Helsinki, 2004. 203pp.

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The Ministry of Social Affairs and Health charged an International Evaluation Group of expert scientists (IEG) to conduct an evaluation of the Finnish Institute of Occupational Health (FIOH) for the period 1997-2003, as part of its regular evaluations of institutions under the supervision of the Ministry. The IEG reviewed the Self-Evaluation reports prepared by FIOH units, and met in February and April 2004 with the leadership of each Department and Regional Institute and with stakeholders and customers of FIOH.

The IEG evaluated FIOH activities in light of the strategic vision of the Ministry of Social Affairs and Health, "Strategies for Social Protection 2010". The Report concludes that FIOH fully deserves its fine reputation as a world and national leader in occupational health, and that FIOH is highly successful in implementing its mission to enhance the quality of modern work life and to ensure the safety and health of Finnish working people. The Report includes recommendations for FIOH to build on this success in meeting the challenges of the 21st century workplace.

**Key words:**

comparative research, evaluation, international comparison, reports



## Tiivistelmä

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Marilyn A. Fingerhut, Frank van Dijk, Erik Dybing, Lars Hagmar, Kari Hemmin-ki, Joachim Lambert, Thomas Schneider, Hannu Uusitalo, Gunnela Westlan-der: Kohti parempaa työelämää. Työterveyslaitoksen kansainvälinen arviointi (1997-2003). Helsinki, 2004. 203 s. (Sosiaali- ja terveysministeriön selvityksiä ISSN 1236-2115; 2004:11) ISBN 952-00-1540-X

Sosiaali- ja terveysministeriö (STM) antoi kansainvälisen tieteellisen asiantun-tijaryhmän tehtäväksi arvioida Työterveyslaitoksen (TTL) toimintaa vuosina 1997-2003. Vastaavanlaisia arviointeja tehdään säännöllisesti STM:n hallin-nonalan laitoksissa. Arviointiryhmä tutustui TTL:n laatimaan itsearviointiraport-tiin ja tapasi helmi-huhtikuussa 2004 TTL:n kaikkien osastojen ja aluetyöter-veyslaitosten johdon sekä sidosryhmien ja asiakkaiden edustajia. Ryhmä arvioi TTL:n toimintaa suhteessa STM:n strategiseen visioon "Sosiaali- ja terveystoimi-kan strategiat 2010". Raportissa todetaan, että TTL ansaitsee hyvän maineen-sa johtavana kansallisena ja kansainvälisenä toimijana työterveyden alalla ja että TTL on onnistunut mallikkaasti täyttämään tehtävänsä työelämän laadun edistäjänä ja suomalaisten työntekijöiden terveyden ja turvallisuuden varmis-tajana. Raportti sisältää suosituksia siitä, miten TTL voi kehittää toimintaansa edelleen ja vastata 2000-luvun työelämän haasteisiin.

### Asiasanat:

arviointi, kansainvälinen vertailu, raportit, vertaileva tutkimus



## Referat

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Marilyn A. Fingerhut, Frank van Dijk, Erik Dybing, Lars Hagmar, Kari Hemminki, Joachim Lambert, Thomas Schneider, Hannu Uusitalo, Gunnela Westlander: På väg mot ett bättre arbetsliv. Internationell utvärdering av Institutet för arbetshygien (1997-2003). Helsingfors, 2004. 203 s. (Social- och hälsovårdsministeriet rapporter, ISSN 1236-2115;2004:11) ISBN 952-00-1540-X

Social- och hälsovårdsministeriet tillsatte en internationell vetenskaplig expertgrupp för att värdera verksamheten vid Institutet för arbetshygien åren 1997–2003. Motsvarande utvärderingar upprättas regelbundet av inrättningar inom ministeriets förvaltningsområde. Expertgruppen granskade den självutvärderingsrapporten som Institutet för arbetshygien hade utarbetat och sammanträffade i april 2004 med ledningen för varje avdelning och regioninstitut vid Institutet för arbetshygien samt institutets olika intressentgrupper och klienter. Expertgruppen värderade verksamheten vid Institutet för arbetshygien med hänsyn till social- och hälsovårdsministeriets strategiska vision i "Strategier för social- och hälsovårdspolitiken år 2010". Rapporten drar slutsatsen att Institutet för arbetshygien helt förtjänar sitt gott rykte som en ledande internationell och nationell aktör inom området för arbetshygien och att Institutet för arbetshygien har varit mycket framgångsrikt i genomförandet av dess uppdrag att främja kvalitet på arbetslivet och säkerställa de finska arbetstagarnas säkerhet och hälsa. Rapporten ger Institutet för arbetshygien rekommendationer om hur institutet kan vidareutveckla verksamheten och möta utmaningar från arbetslivet på 2000-talet.

### Nyckelord:

internationell jämförelse, komparativ forskning, rapporter, utvärdering



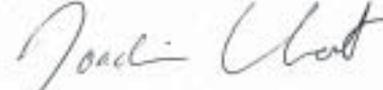
To the Ministry of Social Affairs and Health

According to the assignment given to us by the Ministry of Social Affairs and Health, we have carried out the scientific and operational evaluation of the Finnish Institute of Occupational Health and we hereby submit our Report to the Ministry for consideration

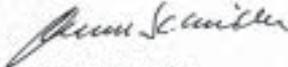
Helsinki, June 10, 2004

  
Dr Marilyn A. Fingerhut  
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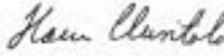
  
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# 1 Preamble

## *Introduction*

The Finnish Institute of Occupational Health (FIOH) was founded in 1945 as the Foundation for Occupational Medicine. Its current mission is to “promote the work ability and functional capacity, general health, and quality of life of Finnish people of working age. To this end, the Institute produces, compiles and disseminates scientific information on the relationship between work and health and promotes its utilization”. As the FIOH approaches its 60<sup>th</sup> anniversary, it is appropriate to reflect upon the dramatic changes that have occurred in Finland’s workplaces from the post-war period through the present time. Overall, throughout more than half a century, there have been improvements in working life and in the health and safety of workers, and the FIOH has been a major contributor.

As the International Evaluation Group considers the work of the FIOH for the current and future workforce of Finland, it will look at the key challenges facing the FIOH. Rapid economic growth, globalization, and structural changes in the economy, as well as in companies, have characterized Finland’s working life towards the end of the 1990s and at the beginning of the 21<sup>st</sup> century. Growth occurred in some sectors, such as construction and trade, information technology, and social services as the country recovered from the depression of the early 1990s, but other branches of the economy, such as agriculture and forestry, contracted. Unemployment has stabilized at 10%, and about 20% of workers do not have a permanent work contract. In 2003, economic growth stalled and declining profitability has led to restructuring and renewed staff cuts. Clearly, both traditional (injuries, ergonomics, and chemical exposures) and new work risks such as increasingly intensive work among the survivors of downsizing call for solutions. At the same time, the aging of the workforce, a tendency for early retirement (average age of 59), and increasing costs of disability pensions have brought about the recognition that a diminished labor force in the future cannot maintain the economy at an adequate level and that costs must be contained.

Determination to address the needs of the future and the present led the Ministry of Social Affairs and Health in 2001 to set out ‘Strategies for Social Protection 2010’, which calls for efforts to have people stay on at work for 2-3 years longer than they do at present, for the general functioning capacity of the population to improve, for work to be more attractive and to promote well-being, and for the diminishing of social exclusion. The FIOH plays a central role in guiding the occupational professionals, enterprise owners, and the employees toward organizational and personal changes that will increase the ‘work ability’ of the labor force, improve organizational arrangements in workplaces, and ensure the health and safety of workers. For over a decade, the FIOH has been recognized globally for leadership in the “maintenance and promotion of the workers’ health and working capacity”. Nevertheless, the challenge remains difficult and complex.

### ***The Task of the International Evaluation Group***

The International Evaluation Group (IEG) was requested by the Ministry of Social Affairs and Health to conduct a thorough and objective scientific and operational evaluation of the entire Institute and its Departments and Regional Institutes for the period 1997-2003. The Ministry asked that the evaluation assess the 'mission effectiveness' of the institute, noting how well the FIOH has succeeded in implementing its mission in modern work life. Finally, the Ministry directed that the evaluation should be future-oriented and make recommendations for the further development of the FIOH's activities. (See Appendix 2.)

## 2 Executive Summary

The Ministry of Social Affairs and Health invited an International Evaluation Group (IEG) to evaluate the Finnish Institute of Occupational Health (FIOH), in accord with its commitment to ensuring the scientific quality and performance of research institutions within its jurisdiction. The International Group was composed of nine senior experts in the various areas of occupational safety and health from six countries (for further information, see Appendix 4):

- Dr Marilyn Fingerhut, National Institute of Occupational Safety and Health, USA (Chairperson of the group)
- Professor Frank van Dijk, University of Amsterdam, The Netherlands
- Professor Erik Dybing, Norwegian Institute of Public Health, Norway
- Professor Kari Hemminki, German Cancer Research Center (DKFZ), Germany, and Karolinska Institute, Sweden
- Professor Lars Hagmar, University of Lund, Sweden
- Dr Joachim Lambert, Commission for Occupational Health and Safety and Standardization (KAN), Germany
- Dr Thomas Schneider, National Institute of Occupational Health, Denmark
- Professor Hannu Uusitalo, The Finnish Centre for Pensions, Finland
- Professor Gunnela Westlander, University of Linköping, Sweden

A prior evaluation occurred in 1995, with a follow-up review in 1997. During this period, Professor Jorma Rantanen served as the Director General of FIOH, having had a long and successful career from 1974 to 2003. After his retirement, Professor Harri Vainio became the Director General in November 2003.

Prior to the work of the independent group of external evaluators in 2004, each Department and Regional Institute produced a self-evaluation report, covering the years 1997-2003 (the Executive Summary of the self-evaluation report is in Appendix 3). The report addressed the four perspectives of the evaluation sought by the Ministry:

- society and customer results ('mission effectiveness')
- knowledge, competence and work ability
- operational efficiency and quality
- resources and financing

The IEG met in February 2004 to discuss with the leadership of each Department and Regional Institute the self-evaluation reports prepared by the units. Moreover, an IEG member personally visited each unit. The IEG evaluated the FIOH's activities in light of the strategic vision of the Ministry of Social Affairs and Health ('Strategies for Social Protection 2010', published 2001), in which the following strategic objectives were set:

- people stay on at work for 2-3 years longer than they do at present
- the general functional capacity of the population improves
- work is more attractive and promotes well-being
- social exclusion diminishes

In April 2004, the IEG reconvened and met with representatives of the Ministry of Social Affairs and Health and the Ministry of Labour, and with customers and stakeholders of FIOH (see Appendix 1). The preliminary results of a recent FIOH customer survey were also shared with the IEG. Following the deliberations of the IEG that resulted in consensus on all issues, a draft report (without conclusions and recommendations) was prepared and circulated to FIOH staff in early May for a check of accuracy. The report was finalized and delivered on June 10, 2004 to the Minister of Health and Social Services, Liisa Hyssälä, and a seminar was held for FIOH staff.

The IEG Report concludes that the FIOH fully deserves its fine reputation as a world and national leader in occupational health, and it has been highly successful in implementing its mission to enhance the quality of modern work life and to ensure the safety and health of Finnish working people. It is a most productive Institute consisting of permanent and temporary staff with the appropriate competence and diversity. The IEG concludes that the FIOH develops its strategies and activities, within its four core processes of research, information dissemination, service and training, to advance the strategies of the Ministry of Social Affairs and Health. In response to the Ministry request to make future-oriented recommendations, the IEG Report provides an assessment of and recommendations for the FIOH overall, and a similar assessment with recommendations for each Department and Regional Institute.

The International Evaluation Group appreciated the opportunity to respond to the request of the Ministry of Social Affairs and Health and thanks the leadership and staff of FIOH for their full cooperation in this evaluation.

# 3 General Review of Finnish Institute of Occupational Health

## Brief description

### *Finland 1997–2003*

Finland is the seventh largest country in Europe by land area, but a small country by size of population, about 5.2 million. The bulk of the population is concentrated in the urban areas of the southern and western parts of the country, while still more than a third live in rural areas.

Finland became a member of the EU in 1995 and entered the Economic and Monetary Union (EMU) in 1999. The membership led to a process of amending the legislation and shaping the roles of political institutions to correspond with EU legislation. The total number of the labor force (both employed and unemployed) was 2.6 million in 2002. The unemployment rate was 9% in 2002. In Finland, women participate very actively in working life; they account for 48% of the labor force. In 2002, four out of five employees had a permanent employment contract.

The large post-war age cohort is approaching the age of 60 years, and more than a quarter of the employed labor force is at least 50 years old, whereas in 1994 they accounted for only 19%. The average age of the Finnish population is slightly below that of the European Union, but the Finnish labor force is aging faster than the populations in other EU countries so that in 2010-2030 the total population over 65 years of age in relation to the number of prime age working population (from 20 to 64) will increase very fast and by 2030 will be second highest after Italy. Currently, according to EU statistics, the average age of withdrawal from the labor market is about 61.5 years, while in Finland, national statistics show that the average age of retirement is about 59 years. This has been a major concern in the policy programs of the recent Finnish governments, and a goal has been set to raise the average retirement age by 2-3 years.

The employed labor force can be grouped into three nearly equal-sized occupational branches: production work (31%), service work (34%) and information work (34%). The leading branches in the Finnish manufacturing industry are the metal and engineering industry, information technology, and the wood and paper industry. The private sector employs 73% of the labor force. There were nearly 225,000 enterprises in 2001, but only one out of a hundred companies employed more than 50 persons and only one out of a thousand employed more than 500 persons. However, the 250 or so companies with more than 500 persons employ almost one fifth of the labor force, and 9% of employees work in companies with fewer than five persons.

*The Finnish Institute of Occupational Health*

The Finnish Institute of Occupational Health, the FIOH, is a research and specialist organization in the field of occupational health and safety. Its social mission is to provide for the health and safety of workers, promote their work ability and functional capacity, and contribute to the general health and quality of life of Finnish people of working age. To this end, the Institute produces, compiles and disseminates scientific information on the relationship between work and health and promotes its utilization.

The FIOH consists of the Central Institute located in Helsinki, and of six Regional Institutes of Occupational Health (RIOH), located in all main regions of the country: Uusimaa, Turku, Lappeenranta, Tampere, Kuopio and Oulu. The Central Institute

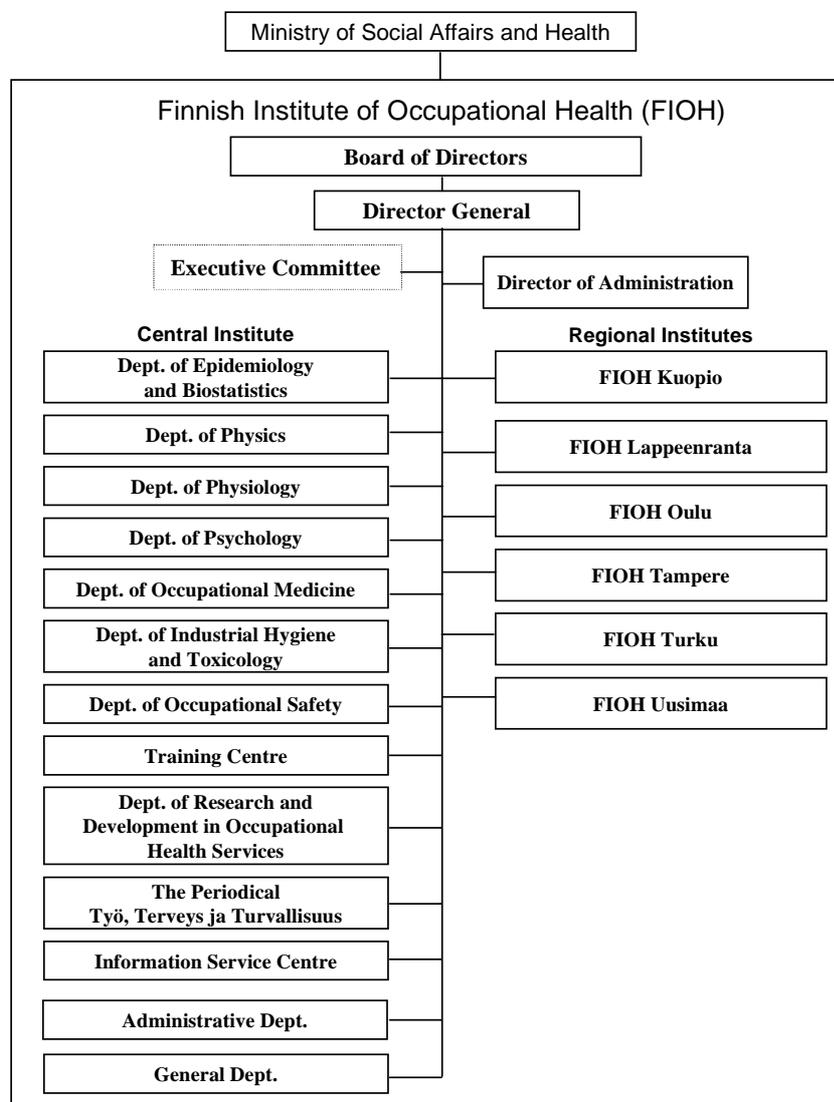


Figure 1. Organizational units of the Finnish Institute of Occupational Health

includes eight Departments representing different disciplines in occupational health and safety, the Training Centre, the Editorial Office of the periodical 'Work Health Safety', the Information Service Centre, and the Administrative and General Departments. Figure 1 illustrates the organizational structure of the FIOH.

The FIOH is governed by the Ministry of Social Affairs and Health and its highest administrative organ is the Board of Directors, where, in addition to the Ministry of Social Affairs and Health, the Ministry of Labour, and the labor market organizations are represented.

The Executive Committee supports the Director General in leading the FIOH. The members are Directors of Departments, and they represent the strategic areas and core processes of the FIOH. The current Executive Committee was appointed in November 2003. Each member represents a group of departments.

Professor Jorma Rantanen had a long and distinguished career as Director General of the FIOH, from 1974 to 2003. After his retirement Professor Harri Vainio became the Director General in November 2003.

### **Influence of the 1995–1997 evaluations**

In response to the recommendations from the 1995–1997 evaluations, the FIOH made some major changes in its organizational structure and physical location, and undertook important monitoring and research. The construction of a new laboratory made it possible to bring together various departments that had been widely scattered. The Department of Research and Development in Occupational Health Services was founded in 2001 by merging the Work Ability Centre and the Research and Development Centre for Occupational Health Services, with the aim of strengthening the Institute's support for the occupational health service system in Finland. In 1997, the Institute initiated the triennial Finnish Work Environment Report, which identifies and documents the major problems of working life in Finland. A new Brain@Work laboratory has been created in order to focus on brain, senses and information work. The Training Centre was founded in 2002 in response to the challenge arising from the generation change-over and legislative reforms in occupational health and safety.

### **Influence of Ministerial and FIOH strategic goals**

The FIOH is a part of the national infrastructure for health and safety at work and is responsible for the provision of scientific and expert advice and support primarily for the Ministry of Social Affairs and Health, but also for the Ministry of Labour, other government sectors, enterprises and other organizations, as well as for various occupational groups, social partners, and individual citizens.

During the review period, the FIOH actively participated in numerous national programs in several different ways, either by inclusion of the national objectives into the FIOH institutional strategy and program, or by launching its own Action Programs, which have sometimes preceded the National Program and have been a stimulus for national actions (such as aging workers, burnout studies, and the Occupational Health Services Program).

A key national strategy to which the FIOH is contributing in a major way is that of the Ministry of Social Affairs and Health. The 'Strategies for Social Protection 2010', published in 2001, contains the following strategic objectives:

- People stay on at work for 2-3 years longer than they do at present
- The general functional capacity of the population improves
- Work is more attractive and promotes well-being
- Social exclusion diminishes

The FIOH develops and modifies its strategic plans to advance those of the Ministry of Social Affairs and Health. During the evaluation period, four related strategy documents have been applied: strategies for 1997-2001, 2000-2004, 2001-2005, and the current one for 2004-2007. The current FIOH Strategy 2004-2007 contains six focus areas aimed at advancing the Ministry Strategy 2010 and the dominant occupational safety and health needs of Finnish workers and employers:

- preventing occupational and work-related diseases
- promoting health and safety in the work environment
- developing work organizations and the well-being of personnel
- promoting work ability
- improving the quality and impact of occupational health services and safety at work
- participating in international and EU activities.

The FIOH designs its activities in the context of the Ministerial and other National Strategies. The FIOH makes its societal impact in part by providing research and expert support to advance the policies of the Ministry of Social Affairs and Health. Since Finland joined the European Union in 1995, the FIOH has assisted the Ministry and other segments of government to amend laws and other norms of Finland to comply with EC Directives. The FIOH represents Finland in official bodies of the EU and participates in numerous efforts, such as standardization work, risk assessment tasks of the EC, the Framework Programmes of research, and joint projects with both the Dublin Foundation and the Bilbao Agency for Safety and Health at Work. During the years 1997-2003, Finland and the FIOH also continued to provide valued and strong support to the occupational health programs of the World Health Organization and the International Labour Organization.

## **Management and resources**

### *Resources*

The Ministry of Social Affairs and Health proposes and the parliament determines the amount of the state support for the FIOH. Legislation mandates that the Institute raise at least 20% of its budget from external sources, from research funding, through the selling of services and products to clients, and training. Generally, state support constitutes about 60% of the funding, and FIOH's own income covers the remaining 40%. Table 1 shows the budget of the FIOH for the period 1997-2003 by source of funding.

Table 1. The budget of the FIOH (EUR million), 1997–2003, by source of funding and year.

Year/source	Government*	External	Total
1997	29.2	18.2	47.4
1998	30.2	20.3	50.5
1999	30.4	23.1	53.5
2000	34.1	23.1	57.2
2001	33.9	22.5	56.4
2002	33.7	22.6	56.3
2003	35.1	23.4	58.5

\*Increases are due to costs of new laboratory building, new facilities for the Training Centre, and salary rises according to the national collective labor agreement.

It has been a strategic goal of the FIOH during the evaluation period to invest about 40% of the Institute’s resources in research, while the share of other core processes (services, training, and dissemination of information), i.e. applying the research results and the FIOH’s expertise in practice, is about 60%. The actual trend, measured by the distribution of working time, is presented in Figure 2.

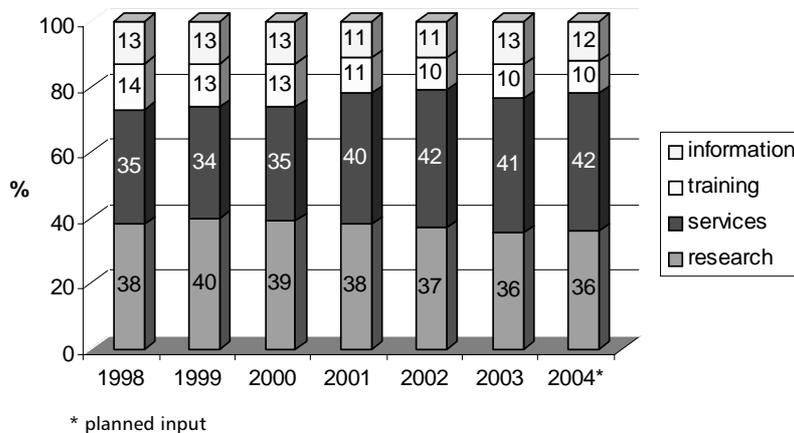


Figure 2. Working time (%) by core processes.

The state support is allocated annually to the Departments and Regional Institutes by the Director General. This allocation is based mainly on the previous year’s performance by the Departments and the Regional Institutes and on the new plans made by the Departments and the Regional Institutes or by the Director General. The Departments and the Regional Institutes then plan their activities within this financial frame, adjusting their expenditure and own income accordingly.

### *Management*

The Ministry of Social Affairs and Health and the FIOH negotiate an annual 'agreement on results'. The prior year's results are evaluated every spring in a seminar where all the research institutes and agencies of the Ministry's sector participate. The agreements now contain goals set for one year and for a four-year period. The basis for goal-setting in the agreements is the Ministry's strategy document ('Strategies for Social Protection 2010').

The management system within FIOH is based on the performance management model ('management by results'), although in recent years it has assimilated aspects of the Balanced Scorecard (BSC) model: staff competence and well-being, processes, and quality are included in the management system. The Departments and the Regional Institutes have their own annual objectives and budgets for which they are responsible to the Director General. Objectives and results are discussed in two annual meetings between each Department and the Executive Committee. The FIOH's plan is proposed annually to the FIOH's Board of Directors as the 'Annual Budget and Plan of Action'.

### **Staff competence and renewal**

Governmental funding for the period 1997-2003 has provided 80% of salary annually for about 586 persons, with the balance coming from external funding. In 1997, 152 additional persons were funded entirely by external income. While the number of staff funded by the government has remained steady, the number of person-years funded by external income climbed to 215 by 2003. The proportion of personnel paid from external funding ranges from 9 to 40% among the Departments and Regional Institutes. Distribution by gender in FIOH has remained steady during the evaluation period, with 66% women in 1997 and 68% women in 2003. In 1997 there were 127 staff members with doctoral degrees (40% women), and this had increased to 160 (46% women) by 2003. From 1997 to 2003, the proportion of younger age groups has decreased. In 2003, 40% of the personnel were over the age of 50. About 30% of the permanent employees will retire over the next 10 years. About 3% of the total sum of salaries is used for the training and education of personnel, and FIOH researchers are widely involved in training PhD students.

Until 2003, the salary system was based on task titles and salary classes, in addition to seniority. The new salary system is based on the competence demands of the work and on the level of performance. The system assists the salaries for posts in health care, specialist work and supervisory posts, which are not competitive with salaries in comparable posts outside the Institute. Surveys on work climate and well-being of the personnel have been conducted yearly since 1998. Commitment to work, job satisfaction, and opportunities to influence matters at work are generally high in all of the surveys. The results are lower for leadership practices and the work climate.

## Key activities

The key activities of the Departments of the Central Institute and the Regional Institutes are described in the chapters that follow.

The core process activities of the Departments and Regional Institutes are conducted primarily within each unit. In contrast, although leadership rests within a single department or Regional Institute, the FIOH's *Action Programs* are cross-Institute programs aimed at intensive examination and action to address major current and emerging problems in Finnish work life. The Action Programs are carried out in multidisciplinary collaboration, and they put all the core processes of the FIOH (research, services, training, and dissemination of information) to use. The FIOH often carries out the programs with external collaborative partners. They extend the scope of expertise and bring the end-user's perspective to the program. The FIOH's Action Programs in the period of 1997-2003 are listed in Table 2.

*Table 2. The FIOH Action Programs 1997 – 2003 and Lead Department/Regional Institute*

- Wood-dust - Exposure Assessment and Health Effects (2002-2006), Industrial Hygiene and Toxicology
- Good industrial air (1998-2001), Physics
- Prevention of health risks from exposure to non-ionizing radiation (1998-2003), Physics
- Workplace 2000 (1994-2000), Occupational Safety
- Allergy and Work (1992-1997), Occupational Medicine
- Promoting Health, Safety and Work Ability in Security Occupations (1999-2003), Physiology
- Human Aspects of Work in the Information Society (2000-2004), Physiology
- Learning Organizations (1997-2001), Psychology
- Human Resources for Work (1997-2000), Psychology
- Decent Work - A Sound Life (2001-2002), Psychology
- Changes, Flexible Solutions, and Well-Being at Work (2003-2007), Psychology
- Working Environment 2005 (2001-2006), Kuopio
- Work in the Cold (1997-2000), Oulu
- Indoor Air and Environment (1994-1998), Uusimaa
- Small Workplaces (1995-2000), Uusimaa
- Support for Occupational Safety and Health Activities (2003-2005), Tampere
- Working Conditions, Work Capacity and Well-Being in the Social and Health Care Sector (1999-2002), Turku
- Changing Social and Health Care Work (2002-2005), Turku
- Youth and Work (2002-2007), Occupational Health Services

Action Programs are coordinated by the director of the program, who typically has a position as a research professor for a certain period. Very few additional resources are given to the programs, typically only a part-time secretary. The success of the program is therefore based on the cooperation of the Departments and Regional

Institutes and external partners, the managing skills of the director, and the ability of the program to raise external funding. Detailed comments about each Action Program can be found in the Chapters that follow.

## **Productivity**

The productivity of the individual Departments, offices and Regional Institutes is described in the following chapters. Overall, productivity is extremely high, measured by products from all four core processes and in collaborations over the Action Programs.

## **Quality**

The research work of the Institute is reflected in outputs such as scientific articles, as well as popular articles, that lead to practical guidelines, services, information for experts and for the public, and training targeted at workplaces. The FIOH is recognized internationally as a leader in research, as confirmed by broad participation in competitive EU activities and international reliance on estimates of occupational health exposures and problems reported in scientific studies, for example, prospective studies and those using the excellent registers maintained in Finland. The survey of Finnish work life carried out in 1997, 2000 and again in 2003 has provided valuable insights into the workplace risks encountered by the Finnish workforce, such as information-intensive work and ergonomic demands, and these findings have been used to produce services, training, and information products.

The increasing demand for services, particularly from the Regional Institutes, indicates the high quality and relevance of the service and guidance provided. FIOH training courses are widely sought, leading to the establishment of the Training Centre in 2002. The Institute's information activities reach all levels of audiences, with quality confirmed by high volumes of product sales and widespread media attention to the findings of the FIOH, particularly in studies of resources for people for work, the risk of burnout in Finnish work life, health problems caused by mold-damaged buildings, the health effects of night and shift work, and working conditions in small workplaces. The Youth and Work Action Program has also attracted substantial interest in Finland.

## **Relevance**

### *Relevance to core processes*

The core processes of the FIOH are research, services, training, and dissemination of information. The FIOH has developed these core processes as an integrated system, in which the role of research is to generate new knowledge and expertise. The three other core processes aim at transferring the knowledge and expertise for use by the clients (Figure 3). Services and training involve direct contacts with the clients and help the FIOH to chart the clients' experiences and needs and to identify unsolved problems that require attention for further research.

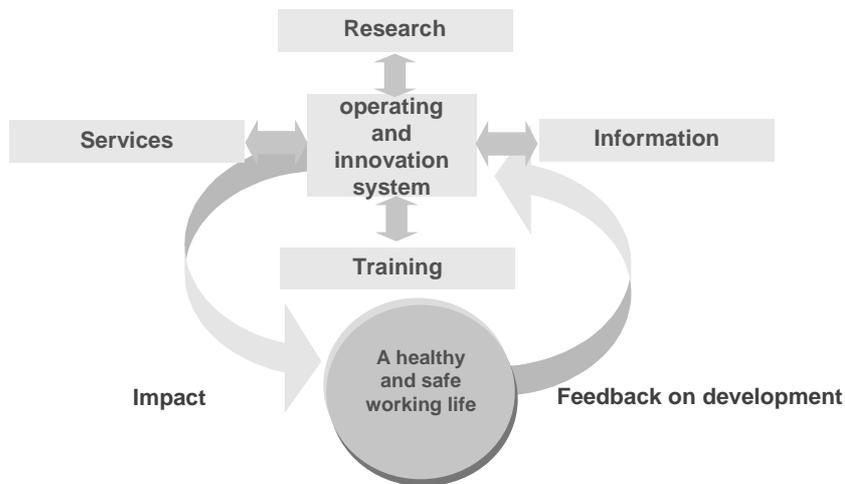


Figure 3. The core processes of the FIOH

The role of *research* is to create a strong competence and expertise based on scientific evidence in order to have an impact on the health of the work force. The research focuses specifically on answering questions arising from work life in Finland, and also on enabling the FIOH to act as an expert on these issues in international forums.

The FIOH offers workplaces comprehensive *services* for surveying and developing work environments and work organizations. It also diagnoses diseases compensated as occupational diseases by insurance companies. With the help of the Regional Institutes, the Institute's services are available throughout Finland. Free expert services for the authorities (surveys, expert opinions, evaluations, etc.) and the development of cooperation with national authorities, EU authorities and international organizations are another type of service.

The goal of the Institute's *dissemination of information* is to provide reliable information for the improvement of working conditions and for enhancing capacities to handle demanding work and risk factors. The target group is comprised of experts, decision-makers, and authorities in occupational health and safety and development of work life, as well as of workplaces, but also includes the general public. The information channels include handbooks, guides, periodicals, online publications, and press releases. The Institute's Information Service Centre provides library and information services and electronic databases in occupational health and safety matters.

The FIOH arranges *training* for professionals and experts, and increasingly also for management and other groups in society, in the development of work environments, work communities, and occupational health care. The FIOH's Training Centre organizes competence training programs for the professionals and experts defined in the Occupational Health Care Act. The physicians specializing in occupational health care participate in a practical study module at the FIOH.

### Relevance to strategy and mission

The work ability model is one of the cornerstones of the FIOH's strategies. In Finland, the definition of the 'promotion and maintenance of work ability' (PMWA) was included in the collective agreement between employers' associations and trade unions in 1989, and the duties of the occupational health services (OHS) regarding the PMWA were outlined. In 1991, the PMWA was included in the Finnish Occupational Health Service Act and as the employer's obligation. The PMWA was defined as:

*“Workplace activities aiming at maintaining the ability to work include all measures that the employer and the employees as well as the cooperative organizations at the workplace make in a united effort to promote and support the ability to work and to enhance the functional capacity of all persons active in working life throughout their working careers.”*

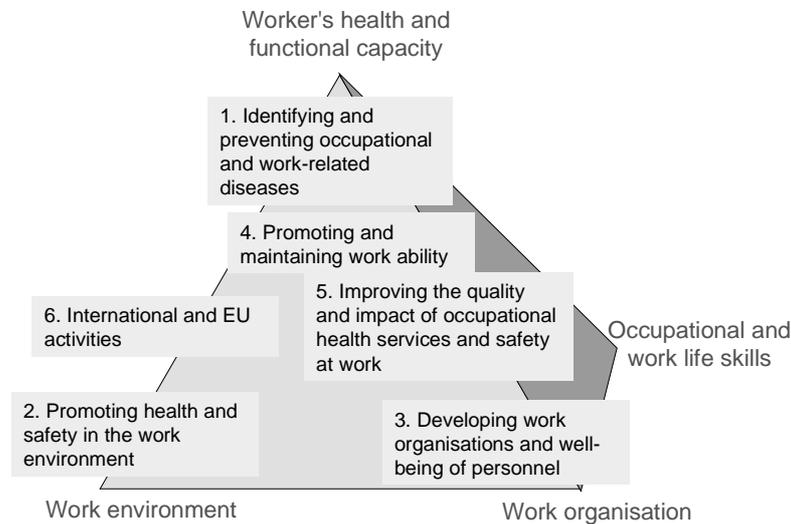


Figure 4. The work ability model and the FIOH's priority areas in 2004.

The Ministry of Social Affairs and Health delegated the further development of the concept and activities of PMWA to the FIOH. FIOH research has gradually amplified this model, bringing it to its current 2004 dimension. Figure 4 illustrates how the work of the FIOH in its six priority areas promotes 'work ability'. Work in the strategic priority areas leads to the result areas of workers' health and functional capacity, competence and skills needed in modern working life, work environment, and work organization.

### Relevance to future plans

The 'Strategies for Social Protection 2010' of the Ministry of Social Affairs and Health and the FIOH Strategic Objectives 2004 2007 will continue to inform the work of the FIOH. The substantive challenges to be addressed through research and expert activities are the aging-related problems of work ability, youth and work,

psychosocial work load and stress, mental health and work, new work organizations, work-related musculoskeletal disorders, challenges related to new technology, and new and emerging risks, including biological factors and new chemical and physical factors. Traditional risks will also need to be addressed further. The development of service and advisory mechanisms is also needed to put the new knowledge into practice.

The new Occupational Health Service Act of 2002 and the amended Occupational Safety Act of 2003 were developed with the assistance of the FIOH, and their requirements will continue to stimulate avenues of research, service, training, and information at the FIOH in the future. The needs of the European Union regarding worker health and safety and work ability will provide opportunities and challenges for the FIOH in the future.

FIOH staff widely appreciate the collaborative Action Programs that have focused and coordinated expertise from across the Institute and have fostered connections with companies and societal institutions in addressing selected problems. The IEG was asked to comment upon, and endorses, the Institute's proposed future lines of emphasis on primary prevention and health promotion; the extension of the principles of the temporary Action Programs to create permanent coordinated cross-Institute thematic priority areas; an emphasis on evaluation and assessment of the effectiveness of guidance tools and other products, and of FIOH training and information; and an emphasis on research in intervention effectiveness to evaluate widely in workplaces the implementation of knowledge gained through research and service. The IEG strongly encourages the FIOH to pursue these approaches and to develop broad staff expertise in intervention effectiveness (evaluation) research so as to ensure success.

A future challenge for the FIOH's information dissemination core process is to broaden the excellent level of information provision to achieve full accessibility of new and relevant scientific information by scientific colleagues, and experts in occupational health services and in health care. Additionally, for true national implementation of workplace changes, full accessibility is desirable of successful practical products for use by professionals but also by social partners, workplace managers and workers, entrepreneurs, and independent farmers. For the training core process the future will bring a shift towards evaluation of not only competence, but also the impact in practice in workplaces and in the practices of the trainees.

### **Customer/Stakeholder relationships**

The FIOH has many customers and stakeholders in cooperative networks intended to address the key problems of occupational health in Finland. These include

- Ministries and administrative agencies (Ministry of Social Affairs and Health, Ministry of Labour, Ministry of Education, Ministry of Foreign Affairs, Ministry of Communication and Transportation, Ministry of Industry, the Finnish National Insurance Institute, chemical safety authorities, etc)
- Social partners (employers and labor)
- Occupational health services
- Occupational health physicians and occupational health nurses
- Occupational safety authorities and safety personnel at workplaces
- Workplaces

- Standardization organizations
- Manufacturers of products used at the workplace (for example personal protective equipment)
- Research organizations (universities, R&D institutions)
- Occupational and Public Health Care (occupational health care units, occupational medicine units)
- Education groups (professional and vocational education and training organizations)
- Interest groups (labor market organizations, associations of occupational safety and health and in public health)
- EU agencies
- Nordic and Baltic partners
- Occupational safety and health researchers and organizations in other countries
- International organizations (WHO, ILO)

The FIOH's ultimate target groups are the working population, individual workers, workplaces, work environments and work communities, and the special risks and problems related to them. The Institute also provides support and advice to social partners and occupational health and safety services and experts in the field, training and information to enterprises and other organizations, and advice and services to individual workers or employers.

The IEG notes that the FIOH has broad and well-functioning relations and networks in the Finnish society. Their existence supports the mission and tasks of the FIOH in an important way.

Client interviews carried out by the IEG testified to the important role of the FIOH in the Finnish working life. Its research was highly valued and the need to maintain it high standard was frequently expressed. Almost all stakeholders emphasized the significance of the practical applicability of the FIOH's expertise to Finnish working life. All expressed interest in having even more practical tools for use in workplaces and in working as active partners with the FIOH in workplace intervention efforts. Client interviews also pointed out multifaceted and sometimes diverging expectations that various partners have towards the FIOH. This creates a challenge to FIOH leadership to balance the activities in an optimal way to serve its clients in the best possible manner.

## **Impact**

The FIOH bases its activities on research that is of outstanding quality by any standard. This, as such, should be understood as an important impact, since it lays sound scientific ground for action. The FIOH has also created effective networks for numerous national policies and programs in order to advance occupational health.

A considerable part of the FIOH's resources is used to provide various occupational health services for its clients. These activities show that there is a demand for such tailored services, and moreover, existing client satisfaction surveys show that these services are generally regarded as useful.

The FIOH's training programs are extensive and feedback received from participants is generally positive. Suggestions for improving them include continual antic-

ipation of future workplace needs, devoting greater attention to the area of mental health, and an increase in emphasis on providing practical applications for use in the workplace. The information dissemination model developed by the FIOH is advanced, and serves both professionals and the general public.

While the achievements mentioned above do not fully describe impact, which is very difficult to measure, they show that the FIOH has greatly advanced the knowledge, tools, and methods to improve worker safety and health.

The FIOH also achieves impact through expert advisory, analytical, and other support and training for the ministries, authorities, front-line organizations, occupational health services, company management, company safety and health persons, safety and health committees, safety officers, and safety representatives.

Some program objectives cannot be achieved by the FIOH's actions alone, for example, an increase in retirement age, which is influenced by many factors such as age, employment situation, the human resource policies of employers, and pension benefits. Thus operative outputs can and should be monitored, but the ultimate impacts are long-term in character.

## **Conclusions**

The International Evaluation Group concludes that the FIOH fully deserves its fine reputation as a world and national leader in occupational health. The FIOH is highly successful in implementing its mission to enhance the quality of modern work life and to ensure the safety and health of Finnish working people. It is a most productive Institute comprised of permanent and temporary staff with the appropriate competence and diversity. The FIOH develops its strategies and activities, within its four core processes of research, information dissemination, service, and training to advance the strategies of the Ministry of Social Affairs and Health.

We particularly commend the outstanding research of the FIOH, but also recommend that staff expertise be broadly strengthened in intervention effectiveness (evaluation) research and that the FIOH undertakes to evaluate the success of key workplace interventions, information dissemination, service recommendations, and training. We note the high quality of coordination and collaboration within the temporary Action Programs, and broad the recognition of staff of the value of cross-Institute cooperation. We encourage the FIOH to further develop permanent collaborative thematic programs involving cross-Institute and external partners in priority areas that tap appropriate expertise, focus efforts, and increase efficiency. Coordination of laboratory and other cross-Institute activities can also be enhanced. Further success will require that indicators of success and managerial and staff performance evaluations address the strength and effectiveness of collaborative and coordinated efforts.

We provide general recommendations for the FIOH in this chapter. In the following chapters, specific recommendations are given for each of the core processes, Departments and Regional Institutes. We make numerous suggestions that FIOH leadership, Directors of Departments and the Regional Institutes, and staff should assess a particular current situation and consider possible changes. We also identify several situations that would benefit from recommendations to the FIOH from a working group. The IEG suggests that all evaluations should address costs, benefits, impact,

consequences, and opportunities for adding, coordinating, streamlining, decreasing, and changing activities. In some instances, the FIOH would benefit from inclusion of external consultants in the working groups.

## **Recommendations**

### *General issues*

1. The societal and customer results of the FIOH are very impressive. The FIOH has participated in a large number of projects and programs initiated by the Finnish government and various ministries. The FIOH's knowledge has been perceived to be useful and FIOH maintains effective networks with the government, ministries, and various authorities. The IEG recommends that the FIOH improve its tracking and understanding of the widespread use and application of its research and practical products. The IEG has the sense that there is under-recognition of the benefit to workers and enterprises in Finland and globally.
2. There is a need to critically monitor the balance of external funding with the full costs of the services and the demands on the FIOH workforce to ensure that the mission of the FIOH is properly advanced.
3. The IEG strongly recommends that the FIOH strengthen staff expertise in intervention effectiveness (evaluation) research and increase the use of evaluation research. Adequate institutional resources should be provided for these efforts. This type of research, also called intervention effectiveness research, ensures the transfer of research findings into practice in the workplaces and evaluates the success of interventions and their ultimate impact on reducing illness and injury. This research requires planning, protocol development, review, and conduct similar to the procedures already in place for etiologic research. It often follows the generation of major research findings that give insight into needs for changes in workplaces. The results of evaluation research confirm the value of the intervention and/or suggest modifications.
4. The IEG notes that the palette of occupational health problems continues to shift to aspects of psychological and work organization issues, and that this area relates strongly to the objective of the Ministry to raise the average retirement age. We recommend that the FIOH continue to pay even more attention to this trend in its research, services, training, and information dissemination. Such a consideration might require a continued shift in the distribution of resources to these issues. The needs of the Regional Institutes for expertise in these areas should be examined, as they will play a key role in assisting companies to implement changes. We also encourage the FIOH to place more emphasis on obtaining evidence regarding the success of preventive programs that address work ability, mental health, and rehabilitation of workers.
5. Action Programs are highly valued as a tool to focus resources on securing societal impacts and creating opportunities for genuine cross-Institute and external collaboration. The IEG encourages continued use of selected Action Programs, but notes that adequate resources are needed and improvements are needed at start-up, termination, and regarding the time needed for administration of the Program. More time at the start to plan the Action Program and to obtain external funding is desira-

ble, and resources are needed at its end to incorporate selected aspects of the Action Program permanently into the work of the FIOH.

6. The IEG was asked to comment on the value of the further development of thematic priority areas in the Institute and to recommend key areas. The IEG concurs with the Institute's proposal to consider further emphasis in priority areas such as mental health, work organization, brain and work, musculoskeletal disorders, work safety and accident prevention, and allergies and hypersensitivity risks. These fit with the dominant problems of workers in Finnish society and the objectives of the Ministry, and can complement work being done in other countries. It is recommended that the Institute consider besides primary, also secondary and tertiary prevention and evaluation research in these thematic programs.

7. The Institute could utilize the holistic approach of the topical Action Programs to further organize and focus work contributions from across the Institute to include research, training, information dissemination, service and evaluation of the success and impact of workplace interventions in these priority thematic areas. Further integration of the Regional Institutes in the research as well as in the design and implementation of practical results in workplaces is desirable. The IEG also encourages the FIOH to partner even more broadly in the initiation, design, implementation and evaluation of success of the thematic area projects with social partners (including specific workplaces), occupational health professionals, and other relevant experts from academia and ministries to enhance the relevance, practicality of the research and tools, and the likelihood of future broad implementation of successful interventions.

8. Because intervention effectiveness (evaluation) research must take place in workplaces, and in relation to employees and employers, the cooperation of the social partners, and of occupational health and safety personnel, is essential. In particular, companies or governments with multiple worksites and/or operating units are valuable because interventions can be selectively put in place to test effectiveness in generating desired results. The FIOH has carried out some research of this type and companies have been most cooperative. Because of the importance to Finnish society that workplaces be both productive, but also provide for the well-being of the employees, it will be helpful if the government and social partners encourage even broader cooperation with the FIOH in this type of practical research.

9. Due to the huge number of moisture-damaged workplace buildings in Finland, several FIOH units are deeply involved in the study of exposure to and health effects of micro organisms in moist settings. The IEG noted that there was no comprehensive FIOH strategy for this research. It is recommended that the FIOH consider the formulation of a comprehensive strategy with the National Institute of Public Health, which has a focus on moisture problems in private homes, and set up a scheme for division of research tasks

10. In some Departments and Regional Institutes valuable tools and guidance documents are developed that contribute to making work-places healthy and rewarding for the employees, but which are used relatively narrowly, perhaps only by a single researcher or unit. The IEG recommends that the FIOH assess the situation of products generated throughout the Institute to identify products with substantial value to entire segments of society or in specialized areas, and which should be widely used.

Additionally, as it seems that many practical products are being created and shared by expert scientific personnel, it is desirable for the FIOH to review the situation and to consider whether there is value in establishing a special group for the marketing of valuable products, software tools, patents, etc. This type of effort could take advantage of the different skills of marketing personnel and greatly facilitate the transfer of research and service and information tools into wide practice in workplaces.

11. The IEG notes the efforts to address the needs of small enterprises and entrepreneurs and encourages the FIOH to continue to seek ways to reach these groups. Consideration should be given to possible barriers that exist for these groups due to the costs of FIOH products and training, and to opportunities that the website might provide.

12. The Institute has an outstanding information dissemination program, but even so, the important scientific and practical information from the FIOH and other (scientific) sources, is not always easily accessible to all scientists, occupational health services experts, small enterprises, entrepreneurs, and employees. The IEG encourages the FIOH to evaluate the needs and to strive to reach a goal of full accessibility for all of this important information.

13. The FIOH, and the various Departments and Regional Institutes carry out customer surveys. The IEG commends the FIOH for these important activities and suggests that FIOH consider what improvements could be made in the system for getting feedback from its clients. Modifications might include, for example, a standardized set of questions to be used in the Regional Institutes at regular intervals. Such concerted surveys would allow systematic comparison of client satisfaction and expectations in different regions. In order to get a comprehensive conception of the need for FIOH's services, the possibility to expand such a survey to target groups who are not clients should be explored.

#### *Planning and management issues*

14. Work overload for the dedicated staff of the FIOH may have even increased since the 1995-97 evaluation, when the concern was also expressed. The IEG believes that the generally hard working and committed staff continues to struggle with balancing the demands of service requests with ongoing research. It is recommended that the Institute leadership form a workgroup to develop ways to address this concern. Consideration should be given to whether it is to the benefit of the Institute to identify some activities that could be carried out by others outside the FIOH.

15. The upcoming retirement of one-third of the FIOH staff presents a problem. The FIOH is encouraged to develop a framework for handling this problem, including an analysis of necessary replacements and of advantages to bring on staff with new areas of expertise to address some of the overload while also changing focus to emphasize new areas of research, training and information.

16. The IEG encourages the FIOH to review the current national training of all occupational health professionals to ensure that adequate attention is given to understanding risks and successful approaches to solutions for the newer work hazards including work organization, mental health, and stress. The FIOH should also continue to ensure that the training and procedures of the occupational health services

nationally are progressive in recognizing hazards, recommending approaches to solutions, and providing practical support and guidance to employees and companies.

17. The IEG and FIOH customers recognize that a great benefit of the service and training core processes is the close contact of FIOH staff with managers, workers, and occupational health service professionals in Finnish workplaces. To further highlight the relevance and practical value of this work of the FIOH, the IEG recommends that FIOH management foster cooperation with customers in the early stages of initiating plans for research, training, and service and information efforts, and arrange for partnerships and evaluation of the achievement of the aims.

18. The FIOH has excellent analytical facilities for physical, chemical, and biological factors. The laboratories of the Regional Institutes and the Central Institute increasingly share analytical tasks and provide back-up for each other in order to provide fast and effective service. However, it may be the case that the analytical capacity is not fully used and there may be opportunities for improving efficiency and reducing costs, while retaining high quality. The IEG recommends that the FIOH assess the laboratory situation throughout the FIOH, including the Regional Institutes and the laboratories of the Central Institute, and consider how to further facilitate the sharing of tasks regarding analytical service work.

19. Coordination of laboratory activities and other topic areas widespread through the FIOH can be enhanced. Within the FIOH there are discussion groups with members from various parts of the Institute that involve some level of cross-Institute coordination, but which can be strengthened. The IEG suggests that the FIOH management review the topics that involve several Departments and Regional Institutes, and the various coordinating groups in the Institute, and develop mechanisms to facilitate coordination and the implementation of ideas and recommendations. The occupational hygiene discussion group, which was strengthened following the 1995–1997 evaluation, serves as a possible model. Genuine cross-Institute coordination in major topical areas will require that indicators of success, and managerial and staff performance evaluations, address the strength and effectiveness of collaborative and coordinated efforts.

### *International issues*

20. Collaborations of FIOH experts in projects of the Nordic countries and the European Union are benefiting both Finland's workers and those in other countries. The FIOH should continue to encourage these collaborations. The EU Framework Programmes constitute an important source of research funds and the opportunity to work with international colleagues to address problems facing all nations.

21. The FIOH is highly valued by both WHO and ILO for the work of FIOH staff on the many levels needed by these organizations: research, technical assistance, advice, conferences, policy development, capacity building, and information dissemination. The IEG strongly encourages the FIOH to continue its coordination with the Ministry of Social Affairs and Health and the Ministry of Foreign Affairs in supporting this international work, as the work of the FIOH and of other developed countries is critical for addressing the needs of developing countries and the entire global village.

# 4 Reports on Core Processes, and Departments and Regional Institutes with Action Programs

## 4.1 Research - Core Process

### Brief description

The role of *research* at FIOH is to create a strong competence and expertise based on scientific evidence in order to achieve impact on the health of the work force. The research focuses specifically on answering questions arising from work life in Finland, and also on enabling the FIOH to act as an expert on these issues also in international forums.

*Action Programs* are the FIOH's already well-established tool for integrating research with other core processes for solving major current and emerging problems in Finnish work life. The Action Programs require multidisciplinary collaboration; often the collaborative partners are from outside the FIOH and they either extend the scope of expertise and/or bring the end-user's perspective to the program.

It has been a strategic goal of FIOH to invest about 40% of the Institute's resources in research. The actual figures have been a few percentage points below that.

### Influence of the 1995-1997 evaluations

The previous scoring system for 'research achievement points' was abolished already at the follow-up of the previous evaluation, but there is still a concern among the staff that the present management system does not adequately support collaborative efforts.

The FIOH has large permanent resources, which gives the possibility to plan, coordinate, and conduct large research programs that could not be done by traditional university institutions that normally have many fewer permanent positions. Action Programs have been one option for enlargement of research projects, but their constructions have inherent limitations. Except for the Action programs there has been rather little coordination between the Departments or horizontally within different fields of research. This has led to fragmented research activity with a great number of small projects; the number of ongoing research projects in 1997-2002 ranged from 203 to 230 at the end of the year. This has also hampered the establishment of research groups with a sufficient critical mass in some high-priority areas, in which the researchers are scattered over many Departments. In some areas, such as occupational hygiene, musculoskeletal disorders and ergonomics, task groups have been formed with the aim of enhancing networking, coordination, collaboration, and prioritization of research activities. Larger collaborative research programs are needed in the future in the high-priority areas determined in the strategy of the FIOH.

The previous international evaluation group proposed that some of FIOH resources should be put aside for research time that could be applied for by different Departments and Regional Institutes. Such an intramural granting system has unfortunately not been implemented.

## **Management and resources**

The Director General directs research at FIOH. The Departmental Directors supervise and develop research in their Departments. The Director General appoints the Research Committee comprised of members representing senior research scientists in all major disciplines of the FIOH. This structure has aimed at coordinating research across the Departments and at safeguarding against overlap of projects. The Research Committee has a half-time secretary and a half-time technical secretary.

The task of the Research Committee is to support the Director General, Departmental Directors, and research scientists in maintaining and improving scientific relevance and quality, in complying with the guidelines for research, in the scientific evaluation of research projects, in the reporting of research activities, in organizing researcher training, and in other tasks delegated by the Director General. The Committee is responsible for developing the operational guidelines for research. The final decision to start a research project is made by the Director of the Department. It is his/her responsibility to make sure that research complies with the strategy of FIOH and that it is executed efficiently with the available resources, and in accordance with good scientific practice. The principal investigators are in charge of planning and managing the research projects so that they provide relevant scientific results and that the resources are used effectively.

The total yearly expenditure on research in the FIOH has been about EUR 21 million during the last 5 years, which is an increase as compared with about EUR 16 million in 1997. The annual external funding has ranged from EUR 4.5 to 7.9 million, which is 28-36% of the total expenditure. The dominating external granting bodies are the Finnish Work Environment Fund and the EU. Other external funding comes in smaller amounts from many, mainly national sources.

## **Staff competence and renewal**

The total number of research personnel at the FIOH was 384 in 2003, which is almost the same figure as in 1997. These include three time-limited research professors and 22 senior researchers. Another 55 are specialized researchers and another 45 have a doctoral degree. Altogether 71 doctoral dissertations were completed during the period 1997-2003. Fifty-one of these researchers are presently working at the FIOH. There are 120 doctoral students currently engaged in FIOH research projects or supervised by FIOH research scientists. Twenty-one researchers from the FIOH staff have during the period 1997-2003 been in post-doctoral training or visiting scientists in foreign research institutes or universities.

## Productivity and quality

There was an average of 658 scientific publications yearly during the period 1998-2003 at the FIOH. The corresponding average figure for peer-reviewed articles in international journals was 246. These figures have been relatively stable over the years. The number of research articles per person-years of research and the impact factors<sup>1</sup> of the scientific journals by FIOH units are given in Table 3. Impact factors provide, however, only a rough measure of the visibility of research and its scientific impact, partly because the journals in different fields vary markedly in terms of the impact factors. The list of top 50 publications rated by impact factor and relevance is impressive. It is noteworthy that these publications relate to a number of research areas and units in FIOH. The number of PhD students working at FIOH or supervised by FIOH researchers has been quite impressive.

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<sup>1</sup> The journal impact factor is a measure of the frequency with which the 'average article' in a journal has been cited in a particular year. The journal impact factor for year 2002 is based on the ratio between the number of cites in 2002 to articles published in the journal 2000 and 2001, and the number of articles published in the journal 2000 and 2001. Journal impact factors vary considerably between different scientific subject categories. Thus, comparisons within each subject area are meaningful and fair.

*Table 3. Number of research articles per person-year of research and the impact factors of the scientific journals by FIOH units, 1997-2002*

Unit	No. research articles per person-year	Mean impact factor 1997-2002 for journals in which the articles were published
Department of Industrial Hygiene and Toxicology	1.1	3.1
Department of Physics	1.2	1.8
Department of Occupational Safety	1.1	0.6
Department of Occupational Medicine	3.1	1.9
Department of Epidemiology and Biostatistics	1.9	2.1
Department of Physiology	1.2	1.4
Department of Psychology	1.5	1.9
Kuopio RIOH	1.8	1.2
Oulu RIOH	1.6	2.1
Uusimaa RIOH	1.1	2.2
Tampere RIOH	1.2	1.1
Turku RIOH	1.4	2.1
Lappeenranta RIOH	0.3	0.6
Department of Research and Development in Occupational Health Services	1.3*	2.0*

\*2001-2002

## Relevance and impact

Research at the FIOH has mostly been of a very high quality, with high productivity and also with high relevance for Finnish working life. There is, however, a need to focus even more on the currently very important problems with mental health problems and musculoskeletal disorders and their relation to working life. The social impacts of FIOH research cannot be so easily assessed, as the process through which scientific results impact society which is affected by a number of other societal factors as well, is a complicated one. Therefore, a simplistic assessment of e.g. the effect of FIOH's research on the duration of working years of the Finnish workforce cannot be directly done. Most impacts of research are of an indirect nature; they take a long time to filter through and they are difficult to measure. It should also be emphasized that research as a core process is a prerequisite for the high quality of the other core processes at FIOH: service, training, and information.

## Conclusions and recommendations

### *Conclusions*

The research activities at the FIOH are generally of a very high quality and most research groups show high scientific productivity. It is more difficult to assess the direct societal effects of the research, but it may be possible to focus even more on current and future occupational health problems in Finnish society.

Finland has many national registers and surveys, as well as prospective population-based cohorts that are valuable to the work of the FIOH. These databases have been used successfully by the FIOH to produce descriptive and etiological epidemiology of high relevance for Finnish working life.

There is a need for more intervention research projects with appropriate evaluation methods. Interventions may consist of training, information dissemination, workplace improvement, individual employee support, screening, or therapy. Evaluation of intervention effectiveness requires collaboration with social partners and stakeholders to ensure continuous contact between researchers and target groups for post-intervention measurements. Available birth cohorts provide opportunities for FIOH to understand early risk factors for work-related ill health and to design practical tools to be used in health promotion interventions.

The time-limited Action Programs have been a rather successful method to ensure collaborative research activities involving several Departments and Regional Institutes. Long-term research themes could be another means to bridge gaps between disciplines and units. It must be emphasized that high quality research activity is essential for a successful performance of the FIOH's other core processes: service, training, and information. In order to ensure a continuous process to identify strong research areas, research areas needing to be strengthened or downsized, and to facilitate redirections of research focuses within the FIOH, an *ad hoc* international research advisory committee could be helpful. In order to facilitate new starts of research activities, including pilot studies, the management may need to put aside some specific resources for that purpose.

*Recommendations*

- 22. The IEG recommends formation of (virtual) research themes, as a process for long-term collaboration between FIOH Departments and Regional Institutes. Initially such themes could focus on musculoskeletal diseases and mental health and work.
- 23. The IEG recommends that the FIOH continue its excellent work with descriptive and aetiological epidemiology, using data from unique Finnish registers, surveys, and prospective population-based cohorts.
- 24. The IEG recommends that the FIOH strengthen staff expertise in intervention effectiveness (evaluation) research methodology and provide adequate resources for these efforts.
- 25. The IEG recommends that an *ad hoc* international research advisory committee could be helpful for the FIOH management to support a focusing on relevant research projects of the highest scientific quality and of relevance for Finnish working life.
- 26. A way to implement a redirection of research could be to put aside some of the FIOH research resources for an intramural granting system.

**4.2 Information - Core Process**

**Brief description**

The FIOH has developed a model which relates its core processes together and defines their role in the innovation chain. Figure 5 displays the model.

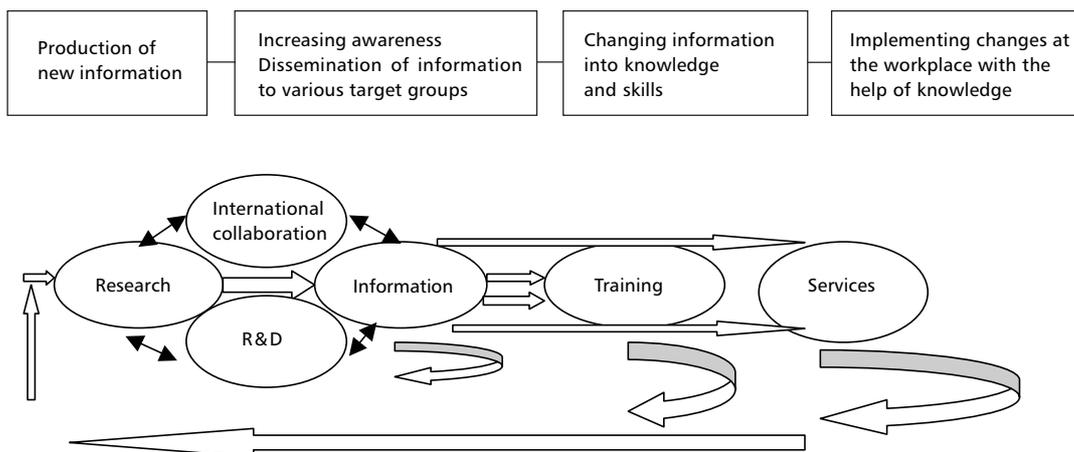


Figure 5. The relationship between the four core processes of the FIOH.

FIOH's own research activities, and research carried out elsewhere, produce new information that the FIOH disseminates to various target groups. Training is a way to change information into knowledge and skills, and through services changes can be implemented in workplaces. In order to function satisfactorily, this model requires effective cooperation and feedback between Departments and units operating in different phases of the innovation chain.

The four specific information units: the Office of Information and International Affairs, the Editorial Office of the periodical *Work Health Safety*, the Publication Office and the Information Service Centre (Library), have planned their activities in cooperation and coordination. In addition, all the Departments of the Finnish Institute of Occupational Health are involved in information dissemination, especially because one of the goals of the FIOH is to foster and promote the use of information at workplaces. For this purpose, the training, advisory services and intervention studies of the FIOH are needed and they are powerful collaborators in achieving the goal.

### *Channels of information dissemination*

The FIOH uses various channels to disseminate information: media, including radio and TV, public relation activities, journals, magazines and newsletters, books and other publications, web service, and library and information services.

Through media it is possible to reach the working-aged population. The FIOH has cooperated with the Finnish Broadcasting Company in order to produce a series of programs presented on TV dealing with working life issues. The number of press releases is about 40 per year and the number of press conferences more than 10. Approximately 10 of the press releases reach at least a million readers.

The FIOH regularly informs decision-makers and other stakeholders about its activities and achievements. It arranges visits to the Institute for students and other interest groups and provides stands at fairs and exhibitions.

The FIOH has three journals of its own: scientific journal in Finnish (*Työ ja ihminen*, 4 regular issues), the periodical '*Work Health Safety*' (see below), and a quarterly newsletter, '*Työterveiset*', which describes the activities of the FIOH in thematic issues (distribution 15,000). The periodical '*Work Health Safety*' carries out a reader survey every three years, and has received positive feedback from its readers concerning its value as an information source. There are also regional newsletters and research reports series.

With its sister institutions in the Nordic countries, the FIOH publishes the *Scandinavian Journal of Work, Environment and Health*, a multidisciplinary, international scientific journal in the field of occupational and environmental health.

### *The periodical 'Work Health Safety' (TTT)*

The magazine TTT promotes occupational health and safety by providing information on work environment, work organizations, and the interaction between work and health. The target of the periodical is Finnish workplaces, which are in practice reached through their occupational safety and health delegates and vice delegates, occupational safety and health managers, and occupational health

professionals, who are provided TTT without charge. TTT publishes 12 issues a year with a distribution of 72,597 copies in 2003. The readership was 216,000 per issue.

The periodical has a modern appearance. Readership surveys have been carried out regularly, the most recent in 2003. These surveys have ascertained readers' opinions and wishes, and also the significance and impact of TTT. The 2003 survey showed that TTT has a very good image. Practically all of those who responded consider that it is an expert in its field, and that it provides help in carrying out occupational safety work. More than half consider TTT an indispensable source of advice on occupational-safety matters. Compared to the readership study carried out in 1997, TTT has improved its performance.

These results are impressive from the sample of the readership survey who actually read TTT. It would be useful to understand the views of non-readers to learn how they might be reached by TTT or whether modifications to TTT are needed to reach the current non-readers.

#### *WWW Centre*

The FIOH website was opened in 1995, and now a third 'edition' is at hand. The FIOH has a decentralized production of the web pages. The WWW Centre is a virtual unit, i.e. the experts in the Office of Information and International Affairs and the Information Management Unit of the General Department work closely together to guide and develop work being done throughout the FIOH in web services.

#### *Information Service Centre*

The FIOH has a well-equipped library and information service which cooperates with the network of other research institutes, universities, etc. It acquires and manages information re-sources such as electronic and printed journals, books and databases from international providers and takes care of the information support of researchers and students in the Institute and in Finland and abroad (CIS). It maintains its own databases with a large number of references of books, journals, and other information material to be used in the research, development, and training activities. The Information Service Centre also provides support to the users of occupational health and safety information resources, and supports also the management of information by training the users. The Information Service Centre has performed three user surveys in 1999 to 2003, the results of which have been used to develop services. The personnel of the centre have also participated in some international projects.

#### *The Publication Office*

The Publication Office issues, markets, and sells publications (textbooks, handbooks, booklets, posters, and forms) that are based on scientific research. The publications are aimed primarily at the needs of working life. The Office aims to increase awareness and knowledge of occupational health and safety matters, to help workplaces to develop good working conditions and a healthy work environment, to solve problems arising in work life, and to promote the work ability and well-being of workers. The Publication Office publishes some 40–50 publications a year and has some 300 publications on its list for sale. The number of copies distributed has varied from 56,000 to 97,000.

The FIOH publications have traditionally been intended for occupational health and safety personnel. Over the past 7 to 10 years, also publications directly targeted to the whole working-aged population have been included in the agenda. There are already some good examples of such small guides that have become best-sellers.

Electronic publishing, i.e. the production of contents, technical realization and manner of distribution have not been developed at the FIOH. This should be included in the agenda, because it disseminates information effectively and economically, and reaches new customer groups.

### **Influence of Ministerial and FIOH strategic goals**

For the FIOH, information dissemination is a statutory function. It has also been defined in the Strategy of the FIOH, in which the following issues have been prioritized:

- improving awareness of and knowledge in occupational health and safety in Finnish society
- providing current and reliable overviews of the status and problems of occupational health and safety and working life in Finland, to both decision-makers and the public
- organization of information support for the occupational health and safety personnel
- using of media, publications and information services as the forms of information dissemination
- using of printed publications as well as web services
- collaborating with the Departments especially in the FIOH Action Programs in order to ensure their impact in working life.

Information dissemination is an essential core process of the FIOH for the achievement of the strategic goals of the ministry and of the FIOH as well.

### **Management and resources**

The core process of information dissemination is decentralized to different units, and website management is handled by a virtual centre. This kind of horizontal organization of information dissemination tasks requires effective coordination. It is facilitated by the fact that a member of the Executive Group is responsible for coordinating information activities.

Working time devoted to the core process of information has remained relatively stable during the period 1998-2004, between 11 and 13 percent.

### **Productivity**

The productivity of the information core process has been maintained at a high level. However, rapid developments in information technology pose a challenge to the FIOH's information services. Available new technologies will assist the FIOH in reaching the target groups even more effectively.

## **Relevance**

Information is properly regarded as one of the core processes of the FIOH. It is essential for the FIOH to have an impact on occupational health in Finland. The IEG notes that this is acknowledged by the FIOH.

## **Impact**

Information dissemination processes have been systematically developed at the FIOH and also their relationships to other core processes are well designed. The reader survey of TTT periodical and client surveys of information service centre suggest that information dissemination makes a difference; TTT readers are of the opinion that the periodical provides applicable and useful information for their work in improving occupational health and safety.

The channels of information dissemination – especially telematic channels - are developing very rapidly. It is a challenge to the FIOH to make wise use of these new opportunities to maintain its high level of information dissemination in the future as well.

## **Conclusions and recommendations**

### *Conclusions*

The information dissemination model developed at the FIOH is a useful way to conceptualize the relationships between the FIOH's core processes (research, information, training, services). The FIOH has also done much to build practices that enforce the functioning of these relationships and it is relatively advanced in this work compared with many other institutions, although further advances are most welcome.

### *Recommendations*

27. The use of web pages has developed rapidly, but more could be achieved. Electronic publishing should be further developed. This also includes the periodical TTT.
28. The ambition of the FIOH should be to make the most relevant and valid scientific and professional knowledge from scientific and other literature available to occupational health and safety personnel, and in translated form to the government, employees and employers. Contributions from the other occupational health institutes (Nordic, European, American) should be easily available. Although the FIOH has an excellent information strategy, it can be further developed to meet this goal. Information services should continuously monitor the use and non-use of their products and evaluate the effectiveness of these products through market studies. IEG encourages the FIOH to organize a survey or qualitative study to address the manifest and latent information needs of the various target groups of the FIOH to facilitate optimal use of the information available.

## **4.3 Training - Core Process**

### **Brief description**

Training is arranged by the Central Institute and by the Regional Institutes. The total volume of training since 1997 is rather stable, after a doubling of activities in the period 1993-1997. In 2003, 297 courses were given, 8,938 participants had altogether 20,839 trainee days, and 3,115 lectures were given at courses arranged by others.

Training has high priority in the Departments of Research and Development in Occupational Health Services (training for occupational health services professionals), Physiology (physiotherapists) and Psychology (occupational psychologists). The Department of Occupational Medicine and the Regional Institutes are responsible for the practical training of occupational health physicians. Among the Regional Institutes, Lappeenranta and Tampere are the most active in training. The Tampere Regional Institute has a special responsibility in training occupational safety personnel. Kuopio offers much training to farmers and agricultural advisors. There has been an increase in the number of training events concerning psychosocial determinants of health and work ability offered by the FIOH in recent years.

The Training Centre started in 2002 to strengthen the competence of occupational health services personnel and other experts. The Centre is the successor of the Training Office as the research and development centre for the training activities of the FIOH. Its tasks are acquisition, development of the contents of qualifications, marketing, evaluation of implementation, training of trainees and trainers, and administration. Implementation of courses by the staff of the centre itself has been limited. Contact persons within each department undertake additional collaboration and the Centre provides didactic and administrative support for improving effectiveness. Cooperation with universities, polytechnic institutes and other education institutes has been expanded.

In 1998 a comprehensive multidimensional evaluation of FIOH training activities was completed, involving outside experts and customers. This evaluation was the consequence of a recommendation of the 1995 FIOH evaluation. Recommendations on strategic and didactic aspects such as closer cooperation with universities, use of new training technologies, and accents on development of working communities were taken into account. The Centre should concentrate on tutorial and consulting activities as has been implemented. One of the recommendations was that the evaluation system of the FIOH as a whole should be improved, related to effectiveness.

An important challenge concerns the training of a sufficiently large number of qualified and competent occupational health services (OHS) professionals. Since 1997, some 180 physicians with OHS specialist degree have been trained, and at present an additional 556 physicians have registered as trainees in specialization on OHS. Even though the medical schools at the universities are responsible for the specialist training, the FIOH plays a key role in it.

Some universities offer training for occupational health and work psychologists, often in collaboration with the FIOH. A four-week course for safety managers forms the core of occupational safety training.

The tendency in training activities of FIOH is towards more tailored courses and *ad hoc* training. The concept of the innovation spiral has been introduced. Occupational physicians, nurses, psychologists, and safety managers, but also new target groups such as managers, employees, human resources and occupational developers are approached. Educational methods include on-the-job learning and participatory education. Plans are being developed to standardize the training evaluation methods applied by the FIOH throughout Finland.

### **Management and resources**

The responsibility for training activities is divided between various Departments, Regional Institutes and the Training Centre (12 persons). The income from training amounts to 13-15% of the annual income of the FIOH and an input of 10% of the total annual manpower resources of the FIOH is needed to produce this training.

The management and resources of the Training Centre are adequate. The resources for the training of OHS physicians were recently increased. The new building offers good opportunities for optimal quality.

### **Staff competence and renewal**

The competence of FIOH experts in training and education has been promoted by the Training Centre in close cooperation with the personnel training unit of FIOH. The educational level of the staff of the Training Centre is rather high. The staff competencies are didactic methods and organizational skills. However, new didactics have to be explored and new competencies have to be taught to the trainees such as marketing skills, health economics, and process consultation skills. Interest in the effectiveness and impact of the training will increase. As a consequence, there is a distinct need for the continuous education of FIOH staff and staff of the centre. National alliances and international collaboration can support innovation. As two-thirds of the staff of the Centre are above the age of 50, staff renewal is already recognized as a priority.

### **Productivity**

The FIOH has doubled training activities since 1993 and raised its income threefold. The main activity of the Training Office (later Training Centre) was the coordination and organization of training in cooperation with others inside and outside the FIOH. Training curricula for occupational health services specialists were developed and provided. The multidisciplinary training is attended by around 250 specialists yearly. For occupational health services, training has been developed on workplace health promotion (over 3,000 participants), early vocational rehabilitation (900 participants) and early recognition of the threat of incapacity (1,000 participants). Other comprehensive training activities were for managers and personnel staff on age management (1,500 participants) and for work instructors for on-the-job-learning,

nearly 100 participants. In courses implemented by the Training Centre itself, 1,859 trainee days were provided in 2003. The Centre is responsible for in-house training of FIOH staff. The development of e-learning for distance learning has been started, but there are not yet complete distant courses.

## **Quality**

Short-term courses organized by the Training Centre are evaluated through self-evaluation of trainees and trainers. Long-term courses are evaluated by the trainers and by a written and oral evaluation by each participant. Each year all courses are evaluated.

## **Relevance**

Departments and Regional Institutes offer their training expertise to their customers thus fulfilling one of the core processes of the FIOH. The Training Centre makes its own contribution to concrete activities. The addition of the Centre to the FIOH creates a good opportunity for coordination, ensuring relevance to the FIOH, occupational health services, workplace, and client priorities.

## **Customer/Stakeholder relationships**

The relationships with Departments and Regional Institutes are well developed as each Department has a dedicated contact person. However, some units do not use facilities for financial reasons. Relations with various social organizations such as professional associations have recently strengthened and positively judged by them. Yet, there is still a need for training and education that provide knowledge and tools which are easy to apply in practice and that are including solutions. A topic for training that could get more attention is the skill needed to implement interventions in companies. Relationships with companies are intense in cases of close collaboration in various programs. However, as the training courses are expensive, some potential customers, among them employees, can not afford to participate themselves. There was some discussion regarding whether it is desirable to increase cooperation with the universities, polytechnic institutes, and other adult education institutes.

## **Impact**

Non-systematic responses about the impact of FIOH training activities are positive. However, at this moment it is not yet possible to evaluate the impact on e.g. employee health. An increasing number of courses are ordered by companies, which reflects satisfaction with the services given. The Centre has a large impact on training activities both inside and outside the FIOH in accordance with the aim of improving the competencies of trainers, occupational health and safety personnel, and managers.

Training presumably has played a vital role in the implementation of the new occupational health services (OHS) and occupational safety legislation, and in the promotion of good practices in occupational health services, as OHS personnel and

safety managers formed the majority of the trainees in 2003. Topics for impact on society are the maintenance of work ability, awareness of diverse health hazards, and the development of better psychosocial work conditions.

## **Conclusions and recommendations**

### *Conclusions*

Training activities of the FIOH and the Training Centre in particular function well.

### *Recommendations*

29. There is a need for instruments for the development and evaluation of the quality of the training activities of the FIOH and of occupational health and safety services. The introduction of new didactics should be continued. The IEG supports the plans to implement standardized evaluation methods in the FIOH and consequently to give feedback and professional support. As follow-up of trainees is expensive, new creative and adequate solutions for evaluation might be developed.
30. The IEG supports the coordinating role of the Training Centre and recommends that in the future, all Departments and Regional Institutes will use the facilities offered, with the aim of enhancing the quality of training and education.
31. The IEG recommends that the Training Centre include in its responsibilities the development of expertise and methodology to evaluate training courses and their methods so that measurement can be made of the competence obtained and the resulting behavioral changes of participants, and also of the short and long-term impact on workplaces and on the health of workers.
32. The IEG recommends that FIOH Departments and Regional Institutes, supported by the Training Centre, facilitate the exploration and use of distance learning on a larger scale, to take advantage of the Internet in order to extend the training to learners at a distance.
33. As the training courses are expensive, FIOH should consider to strengthening the strategy to train the trainers or other 'multipliers'. E-learning might be an alternative solution for reaching the largest possible group.

## **4.4 Advisory Services - Core Process**

### **Brief description**

According to its legislation, FIOH is mandated to raise at least 20% of its budget from external sources. FIOH can generate extra revenue on top of this 20% and use this for purposes of its choice. This flexibility has given an incentive to produce extra revenue and use it to fund priority targets. In recent years, the external funding has been about 40% and most of it has been generated through a wide variety of services discussed below.

### **Influence of the 1995-1997 evaluations**

The evaluation appreciated the importance of service functions for making contacts and distributing information to the field. There were concerns about the burden of services imposed on some activities and the poor earning of some service functions. Also, the temptation of 'following the money', i.e., prioritizing the needs of funding customers rather than those of the FIOH was considered a dilemma. The FIOH has continued to be responsive to the service needs of the customers. The fiscal balance of the service functions has improved, allowing use of the funds for other activities.

### **Influence of the Ministerial and FIOH strategic goals**

Both goals have been met and surpassed in providing services.

### **Management and resources**

Management of resources has been generally good. The income from services amounted to over EUR 10 million in 2003 (some 8 million in 1997). Service income is nearly 50% of all own income. The Regional Institutes account for about 40% of the service income. About 15% of the service work hours are used for counseling, which is free of charge. The costs for providing services were higher than the earned income, i.e., the income was 55% of the costs when free advisory services are included.

### **Key activities**

Occupational health services include consultations to promote good occupational health care practice, maintenance of work ability, and recognition of health hazards, including musculoskeletal diseases and mental stress. The Department of Research and Development in Occupational Health Services has developed functional models to improve the coverage, quality, and cost-effectiveness of occupational health care. The Regional Institutes have supported occupational health services by counseling in occupational toxicology, in the content of occupational health care, and in exposure and risk assessments. Services in occupational medicine include the diagnosing of work-related and occupational diseases and the evaluation of work ability. The Department of Occupational Medicine and the Regional Institutes together with the university central hospitals and central hospitals offer occupational medical

services. The Department of Occupational Medicine has its own inpatient ward. An information service on pregnancy and work is maintained.

Services in occupational hygiene and biomonitoring focus on the assessment of work-related chemical, biological and physical exposures, and on the reduction of health hazards. The Regional Institutes assess exposure at 1,200 workplaces every year. Forty-five thousand chemical, biomonitoring and material analyses are carried out annually at the Aerosol, Biomonitoring and Chemical Laboratories of the Department of Industrial Hygiene and Toxicology, and at the Regional Institutes. The Chemistry Laboratory at the afore-mentioned Department tests the chemical resistance of protective materials in accordance with the European standards. Exposure assessments lead increasingly to projects to develop work environments. Indoor air quality and chemical exposure assessments are the most requested services. For example, the need for analyses of sensitizing chemicals has increased. The requirements of the European Commission related to the regulation of existing and new substances (REACH) are estimated to markedly increase the need and resources for risk assessment of chemicals. There is also an increasing need to assess exposure to reproductive-toxic chemicals. Accreditation has gradually increased at the FIOH, and presently the Institute has seven accredited laboratories. The Department of Physics is accredited in testing personal protective equipment, video display terminals, laser devices, and sound level meters. The Biomonitoring Laboratory of the Department of Industrial Hygiene and Toxicology is accredited in several biomonitoring analyses. The Section of Occupational Hygiene and Toxicology of the Kuopio Regional Institute is accredited in the sampling of workplace air, chemical testing of air samples and in several biomonitoring analyses, and the Acoustic Laboratory is accredited in the noise testing of machines. The Chemical Laboratory of the Uusimaa Regional Institute is accredited in VOC and ammonium determinations. The Chemical Laboratory of the Tampere Regional Institute is accredited in the determination of volatile organic chemicals in the work environment, and in analyzing airborne dusts and emission samples. The Laboratory of Acoustics in Turku is accredited in the airborne sound isolation of building elements. Coordination of the occupational hygiene activities has been promoted by a cooperation group. The group has achieved a number of improvements in specialization and distribution of work, customer contacts and work procedures. The past overlaps of activity between and capacity between the Regional Institutes have been reduced by the cooperation group.

Occupational psychology services consist of selection assessments, organizational development, and individual psychological assessments. Development projects include management development, the implementation of organizational changes, and the solving of crises and conflicts within the work community. Selection assessments and individual psychological assessments are carried out at the Department of Psychology. Development projects in work organizations are undertaken by the Department of Psychology and at the Regional Institutes. Requests for services to manage and to carry through changes and to solve conflicts have increased.

Occupational safety services are mostly consultations for companies to help improve their safety and to develop methods for self-assessment and subsequent improvement processes. The Department of Occupational Safety has developed such methods,

and development projects have been carried out by the Department of Occupational Safety and the Regional Institutes of Kuopio, Tampere, Turku and Uusimaa. New services in safety include monitoring and evaluation methods and softwares such as the TR-index, Elmeri, Näppärä, Valmeri, and Safety Check-lists. Several companies have launched programs aiming at the zero-accident level. This has increased the request for consultations.

Testing and certification services consist of personal protective and marine safety equipment. The accredited test methods comprise 140 standards covering practically all-essential equipment.

Ergonomics services are consultations to optimize employee workload, to promote health and work ability, and to improve working conditions. The Department of Physiology and the Regional Institutes have developed methods to assess workload, and they initiate development projects at workplaces. The Department of Physiology and the Regional Institutes of Kuopio, Oulu, Tampere and Turku also measure the physical capacity of special groups of workers. The amendments to the Occupational Health Service and Safety Acts will increase the requests for assessing workload and the risks related to excessive workloads.

## **Future plans**

A number of future challenges has been outlined. The amendments to the Occupational Health Service and Safety Acts will emphasize cooperation between various actors in health and safety matters. Risk assessment and the assessment of workload will receive more attention. This means frequent requests for expert services, especially risk assessments. The EU legislation on chemicals (REACH) increases the need for exposure assessment of chemical hazards. The attractiveness of industrial workplaces will become an important issue in the future along with the aging of the workforce. This means a greater need for improving the work environment, work organizations, and management practices. There is an increasing need for good practices, and the work of the European Agency for Safety and Health at Work will be continued and supported. Training and guidelines on how preventive measures at work can be initiated in companies will be needed. Guidebooks on good design practice are necessary to help the transfer of knowledge from researchers to designers. In the future, occupational health and safety work will need to focus on the impact and follow-up of development, research and training in the prevention and control of hazards at work. Emphasis will be placed on the development of techniques and tools for modeling, simulation and visualization of future work.

## **Productivity**

The services use 35-40% of all person-hours at the FIOH (358 person-years in 2003), and the demand for services is increasing. 30% of the service person hours are used for occupational hygiene and toxicological assessments, and 25% for medical services. 15% of the service work hours are used for occupational health psychology, and 2 to 4% for ergonomics, safety, work ability, and health care services. In 2003 the service income per person was about EUR 29,000, which is less than the average annual personnel costs. Overall, the service functions cost more than they produce.

## **Quality**

Overall, the quality is high. More details are given in the Chapters describing the work of the Departments and Regional Institutes.

## **Relevance**

The relevance is generally high, particularly where the requests come from the workplaces.

## **Customer/Stakeholder relationships**

The customers for FIOH services include many kinds of organizations and institutions, including workplaces, manufacturers, health care units, designers, labor market organizations, insurance companies, and authorities. According to a customer survey conducted by the FIOH in 1999, 80% of the customers of the Tampere Regional Institute were satisfied with the services. More than half of the service groups had a satisfaction level of over 90%. In 1997, a customer survey on indoor air services at the Uusimaa Regional Institute gave similar results. Overall evaluation appears very positive, and the function of Regional Institutes in keeping regional contacts is instrumental. According to the 2004 FIOH Customer Survey, the service functions received a very positive evaluation, with 80-90% rating for satisfaction. However, only 17.1% of the respondents considered expert services as the most descriptive core process of FIOH (research 35.5%, training 27.5%, and dissemination of information 17.4%).

## **Impact**

The FIOH has been the only provider of many services to its area of mandate. The overall impact has been high.

## **Conclusions and recommendations**

### *Conclusions*

The services offered by the FIOH should contribute to its overall goals of promoting health, safety and work ability, improving work environments and products, developing work organizations, and preventing work-related diseases. In addition to direct services, the FIOH develops analyses and methods, modeling and software products to support the activities carried out at workplaces, and the activities of the occupational health services and authorities. Service functions have been very important to the activity of the FIOH in many ways, as recognized and praised by the previous evaluations. They make possible the flow of the most relevant information to those who benefit from it. The level of knowledge and skill can most effectively be raised by combining research, services and new technologies, and distilling these into good practices and guidelines. By harmonizing the methods and work operations, the FIOH can function more cost-effectively and improve quality. Participative and multidisciplinary teamwork brings creativeness to solving problems, and developing new approaches and methods. The FIOH with its network of Regional Institutes has been very successful in this.

The FIOH is mandated to raise at least 20% of its budget from external sources. It can generate extra revenue on top of this 20% and use this for purposes of its choice. Although the FIOH, and the IEG, consider the flexibility of the system very important, the IEG finds also some potential problems. The first one is the danger that external funding can steer the direction of research in some unwanted direction. The IEG could not assess whether such problems actually exist. The requirement for relevance in the service functions is underscored by the fact that the service income covers only 55% of the underlying costs. A second problem is the exhaustion of the personnel carrying out services, often with tight delivery times and with pressure to accept more duties than capacity allows. One probable reason for this over-commitment is the perceived benefit of the generated extra revenue. A third problem appeared to be the lack of assessment of the results and impact from the provided service. However, the IEG agrees that disappointed customers do not come back to ask for service. As the last point, the combination of service and research would benefit both the provider and the customer. Satisfied customers are likely to be cooperative in scientific projects and incorporation of scientific components with a service activity is likely to increase its quality and make the assessment of the quality easier. Although scientific parts are included in some service activities, they are missing in others. Even a centralized collection of results from “routine” services and reporting the results from individual workplaces together with the collected reference values will be stimulating to the customer and such data may be of general interest.

#### *Recommendations*

29. Service activities have been important for the mission of FIOH and they should be continued in the future.
30. There is a need to critically monitor the balance of external funding with the full costs of the services and the demands on the FIOH workforce to ensure that the mission of FIOH is properly advanced.
31. The FIOH should be able to solve the work load problems of its personnel, including those carrying out services.
32. The IEG recommends a further integration of scientific questions into service activities and development of centralized registration schemes for the results obtained, to help in the assessment of the results and to motivate customers to take corrective action at the workplace.

## **4.5 Department of Epidemiology and Biostatistics**

### **Brief description**

Epidemiologic surveillance and research on the occurrence and work-related causes of diseases and other states of health has been part of the FIOH's mission since its beginning, and the activities at the Department of Epidemiology and Biostatistics (DEB) have a world-wide reputation for excellence.

The goal of the epidemiologic research is to broaden the knowledge base that can be used to prevent or control health problems in working life. The priority research areas cover musculoskeletal diseases, respiratory diseases, reproductive health and cancer, morbidity and mortality by occupation and branch of industry, social epidemiology, and social research. Although epidemiologic research is conducted in several of the FIOH's Departments and Regional Institutes, the DEB has the capacity to provide scientific guidance and service to epidemiologic activities in other parts of FIOH.

The DEB also coordinates occupational health and hazard surveillance and monitors states of and trends in health, working conditions, and working life. Important tools for these tasks are the national registers maintained by the DEB; the Finnish Register of Occupational Diseases and the Register of Occupational Exposure to Carcinogens. Moreover, the DEB has developed the occupational hazard surveillance databases FINJEM and CAREX. The main purpose of surveillance is to produce indicators of trends for prevention and health promotion purposes. The beneficiaries of the monitoring information include occupational health and safety administrators, inspectors, specialists, and researchers.

The Department provides statistical specialist services to ensure good epidemiological practice and biostatistical methodology in research at the FIOH, and also conducts methodological research. The Department works in collaboration with other Departments and Regional Institutes, and has a wide national and international network.

### **Influence of the 1995-1997 evaluations**

During the period 1997-2003, the FIOH established a systematic surveillance program utilizing national registers, questionnaire-based interview surveys, observational company surveys, and expert judgment approaches. Information is interpreted and summarized annually and every three years in a book written by about 60 experts at the FIOH. This book ('Work and Health in Finland') has been published 1997, 2000, and 2003 in Finnish, with an English summary. Hazard surveillance methods have been developed on the basis of a combination of measurement/survey data and expert judgements. Exposure information systems (e.g. FINJEM, CAREX) include documented information on the prevalence and level of exposure by occupation and industry for a wide range of factors. These databases are the backbone of occupational hazard surveillance and risk assessment and are used in international risk assessment projects (WHO, EU, IARC), as models to develop national hazard surveillance systems and as exposure assessment tools

in epidemiological studies. The Department of Industrial Hygiene and Toxicology has the principal role in risk assessment at the FIOH, and the DEB supports it with expertise.

### **Influence of Ministerial and FIOH strategic goals**

Demographic, technological and societal changes (ageing of the workforce, decline of agriculture, increase of the tertiary sector) have influenced the orientation of both research and surveillance activities. Increasing emphasis has been placed on research into the work-relatedness of diseases in a broad sense. To produce indicators of the health and work ability of the employed population, methodologies for estimating working-life expectancies (WLE) have been developed. This technique has been applied to data on ageing municipal workers, and will be applied to the total employed Finnish population.

### **Management and resources**

The total expenditure for 2003 was EUR 2.1 million, an increase from EUR 1.5 million in 1997. Seventy-five percent of the costs in 2003 were used for personnel. The state support covered 76% of the costs and 24% consisted of the DEB's own income. Almost all own income (87%) came from research grants.

### **Staff competence and renewal**

In 2003 the DEB had a staff of 42 persons, compared with 35 for 1997. The staff consisted of 11 docents, four with a doctoral and one with a licentiate degree. One scientist was abroad for one-year's post-doctoral training. Currently nine researchers are preparing doctoral theses, five in musculoskeletal disease epidemiology, two in cancer epidemiology, and two in social research. The competence in epidemiology and biostatistics is excellent at the DEB, but there is less skill in and experience of qualitative research methods. There is, however, an ongoing internal study group focusing on qualitative research methods. There is a clear need for developing expertise in evaluation research in the future.

Training a new generation of occupational epidemiologist and biostatisticians is vital for the future, because by the end of 2011, one third of the permanent scientists are expected to retire.

### **Key activities**

The DEB provides statistical expert services to other Departments at the FIOH. Eight statisticians participate in the design of studies and in the analysis of data, as well as in the interpretation and reporting of analysis results. Shorter consultations are also given. The annual number of joint projects has been around 40. In addition, the DEB carries out the maintenance and development of the statistical data processing system. The research personnel at the FIOH have up-to-date and versatile statistical software at their disposal.

The DEB produces and disseminates information about the state of and trends in occupational health and safety in Finland. This work includes coordinating the surveillance activities of the FIOH and collecting, interpreting and disseminating information on periodic FIOH surveys (e.g., Work and Health in Finland interview study, Maintenance of Work Ability Barometer, Occupational Health Services survey), observational surveys (e.g. Work Environment 2005) and work-related data from other institutions (e.g. Statistics Finland). Since 1997, the book ‘Work and Health in Finland’, summarizing the results of these activities, has been published every third year.

As a basis for this surveillance activity, the DEB maintains and updates the Finnish Register of Occupational Diseases, the Register of Occupational Exposure to Carcinogens. Moreover, updating and maintenance of the hazard surveillance databases FINJEM and CAREX must be considered as part of the surveillance task.

## Productivity

The yearly numbers of scientific peer-reviewed articles and research reports during the period 1997-2003 have been between 70 and 80. Looking separately at original peer-reviewed articles in international journals (Table 4), 44 were published in 1997, then productivity decreased to between 25 and 32 articles yearly during the period 1998-2002, but in 2003 productivity was again higher and 47 articles were published. Publication frequency by subject area during the period 1997-2003 is given in Table 4.

*Table 4. Number of original articles published in international peer-reviewed journals by subject area and year, 1997-2003.*

Subject area	1997	1998	1999	2000	2001	2002	2003	Total	%
Cancer and genotoxicity	12	10	7	10	11	11	10	71	28.2
Musculoskeletal diseases	5	4	0	3	7	8	8	35	13.9
Respiratory diseases	6	3	3	2	3	12	6	35	13.9
Reproductive health	0	3	5	3	2	1	2	16	6.3
Social epidemiology and mental health	9	0	4	1	2	7	6	29	11.5
Other diseases	2	3	1	4	2	2	2	16	6.3
Occupational hygiene and biomonitoring of exposure	6	4	1	1	2	5	8	27	10.7
Epidemiologic and biostatistical methods	3	0	6	1	1	0	2	13	5.1
Others	1	1	3	0	2	1	3	11	4.4
Total	44	28	30	25	32	47	46	252	100.0

Eighty-one percent of all person-years were used for research in 2003, which is slightly higher than the 77% used in 1997. For 2003, this gives 1.6 peer-reviewed articles or research reports per person-year invested.

FIOH statistics indicate that staff from the DEB gave 18 lectures at courses, meetings and seminars in 1997, but none in 2003. However, in 2003 DEB staff gave 40 lectures at international and national courses, meetings and seminars. Similarly, the statistics in the self-evaluation report also give a somewhat skewed picture of the training activities provided by the DEB. Only external training activities are counted, and not methodological training for FIOH personnel. In 2003, short courses were provided on the basic principles of statistics, the analysis of repeated measurements, the analysis of multilevel models and the principles of structural equations with latent variables. It would be natural if the DEB even formally took the leading role for internal training programs in research methodology for FIOH staff, including those at the Regional Institutes.

## Quality

Articles have been published in a number of international peer-reviewed journals, of which many are of a good or excellent quality. The epidemiologic infrastructure in Finland with high quality register systems for both exposure and disease and personal identification numbers for all citizens, together with the high skill of DEB staff in epidemiologic and biostatistical methods have created the basis for excellent publications.

The surveillance activities with respect to work and health in Finland are unique of their kind with respect to data quality and comprehensiveness. The data are of value outside Finland, too, and full publication of the results in English could be a valuable contribution to many other countries with less advanced surveillance activities.

## Relevance

Table 5 shows the distribution of person-years by core processes.

*Table 5. Person-years (%) by core process in 1997, 2000 and 2003*

Core process	1997	2000	2003
Research	77	70	81
Information	10	14	14
Services	10	11	2
Training	3	5	3
Total	100	100	100
N	35	40	42

The DEB has a key role in the research performed at the FIOH; it provides biostatistical services for projects, and is also an active partner in different epidemiologic projects. There seems to be potential for an even more developed collaboration with other Departments. Looking at subject areas for research, cancer epidemiology and genotoxicology still dominated the publication list during 1997-2003, but no longer to the extent observed in the early 1990s (*The evaluation of FIOH, 1995*). It is interesting that the DEB plans to re-orientate some of the cancer epidemiology activities from etiological research to prevention at workplaces and cancer patients coping with their work. Considering the societal importance of musculoskeletal diseases it is somewhat surprising that the number of publications within this field has not increased as compared with the previous evaluation period. Epidemiology with respect to mental health and work is not as strong as the more traditional areas and there is little expertise in evaluation research methodology.

Surveillance activities with respect to work and health in Finland are very relevant for the strategy and mission of the FIOH.

### **Customer/Stakeholder relationships**

It seems obvious that the impressive statistics on the state of and trends in occupational health and safety in Finland are of great importance for a large number of customers and stakeholders. Moreover, many of these data are obtained through surveillance activities involving customers and stakeholders. Several stakeholders have expressed interest in being involved in a dialogue with the DEB about designing and performing new epidemiological studies. Moreover, stakeholders have also expressed the wish that in the future, the results of epidemiological studies will contribute to creating tools that can be put to practical use in the workplaces to a greater extent than today.

### **Impact**

The excellent research performed at DEB has no doubt had an impact on the international scientific community in the field of occupational health and safety. It is much more difficult to evaluate whether the results of the up to now of mostly descriptive or etiological research, or the surveillance data obtained, have had any direct effect in preventing disease or promoting health. The role of the FIOH is to provide scientifically based understanding of complex interrelationships between work and health that can be used for preventive or health-promoting activities on a societal level. However, the DEB could take a more active role in intervention studies at workplaces and in ensuring the quality of the evaluation of intervention effects.

### **Conclusions and recommendations**

#### *Conclusions*

The Department functions well in providing research of excellent quality and surveillance data of very high practical relevance. Considering the high quality research activity within the Department there could be opportunities for Department

staff to raise more external research funds than at present. The Department has a pivotal role for research within the FIOH due to its excellence in biostatistics and epidemiology. The biostatistical service provided to other departments is important, as well as ongoing collaborations in epidemiological projects. The Department could, however, take a more leading role in such collaborations, including proposed research themes.

#### *Recommendations*

38. The IEG recommends that the Department increase its expertise in intervention effectiveness (evaluation) research and its research activities with respect to musculoskeletal diseases and mental health.
39. The Department should have a pivotal role in future research collaborations within the FIOH, including the establishment of research themes, and take the lead in evaluation research efforts.
40. The IEG recommends that the Department should take a leading role in providing internal training programs in research methodology for FIOH staff, including those at the Regional Institutes.

## **4.6 Department of Industrial Hygiene and Toxicology**

### **Brief description**

The Department of Industrial Hygiene and Toxicology (DIHT) performs research on exposure to chemical and certain biological agents in occupational environments, investigates the effects of such exposures in experimental systems and elucidates the mechanisms underlying the effects exposure causes in exposed workers. An important part of this research activity is to develop new methods for exposure assessment. On the basis of the knowledge and competence established through research, the DIHT performs risk assessments and gives advice to national and international authorities. The Department is also involved in dissemination of chemical safety information, as well as in education and training in exposure assessment, toxicology and risk assessment.

### **Influence of the 1995-1997 evaluations**

The working conditions for the Department have improved markedly since the evaluations in that it is now under one roof in a new laboratory building. This new building includes new animal facilities.

An important lesson learned in the evaluation period has been the need for increased coordination and collaboration with the Department in order to improve the quality and intensity of research, services, expert advice and dissemination of information. This has also led to enhanced contacts with workplaces for services and research

collaboration. Based on the previous evaluation, the DIHT has expanded the toxicological research activities by establishing a Laboratory of Immunotoxicology.

There has also been a need to strengthen knowledge and competence in exposure assessment by applying demanding analytical methodology, including characterization and quantification of novel proteins by advanced mass spectrometric techniques. Advanced instrumentation for biomonitoring has also been purchased in order to put more emphasis on trace elements (ICP-MS). Services have been expanded in the Aerosol Laboratory by including fungal identification in addition to fiber analysis. Quality assurance programs have been prioritized in order to improve the quality and performance of the Biomonitoring Laboratory.

The Unit for Chemical Risk Assessment has focused its work more toward EU-level risk assessment. This will be of importance in relationship to the new EU chemicals legislation (REACH), including the establishment of the European Chemical Authority in Helsinki.

The Department has improved its ability to attract outside funding, both from the EU Framework Programmes and the European Agency for Safety and Health at Work. During the evaluation period, the DIHT has coordinated six major EU 4<sup>th</sup> and EU 5<sup>th</sup> Framework Programme projects and participated in several large partnerships.

The Department has continued its successful research activities in molecular and cellular toxicology, a research area that was especially commended in the last evaluation. Most studies have concerned polymorphisms of xenobiotic-metabolizing enzymes and cancer. The data acquired have been compiled for international collaborative studies using meta-analyses and pooled analyses.

### **Influence of Ministerial and FIOH strategic goals**

The thrust of the activities within the DIHT relate to the ministerial strategy for improving the attraction of working life by improving the quality of working life and enhancing health and safety measures at the workplace. For this, the Department contributes to the focus areas preventing occupational and work-related diseases, and promoting health and safety in the work environment. This includes research related to allergies and hypersensitivities of the respiratory system and skin. Further, the DIHT is involved in the prevention of asbestos-induced diseases. The Department has also participated in the development of new tools for exposure assessment. An important focal activity within the DIHT has been risk assessments related to the occupational setting.

### **Management and resources**

The DIHT receives 60% of its funding (total EUR 6,365,000) through the national budget. Its own income in 2003 (EUR 2,576,000) comes mainly from external funding of research (64%) and through providing services (30%). The expenditure of the Department in 2003 was on personnel (53%), premises (15%), other operating costs (20%) and acquisitions (12%).

The DIHT moved into its present facilities in June 2000. The building contains very good laboratory and office space for the various Department activities. The laboratories are excellently equipped with modern instruments; especially impressive is the mass spectrometry facility within the Chemistry Laboratory.

### **Staff competence and renewal**

In 2003, the DIHT was organized to 7 units: 1) Chemistry Laboratory, 2) Aerosol Laboratory, 3) Unit of Toxicological Risk Assessment, 4) Biomonitoring Laboratory, 5) Laboratory of Molecular and Cellular Toxicology, 6) Laboratory of Immunotoxicology, and 7) Laboratory of Toxicokinetics and Metabolism. The Department has a total staff of 105 individuals. There is very strong academic and research competence among the personnel: 26 persons have doctoral degrees, 3 have licentiate degrees and 32 have masters' degrees. There are 14 docents (adjunct professors) within the Department, who teach in different universities in Finland. During the evaluation period two other persons have obtained docent competence and one research professor has been appointed. There is a good age distribution among the personnel, with 18% aged 29 years and under, and 39% aged 30-49 years. However, during the next five years, five senior personnel and three of the technical staff will retire.

Training of PhD graduate students and their systematic mentoring has become increasingly important. On average, two doctoral students have completed their PhD studies annually. Short and long-term visits by foreign doctoral and postdoctoral students have been an important means through which the DIHT has maintained international contacts; in all, 34 foreign scientists visited the department for two weeks to one year during the evaluation period.

### **Key activities**

The DIHT staff is composed of 105 individuals. According to focus areas, 33% of them are engaged in preventing occupational and work-related disease, 49% in promoting health and safety in the work environment, while 18% are working in other (unspecified) areas.

The Chemistry Laboratory carries out research on identifying and assessing exposure to hazardous chemicals in the work environment. The research is based on a multidisciplinary approach combining the fields of chemistry, industrial hygiene, toxicology and molecular biology. The investigations encompass occupational hygiene studies, identification and analysis of metabolites, characterization of protein and DNA adducts, development of strategies and methods for sampling and analysis of airborne impurities, and testing of chemical resistance of protective materials.

The Aerosol Laboratory conducts scientific research and maintains expert services for the identification, evaluation and control of hazardous dust at workplaces. Current activities focus on mineral fibers, metal dusts, bioaerosols, fungal spores and other indoor contaminants. Asbestos exposure and morphological characterization contributing to diagnosis of asbestos-related diseases are the most prominent areas of expertise.

The Unit of Toxicological Risk Assessment is mainly responsible for carrying out this activity which includes assessment of specific chemicals hazards and risks to human health. The Unit is also involved in risk communication and dissemination of information, with a view to advance chemical safety nationally, within the EU, and internationally. A major part of the unit's resources has been devoted to fulfilling Finland's commitments on risk assessment to the EU Existing Substances Regulation.

The Biomonitoring Laboratory is an accredited testing laboratory involved in biomonitoring of chemical exposure at work. Biomonitoring has been performed for four decades and, at present, analytical methods exist for more than 70 chemicals and/or their metabolites. The total number of biomonitoring service analyses has increased continuously during the evaluation period.

The Laboratory of Molecular and Cellular Toxicology performs research on the relationship between occupational exposure, genetic predisposition, genotoxic effects and disease, especially cancer. The laboratory is involved in investigations on early biological effects and individual susceptibility, on genotoxicity and mechanisms of carcinogenesis, and on the examination of links between genetic alterations in cancers and occupational exposure.

The Laboratory of Immunotoxicology was established in 2000 and is mainly involved in three research areas: 1) examination of immunotoxicological mechanisms of occupational allergies and inflammatory diseases, 2) investigation of strategies for prevention and treatment of allergies and inflammatory diseases, and 3) development of immunological methods for improving diagnosis and exposure assessment, and for biomonitoring purposes.

The Laboratory of Toxicokinetics and Metabolism develops and employs modern methodology for research on industrial chemicals, and produces data on toxicokinetics, metabolic interactions and toxic mechanisms to support risk assessment and practical implementations for the safe use of chemicals at workplaces.

## **Productivity**

The production of scientific, peer-reviewed articles and research in the DIHT has been very good with annual averages of 55-62 articles and reports having been produced during the years 1997-2003. This represents 0.9-1.2 publications per person-year invested in research. The number of PhD theses completed has also been very high throughout the evaluation period. The mean impact factors of DIHT publications have been very impressive, with averages of 2.9-3.3 over the period of 1997-2003. The DIHT has been very active with scientific presentations at meetings, the annual number of abstracts has been 54-61. These presentations enable the Department's research results to reach a wide scientific audience.

The services provided by the DIHT are exclusively in the area of industrial hygiene, toxicology and biomonitoring. The production of occupational hygiene and toxicological statements with respect to workplaces has increased from 20 in 1997 to 70 in 2003. Furthermore, there has been a considerable increase during the period 1997-2003 in the number of analyses regarding the work environment, with the number of specimens analyzed going up from 8,494 to 12,353. Analyses especially

for research purposes, quality assurance and method development have increased: the number of specimens analyzed more than tripled from 1997 (7,361) to 2003 (23,192). One reason for this increase is the necessary inclusion of quality control analyses required for accreditation purposes. A large number of traditional metal and solvent biomonitoring analyses are performed within the DIHT. This raises questions related to the need to carry out these analyses at the Central Institute level, and whether there is good enough coordination with corresponding analytical activities at the Regional Institute level.

The number of asbestos analyses performed in the Aerosol Laboratory covers about 30% of all dust and material samples taken from building and demolition sites in Finland. Over 300 electron microscopic analyses of asbestos fibers in lung tissue were performed in 2003; this corresponds to about 15% of all mesothelioma and lung cancer cases in Finland. Over 1,000 indoor samples were analyzed in 2003 for the presence of man-made mineral fibers.

The DIHT has not been very active in training, the Department has only organized one FIOH course per year during the period 1997-2003. DIHT staff has contributed little to courses, meetings and seminars held at FIOH, whereas they have been very active giving lectures and presentations at national and international scientific meetings.

Overall, the productivity of DIHT activities has been very good.

## **Quality**

The quality of the research activities within the DIHT, as judged from citation impact factors, is very good. The mean impact factor for its 2003 publications was as high as 3.3, which is quite impressive. Especially high impact factors are noted from publications by the Laboratory of Molecular and Cellular Toxicology and the Laboratory of Immunotoxicology.

A good indicator of research quality is related to the degree of success in attracting external research funding. The DIHT has been able to steadily increase its research funding during the evaluation period. As another sign of quality in research, the Department has coordinated six EU 4<sup>th</sup> and EU 5<sup>th</sup> Framework Programme projects (one on biomarkers for isocyanate exposure, one on susceptibility to styrene exposure, one on cancer risk biomarkers, one on wood dust and two on asbestos) and another EU-financed project on individual susceptibility to lung cancer.

The quality of the Department's laboratory services is ensured by including quality control programs. The Biomonitoring Laboratory is an accredited testing laboratory authorized by the Finnish Accreditation Service in 2000. In 2003, 95% of the analyses were accredited.

An important achievement by the Department was the clarification of heavy metal exposure, especially uranium, of Finnish military personnel stationed in Kosovo in 2001. The results did not reveal any increased exposure associated with the use of depleted uranium munitions.

Overall, the quality of DIHT research and service activities is excellent.

## **Action Program: Wood-dust - Exposure Assessment and Health Effects (2002-2006)**

This Action Program focuses on an important occupational exposure factor and involves a number of elements in addressing health problems related to wood dust. The Program will undertake exposure assessments, perform research on health effects (both experimental and epidemiological), activities aimed at control and prevention of exposures, as well as training and dissemination of information. The Program is headed by the Department of Industrial Hygiene and Toxicology and there is good collaboration with other Departments in the Central Institute and several Regional Institutes. The Program also collaborates extensively with international research partners, partly through EU funding (including funding for the project WOOD-RISK). The Program has also been successful in attracting funding from several national sources.

A database on wood-dust exposure has been designed, constructed and tested after collection of data from questionnaires from companies in Finland, France, Germany and Spain. The response rate was relatively low (32%), but the results were considered as representative. Immunotoxicological studies using cell lines and a mouse model, as well as register-based epidemiological studies related to asthma and allergies, are ongoing. Molecular epidemiology investigation of sino-nasal cancer is of special interest in the Program, where *p53* gene analysis is performed on cases collected in Finland, Denmark and France. Several activities have been initiated in relation to control and prevention of wood dust exposure, including modeling of dust and noise levels in numerically controlled wood milling, characterization of dust quality and exposure when working with thermo-treated wood, and monitoring of wood dust exposure and assessment of well-being in door manufacture. The Program has so far organized two domestic courses on wood dust exposure and health effects. The Program is also involved in the organizing of two international scientific meetings.

## **Relevance**

### *Relevance to core processes*

Activities within the DIHT are mainly related to the core processes of research and services (table 6). The research performed in the Department is quite relevant in that many of the results are used for hazard identification and risk characterization to improve working conditions and provide data for Finnish, EU and international authorities for legislation and setting of occupational exposure limits. Results from the biomonitoring activities form the basis for the recommendations for biological action levels for approximately 40 individual chemicals set by the FIOH.

Table 6. Person-years (%) by core process in 1997, 2000 and 2003

Core process	1997	2000	2003
Research	52	58	60
Information	15	12	8
Services	31	28	32
Training	3	2	1
Total	100	100	100
N	86	87	105

#### *Relevance to strategy and mission*

On average, half of DIHT person-years are spent on the protection of workers' health and the other half on improvement of the work environment. Essential for both result areas is the identification and quantification of hazardous chemical and biological exposures, describing the toxic potential of such chemical and biological exposure factors, and characterizing the risk exposures such factors represent. The ongoing research and service activities of the Department are very much in line with establishing knowledge and competence in these result areas.

#### *Relevance to future plans*

The DIHT is in an excellent position to further develop and utilize novel methodologies in their research and service activities, including molecular-biological techniques and proteomics. This will improve the knowledge base for early detection and prevention of occupational diseases. It is important that the Department undertakes a continuous evaluation of work environments in order to adjust research, services and other activities correctly. The Department has expanded research and biomonitoring activities related to important occupational diseases and disorders, such as allergy and stress (hormone analyses). In order to be even more successful, the DIHT will strengthen its networking with other Departments within the Institute and outside parties. In order to have more impact at the workplace level, it will be a challenge for the Department to increase its dissemination of information on workplace hazards and risks. The DIHT should be uniquely positioned in relation to the new EU chemicals legislation (REACH) and the location of the European Chemicals Authority in Helsinki. Given the competence within the Department on exposure assessment, toxicology and risk assessment, the DIHT has valuable expertise for training activities.

### **Customer/Stakeholder relationships**

Exposure assessments to chemicals have been carried out in comprehensive occupational hygiene investigations with a focus on irritants, allergens and carcinogens in various work environments. Quality laboratory biomonitoring services have been provided for Finnish industries, with important new openings related to the metal industry, rebuilding industry, handling of contaminated soils and the stress of certain occupations. A large number of dust and material samples have been analyzed for companies, health centers and hospitals. Research results

from the many projects within the Department are presented to the international scientific community through publication in scientific journals. At the same time, knowledge and competence achieved through research is used in advice given to national and international regulatory authorities, enterprises and occupational health services. In general, contacts with workplaces both with respect to services and research, have improved throughout the evaluation period. The Department has found that establishing the Action Program on Wood Dust has promoted networking, research relevance and dissemination of information. This emphasizes the importance of focusing activities within the DIHT.

## **Impact**

The scientific outputs of the DIHT have considerable impact on the scientific community, as is shown by citation rates of the Department's publications (as measured by impact factors). The knowledge and competence achieved through scientific research is essential for the various advisory functions the DIHT undertakes at the national and international level. The biomonitoring activities of the Department have been important for monitoring occupational settings in order to see if there is compliance with occupational exposure limits. Biomonitoring also generates valuable exposure data that can be used for the possible revision of such limits. Toxicological and biomonitoring research may also generate novel biomarkers to be used in early detection and diagnosis of occupational diseases. There are, of course, difficulties in measuring the direct preventative impact of the DIHT's current activities on worker's health. However, this is a general phenomenon in preventive medicine; it is difficult to measure the absence or reduction of disease occurrence in the future.

## **Conclusions and recommendations**

### *Conclusions*

The Department of Industrial Hygiene and Toxicology functions as a well-organized research and service unit within the Institute, showing high quality and productivity. The Department is now located in a modern laboratory building that is very well equipped. The DIHT has continued with excellent research achievements in genetic toxicology and chemical carcinogenesis. During the evaluation period, the Laboratory of Immunotoxicology has been established. This has been quite successful with a high output of high-quality research. During the period under review, also the activities in the Unit of Toxicological Risk Assessment have expanded. This is seen as clearly important for Finnish and EU regulatory control of chemical exposure. However, there appears to be a need for better coordination of the Central Institute and Regional Institute activities in risk assessment. Contacts with workplaces with respect to both services and research have improved throughout the evaluation period. The Department carries out a large number of traditional analyses related to metal and solvent exposures. The IEG questions whether this activity needs to be performed at the Central Institute level. Thus, there seems to be need for a better coordination of biomonitoring activities between the Central Institute and the Regional Institutes. The DIHT has not been very active in training programs organized by the FIOH.

The Action Program on wood dust is now in its third year of operation so it is too early to evaluate overall performance and accomplishments. The Program appears to be progressing well, although some parts are still under implementation. The EU-funded WOOD-RISK project received a favorable mid-term review in 2003. One concern has been the lack of domestic funding for conducting a Finnish case-control study of sino-nasal cancer as part of a collaborative study. The Program is well constructed to bridge basic research, expert advice for authorities, and promotion of public awareness.

#### *Recommendations*

41. A working group, including an appropriate external consultant, should make a thorough examination of the occupational hygiene and biomonitoring activities within the Central Institute and Regional Institutes, with the aim of addressing the overall needs for such activities in research, quality control, methods development and occupational services, identifying potential overlaps and gaps, and proposing possible reorganization of these activities.
42. The role of the Central Institute and the Regional Institutes related to the new EU chemicals regulation REACH should be evaluated, including the potential for supplying risk assessment services for Finnish chemical producers. Total risk assessment activities within the Central Institute and the Regional Institutes could be further coordinated.
43. The Department should make its broad knowledge and competence more available to FIOH training activities.

## **4.7 Department of Occupational Medicine**

### **Brief description**

The diagnostics of occupational diseases have been one of the main activities of the Department of Occupational Medicine (DOM) ever since the foundation of the FIOH. In section 2 of the Act on FIOH operation and financing, it says that “the FIOH carries out independent health care, medical care and laboratory work in order to diagnose, treat and prevent occupational and work-related diseases and to assess working capacity”. The DOM has taken nationwide responsibility for developing the diagnostics of occupational diseases and in this capacity serves as the reference institute for hospitals, insurance companies and official establishments and institutions. In addition, the Department serves as the outpatient ward for occupational diseases for the Uusimaa region (about 45% of the cases). Only about 25 patients yearly are directly referred from the Regional Institutes. The others are referred to DOM mostly from insurance companies, OHS units and hospital departments. Moreover, multidisciplinary assessments of the working capacity of patients are also performed. DOM trains physicians specializing in occupational health services and occupational medicine for the occupational medicine part of the university curriculum. It also organizes national and international training courses and conferences. The Department produces national and international textbooks and guidelines, and provides expert advisory services (by phone and the Internet).

The Section of Dermatology is the only outpatient clinic in Finland that concentrates on occupational skin diseases. All dermatology patients referred to the FIOH are studied at the DOM. The DOM is also responsible for the provision of occupational health services for FIOH personnel.

The main research activities at the DOM are closely related to clinical services. Research activities at the Brain@Work laboratory are, however, focused on human brain function in information work, and less on clinical diseases.

### **Influence of the 1995-1997 evaluations**

The recommendation of increased integration between the DOM and the Uusimaa Regional Institute with respect to clinical activities has not given many concrete results. The outpatient ward is located at DOM and the occupational hygienists with responsibility for exposure assessments are still located at the Uusimaa Regional Institute.

Since 2001, DOM leadership has allocated 6 months research time annually to be divided among several researchers in periods of about 2 months. Beyond that, no structural changes in organization or resource allocations were made following the previous evaluation in order to facilitate research productivity within the DOM.

In the previous evaluation it was recommended that, through re-allocation, more resources should be put into investigation of musculoskeletal disorders in collaboration with the Department of Physiology, but clinical activities with respect

to musculoskeletal diseases are still very limited. However, a task group is planning that activities will start in 2005. Repetitive movement-related disorders of the upper limbs will be the focus at the beginning. Research activities within the field are under way at the Department, involving some collaboration with other Departments.

The recommendation of a separate evaluation of DOM activities taking into account the balance between clinical and service activities related to the Finnish health system and those that ought to be part of activities at a research institute, has not been followed.

### **Influence of Ministerial and FIOH strategic goals**

Service activities at the DOM are directed towards clinical diagnostics, in accordance with Finnish legislation on occupational diseases and for insurance reasons. This is in accordance with the strategic goal of 'Preventing occupational and work-related diseases' with respect to tertiary prevention. Another strategic goal is 'Promoting work ability', and work ability assessments are to a certain extent performed at the DOM as a part of clinical services.

### **Management and resources**

The DOM is organized in eight sections, including the internal occupational health services unit, and in 2003 had a staff of 130 persons, compared with 120 in 1997. Thirty-five physicians were employed, seven of whom were specializing physicians each staying only six months. In addition to physicians who are specialists in occupational medicine, the staff also includes radiologists, oto-rhinolaryngologists, clinical chemists, neurologists, dermatologists, a psychiatrist, a neurophysiologist, a pathologist, a specialist in medical physics, and specialists in musculoskeletal diseases and respiratory diseases. There is also an inpatient ward with 22 beds, solely used for bronchial inhalation challenge tests for suspected specific occupational asthma.

There are also advanced and excellent technical resources at the DOM for e.g. imaging (including computer tomography), lung physiology, bronchial and nasal challenge tests, bronchoscopy and bronchial lavage. Additionally, sophisticated methods in cognitive neurosciences have been developed in the Section of Clinical Neurosciences and the Brain@Work laboratory. The Section of Dermatology has the most advanced and sophisticated skin test methodology for occupational skin diseases in Finland and acts as a national reference unit.

The total expenditure for 2003 was EUR 7.3 million, an increase from EUR 5.5 million in 1997. Sixty-four percent of the costs were used for personnel in 2003. The state support covered 55% of the costs and 45% was the DOM's own income. In 1997, 91% of own income came from services and only 2% from research grants. Now, there is a better balance so that in 2003, 20% of own income comes from research grants while 75% comes from services.

## **Staff competence and renewal**

The head of Department holds a part-time professorship at the University of Tampere, and nine other members of staff are docents. Since 1997, the staff has completed 12 doctoral theses and one licentiate thesis. The staff is multidisciplinary, including physicians with more than 10 different specialties, and nurses, ward assistants, file-keepers, social workers, clerks and secretaries, laboratory engineers and technicians, chemists, psychologists, one occupational hygienist, one optometrist, and researchers with various professional backgrounds. Altogether 15 doctoral theses are in preparation under the guidance of the researchers at the DOM, but only a few of the PhD students are on the FIOH staff.

Efforts to recruit staff with competence that is relevant to musculoskeletal disorders and mental health have not yet been very successful. The forthcoming shift of personnel will give an opportunity for a redirection of staff competence.

## **Key activities**

The DOM classifies their activities into five lines of activity.

### *Diagnostics and prevention of occupational and work-related diseases*

This includes clinical patient work on occupational and work-related diseases, specialist training of physicians, participation in and responsibility for national and international training courses, and production of textbooks and guidelines for OHS personnel.

### *Assessment of work ability*

This line comprises clinical work ability assessments.

### *Research and development projects related to occupational medicine and work ability*

This line includes research on occupational diseases and methods development for diagnostics. More specifically, research and development projects include:

- Research in respiratory allergies and pneumoconiosis.
- Occupational rhinitis
- Radiology of work-related diseases, with focus on pneumoconioses
- Molecular pathology research
- Occupational skin allergies and diseases
- Clinical neurotoxicology, with focus on solvent exposure
- Work and mental disorders, with focus on psychosocial functioning and work ability of patients with severe mental disorders and the relationship between burnout and mental disorders in the general population.
- Some randomized controlled trials in occupation settings (including worksite exercise training and lifestyle interventions).

### *Brain, sensory organs and work*

This line includes research and methods development for assessing the effects and demands of modern working conditions/IT work on healthy brain and sensory organs.

### *Occupational health services for FIOH personnel*

As shown by Table 7, the total number of person-years dedicated to the lines of activity was 87.9.

*Table 7. Person-years dedicated to lines of activity by type of funding*

Line of activity	Person-years funded by state support	Person-years funded by own income
Diagnostics and prevention of occupational and work-related diseases	43.0	6.8
Assessment of work ability	2.8	2.1
Research and development projects related to occupational medicine and work ability	14.2	4.9
Brain, sensory organs and work	6.0	6.6
Occupational health services for FIOH personnel	1.5	0
Total	67.5	20.4

### **Action Program: Allergy and Work (1992-1997)**

This Action Program was evaluated by the previous IEG, and only the final year of the program coincides with the present evaluation period. The Action Program raised the profile of FIOH work on allergies and provided for internal and external collaboration.

## **Productivity**

The number of patients examined at DOM has decreased since 1997. Altogether 1,745 patients were examined in 2003, compared with 2,275 in 1997. Of the 1,745 patients, however, only about 900 were new referrals. Less than 400 were on a second or third visit to the outpatient ward, and less than 150 were project patients. Some 130-210 patients have been subjected to work ability assessments annually, as a collaborative effort between DOM and the Department of Psychology. Among the new referrals, 384 patients were examined at the inpatient ward, about 200 were examined at the occupational dermatology part of the outpatient ward, and the rest at other parts of the outpatient ward. All patients at the inpatient ward were examined for suspected specific occupationally induced bronchial asthma by inhalation challenge tests. Each patient stayed on average of two weeks at the ward, which is open Monday to Friday, generating 3,800-4,000 patient-days per year.

Work ability assessments were mostly performed on patients with long histories of sick leave and with previous rehabilitation failures. The impact of the work ability assessments has not been thoroughly evaluated, neither for the effectiveness of recommendations for successful return to working life, nor for developing tools for future activities in occupational health services or other parts of the Finnish health services.

Two hundred occupational hygiene and toxicological statements for workplaces were provided in 2003 in collaboration with the Department of Industrial Hygiene and Toxicology.

The number of courses organized by the DOM was 8 in 2003, compared with 20 in 2000, and the trainee days decreased from 3,804 to 569 during the same period. On the other hand, 37 lectures were given during 2003, which is more or less the same number as before. The main reason for this seems to be that responsibility for some training courses were transferred to the Department of Research and Development in Occupational Health Services in 2001, and FIOH statistics have since then not given DOM credits for the number of courses or trainee days, although the DOM staff still contribute an essential part of the lecturing in occupational medicine on these courses. DOM staff has also been active in NIVA courses and in training programs in occupational health in Estonia.

The annual number of scientific peer-reviewed articles and research reports has been between 80 and 90 during the period 1997-2003. This corresponds to about 3 publications per person-year invested in research. Looking separately at original peer-reviewed articles in international journals, the figure has varied between 41 and 68 per year (Table 8), which for 2003 corresponds to 1.6 publications per person-year of research. There has been dramatic shift over the years with respect to research area. The rapid decline in occupational dermatology articles from 2002 onwards can be explained partly by the unfortunate early retirement due to ill health of a leading researcher in this field, and partly by a change of focus from short reports on new allergens to epidemiological studies in various occupational branches. There has been a slight increase in the number of articles concerning musculoskeletal diseases over the years, but the numbers are still rather low. The number of articles on cognitive neurosciences has increased due to the Brain@Work laboratory facilities, but there are very few publications that concern work and mental health.

*Table 8. Number of original articles published in international peer-reviewed journals by subject area and year, 1997-2003*

Subject area	1997	1998	1999	2000	2001	2002	2003	Total	%
Occupational dermatology	25	30	18	25	24	7	4	133	35.0
Respiratory diseases	12	10	5	11	3	9	7	57	14.7
Occupational cancer	9	9	3	5	2	6	4	38	10.0
Cognitive neurosciences	0	3	5	4	2	5	10	29	7.6
Musculoskeletal diseases	2	2	1	2	7	4	7	25	6.6
Reproductive health	0	1	4	2	1	1	1	10	2.6
Social epidemiology and mental health	3	0	1	1	0	2	0	7	1.8
Occupational hygiene and biomonitoring of exposure	1	0	2	1	2	0	0	6	1.6
Others	2	5	12	17	15	7	13	71	18.7
Total	55	61	51	68	57	41	47	380	100.0

Research productivity with respect to number of person-years invested in research has been high for DOM compared with other Departments at the FIOH (Table 3 in chapter 4.1). There are, however, several limitations with this measure. Many articles have authors from several FIOH Departments. Another limitation, which might be rather specific for the DOM as compared to other Departments, is the difficulty in distinguishing between person-years dedicated to research and to clinical services, as many publications are based on clinical data. Thus, the seemingly high research productivity per person-year may to some extent mirror that in 2003, only 22% of the person-years were claimed to have been used for research, while 71% have been used for clinical services. On the other hand, the seemingly low productivity for clinical services (92.3 person-years for 1,745 patients) may also be due to the fact that person-years were preferably classified as dedicated to clinical services, rather than to research.

## Quality

The DOM serves as a national reference institute for the diagnostics of occupational diseases. It has a large and skilled staff and excellent technical facilities. The DOM provides indisputably high quality in diagnostics of occupational diseases. The focus is very much on clarifying medical diagnoses, and less attention is given to ensuring high quality of the crucial exposure assessments which are not provided by in-house experts in occupational hygiene or through visits to workplaces by DOM staff. This can be seen to a certain extent as a drawback and an imbalance in resource allocation. The extensive activities with respect to bronchial challenge tests for insurance reasons are rather unique and provide an excellent quality in diagnostics.

Slightly more than half the scientific papers written were original articles, generally published in good peer-reviewed international journals. The remaining papers comprise reviews, book chapters and national publications. Many of the researchers at DOM have a high international reputation within their fields. Closer collaboration with other Departments at the FIOH would provide an opportunity to strengthen research in current fields of societal interest such as musculoskeletal diseases and mental health.

## Relevance

Table 9 shows the distribution of person-years by core processes.

*Table 9. Person-years (%) by core processes in 1997, 2000 and 2003*

Core process	1997	2000	2003
Research	27	34	22
Information	3	3	3
Services	67	59	71
Training	3	5	5
Total	100	100	100
N	120	131	130

The legal constitution of the FIOH stipulates, among other things, that the Institute shall “carry out research, diagnostic services and clearing-house activities on occupational and work-related diseases”. The strong focus on medical diagnostics of suspected occupational diseases for insurance reasons is a long tradition at the DOM. This has resulted in the expertise, equipment and resources devoted to clinical services at the DOM being comparable with those of a small hospital. The rationale for this was questioned by the IEG, which also raised a question regarding the possibility of transferring clinical service activities to Helsinki University Hospital. The organizational model used at most Regional Institutes, where physicians from the FIOH are responsible for outpatient wards located at University Hospitals which also provide supplementary technical services, may be a possibility for the DOM, too. It seemed to the IEG that a more proactive role for the DOM in the prevention of diseases and promotion of health at workplaces would be more in accordance with overall FIOH strategy. This would also be an opportunity for a renewal of research activities.

The training program at DOM for physicians to obtain a specialty in occupational health does not provide experience in exposure assessments and risk assessments at the workplace level.

## **Customer/Stakeholder relationships**

The main customers for clinical services are insurance companies. Other customers include OHS, municipal health centers, hospitals, rehabilitation centers, labor force bureaus and employers, and of course the patients themselves.

The appendix to the 2004 FIOH Customer Survey presents the results of measurements of patient satisfaction in 1999 and 2002. The 'Quality of care' questionnaire provided by the National Research and Development Centre for Welfare and Health (STAKES) was used since it provides reference material from other health care institutions and hospitals in Finland. The overall results show that patient satisfaction was somewhat higher at the FIOH than in other hospitals in Finland, and that satisfaction with both inpatient and outpatient wards had generally improved somewhat between 1999 and 2002. However, it is unclear to what extent the reference material is provided from health care activities that are comparable with those at DOM.

## **Impact**

The impact of the clinical services is difficult to assess directly, but the high medical diagnostic precision and the development of new diagnostic methods have had a considerable impact on both the medical community and the quality demands set by the insurance companies. An interesting example is the very costly bronchial challenge tests for suspected cases of occupational asthma, demanded by the insurance companies. It appears that the level of the diagnostic standards set by DOM has affected the demands from the insurance companies.

The large staff of highly qualified experts within different fields of occupational medicine is a great potential for high-quality training for occupational health services personnel. DOM has a major responsibility for training of future specialists in occupational health services and occupational medicine. Intensified preventive efforts from DOM experts would be beneficial for Finnish working life.

From a national and an international perspective, the research at the DOM has been of importance, for better understanding of occupational diseases, for clarification of risk factors and as a basis for preventive measures.

## **Conclusions and recommendations**

### *Conclusions*

There are outstanding expertise and technical facilities for clinical services at the DOM, directed at individual patient diagnostics for insurance reasons, and to a lesser extent for work ability assessments. The expertise and facilities still focus on traditional, chemically induced, occupational diseases, while activities with respect to musculoskeletal diseases and mental health are very limited. The patient flow is low in relation to the resources available, and it seems to be diminishing over time; thus it is doubtful whether there is a proper balance between the benefit of high diagnostic accuracy for patients with suspected occupational diseases and the high costs involved for the diagnostic efforts.

It would be worthwhile considering a reorganization of clinical practice within the FIOH. The DOM is a national referral institute which provides excellent clinical practice for diagnosing and handling occupational diseases in Finland. One question to be considered is whether much of the future clinical services should be implemented in university hospital settings for reasons of efficiency and up-to-date quality. Clinical services remaining at the DOM could then possibly be reoriented towards mental health problems and musculoskeletal disorders.

Taking the strategic goals of FIOH into account, a redirection of the clinical services from diagnosis of occupational diseases to prevention of them is warranted. The excellent medical expertise at DOM could give a tremendous contribution to e.g. research- and prevention-driven field studies in collaboration with other Departments at the FIOH. Brain@Work represents a challenging research line and has to be continued.

### *Recommendations*

44. The DOM should continue to be a national top referral centre for diagnostics of occupational diseases and to have a national responsibility for providing excellent clinical practice for diagnosing and handling occupational diseases through e.g. courses, development of practice guidelines.
45. The IEG recommends that the FIOH appoint a special working group, including external consultants, with the task of considering which clinical service activities the DOM should focus on in the future, and what kind of resources it will demand. An optimal distribution of clinical services between the DOM and the university hospitals should be carefully examined.
46. A stronger involvement of DOM in collaborative research and prevention-driven projects, including field studies, is recommended.

## **4.8 Department of Occupational Safety**

### **Brief description**

In Finland, more than 100,000 accidents occur at workplaces every year. Against this background, the Department of Occupational Safety (DOS) conducts research, provides services and gives training in order to prevent such occupational accidents. In the Department, methods and tools for identifying, eliminating and managing workplace risks are developed and implemented in enterprises, to help promote safety at the workplace and beyond.

### **Influence of the 1995-1997 evaluations**

The 1995 IEG recommended that besides the important applied work and services for external customers, there is a need for the DOS to continue its 'basic research mission'. Therefore, the need to develop a reasonable balance between applied work and services for external customers on the one hand, and basic research missions on the other was recommended. The DOS reacted to this request with a number of more fundamental and complex approaches, e.g.:

- promotion of the Zero Accident Vision approach
- integrated safety, including work safety, traffic safety, home safety
- interdisciplinary approach to analyzing slip and fall problems
- research on safety and risks related to movements of workers.

In this context, the new virtual reality lab plays an important role. The new technique provides an opportunity for alternative experiments which were not possible earlier for ethical reasons. The research efforts in the area of human locomotion are aimed at a deeper understanding of the causes of slips, trips and falls. It will focus on a holistic approach to prevention, covering cognitive, psychophysiological, biomechanical, posture control and tribophysical factors.

The 1995 IEG also recommended that additional resources should be put into the Department in order to increase the amount of basic injury causation and prevention research, both in the laboratory and in the field. This recommendation led to a remarkable increase in the DOS budget and personnel for the period 1997-2000. However, the personnel and budget were reduced again in the period 2001-2003.

The 1995 the former IEG recommended that it might be necessary to develop more sophisticated organizational management intervention strategies to deal with more complex problems. The DOS reaction to this recommendation was manifold, as can be seen under 'Key activities'.

Recommendations on closer cooperation with other Departments and other institutions were followed by DOS. The Department extended its cooperation activities to different FIOH Departments, Regional Institutes, and Finnish, European and US institutions.

## **Influence of Ministerial and FIOH strategies**

The work of the DOS is mainly focused on preventing accidents at work. To this end it contributed to the strategies of the Ministry of Social Affairs and Health (1997-2000), especially in the following priority areas:

- priority to preventive health policies
- measures to improve the functional capacity and work ability of people
- prevention of health and safety hazards at work
- development of good occupational health practices.

Through its activities, the Department also contributes to the promotion of well-being of people staying longer at work and to an increase in the average length of work life, thus contributing to the strategic objectives set by the Minister of Social Affairs and Health, in ‘Strategies for Social Protection 2010’.

## **Management and resources**

With 24 employees, the DOS is small in comparison with most other Departments at the FIOH. It was temporarily possible to allocate additional resources to the Department, as recommended by the 1995 IEG. There was a considerable increase in staff from 1997 to 2000, which was unfortunately followed by a reduction below the 1997 level for the year 2003. There could be several reasons for this reduction: on the one hand the Action Program ‘Workplace 2000’ ended in 2000, with the known problems of financial limitations after the ending of an Action Program. On the other hand, the move of the offices and laboratories from Vantaa to Helsinki took place after 2000, hindering the normal research activities of the transferred Departments for some time.

The budget of the department varied between EUR 1.38 million in 1997, EUR 1.87 million in 2000 and EUR 1.70 million in 2003. This year, 33% of the budget was funded by own income and 67% by state support. In 2000, the Department’s own income was 57%, far above the Institute average value of 40%. In the same period, own income for research activities went down from 55% to 38%, whereas own income from services went up from 26% to 40%. This again may be due to the ending of externally funded research projects.

Today, the DOS has excellent laboratories and facilities available, and it is obvious that these will lead to an increase in research activities in the near future. In addition, the concentration of FIOH Departments in one building and the sharing of laboratories with other Departments might lead to a further increase in cooperation, which certainly would be of great value for the DOS and for the FIOH as a whole.

## **Staff competence and renewal**

With 25% of personnel having a doctoral degree (FIOH average 18%) and 42% having a master’s degree (FIOH average 40%), the level of education is relatively high. Currently, there are four PhD students in the Department. At the same time, the group of employees aged under 30 years is comparably high at 17% (FIOH

average 10%) whereas the groups of those aged 30-49 years and 50-59 years are near the average. In the 60-65 age group there is only one person retiring within the next five years.

To maintain skills and to develop competence further, the staff is advised to participate in further education and training courses. The personnel training activities of the Department amount to 1.4% of paid working time, which is below the average of 2.1% for all Departments and Regional Institutes.

Since one third of the staff has lived and worked abroad, the Department has a good level of language skills and international experience, which should make it easy to participate in European and international cooperation.

Looking at the qualification and age structure of the staff on the one hand and the well-equipped laboratories now available on the other, and bearing in mind the research program the Department has planned for the near future, it is reasonable to assume that the DOS will return to the performance level of 3 years ago, especially if cooperation with other Departments is further developed.

## Key activities

The activities of DOS are distributed among the different focus areas as shown in table 10.

*Table 10. Person-years by focus area (%) in 2003*

Focus area	%
Preventing occupational and work-related diseases	1
Promoting health and safety in the work environment	69
Developing work organizations and the well-being of personnel	1
Promoting work ability	0
Improving the quality and impact of occupational health	0
Other	28
Total	100
Number of persons	24

In 69% of its activities, the Department concentrates on the promotion of health and safety in the work environment. A number of projects and developments are devoted to this goal.

The Department has promoted the Zero Accident Vision in Finnish working life. Although this approach was completely new for Finland, it was well received and many firms ordered the presentation about the zero accident philosophy for their employees. Also, several trade unions have officially adopted the zero accident philosophy as their policy guideline.

Along with the Zero Accident Vision, the Department promoted the idea of integrated safety, covering work safety, traffic safety, and home safety at the same time. The philosophy behind this approach is that a general change in behavior is needed to develop greater consciousness about safety.

The Department has developed SINET® - Safety Information Intranet System – and recently ASP (Application Service Provision), modern tools that can be used in monitoring working conditions.

Vipa-Extranet is a project using the new Internet/Extranet technology to form a virtual company. In this virtual company, small companies share safety information and manage their OSH activities. At present, 9 small and medium-sized enterprises with a total of 650 employees are working together in this project.

Participative Simulation Environment for Integral Manufacturing Enterprise Renewal – PSIM - was an EU project (1999-2002). In this project the Ergotool software was further developed by the FIOH, and modified to fit in better with the new Finnish occupational safety legislation and its risk assessment provisions.

In Finland, about 50% of all accidental deaths at work happen in traffic. Therefore, a study was carried out in collaboration with the Central Organization for Traffic Safety in Finland, to identify the factors that affect accidents among professional drivers. Haste and fatigue were found to be the most important risk factors. Specific methods were developed to prevent such accidents.

To improve safety in corporate logistics, MatSim, a simulation method, was developed for evaluating the safety, efficiency and economics of in-plant traffic.

The goal of the EU project ‘Safeti’ (Safer and more effective operations in construction) is to further develop safety and effectiveness of construction-site logistics, and to decrease the amount of manual material handling.

The recently revised Finnish Occupational Safety and Health Act (738/2002) mentions for the first time the need to prevent the threat of violence. The Department has developed a method for monitoring and preventing violence. The method helps workplaces to improve their level of preparedness against violent and threatening situations.

The objectives of ‘Sätke’, a joint research and development project between power network contracting companies and the FIOH, were to reduce physical strain at work and to improve workers’ health and safety. Physical workload, poor working postures and accident risks were assessed systematically.

The project ‘Safe access paths to mobile machinery’ aimed at an improved design of access paths to and from the cabs of mobile machines. The project included statistics on accidents, interviews with users and analysis of users’ movements on existing access paths and in a laboratory mock-up. A check list for designers of access paths was developed.

In collaboration with three US institutions, a project is being carried out that aims at a reduction of slip, trip and fall (STF) injuries by at least 25% among health care

workers during a 3-year post-intervention period. The study methods combine preventive interventions with experimental laboratory tests in an epidemiologic case-crossover study. The importance of these activities is obvious if one remembers that in developed countries, slips, trips and falls (STF) cause between 20% and 40% of disabling workplace injuries, and that in addition falls are the second leading cause, after motor vehicle collisions, of accidental death.

A special laboratory is now available for research on safety and risks related to machinery, the human-machine interface and movements of workers. The laboratory comprises a 'real hall' and a 'virtual room'. Whereas in the real hall work tasks can be simulated under controlled conditions, in the virtual room virtual work environments can be generated. These can be used to simulate risky work tasks using real subjects or virtual workers.

### **Action Program: Workplace 2000 (1994-2000)**

The Department was responsible for the Action Program 'Workplace 2000', which lasted from 1994 to 2000. The aims of this Program were to predict future trends in working life, to improve the safety and usability of new production technology, and to develop modern approaches to safety management. The Program consisted of numerous individual projects. Most of the projects were carried out with the collaboration of other Finnish, European and international research institutes, labor market organizations and enterprises, as well as with other FIOH Departments and Regional Institutes.

Standardized observation methods were developed for use in the evaluation and development of the physical work environment. It was shown that 'TR observation for construction' and 'ELMERI observation for manufacturing industry' are reliable, and that both are valid in predicting the accident rate at a workplace.

A total of 30 trade-specific safety checklists were also developed for different occupations. The lists are designed especially for SMEs and can be used to monitor and develop health and safety at a workplace. The checklists have been widely distributed in print and via the Internet.

Other activities addressed the interdependence of safety and smooth-running work without disturbances. Smooth-running work is usually seen as an important element in labor productivity. It could be demonstrated that labor productivity and safety go hand in hand.

The aim of a further project in the Action Program was to apply new virtual reality technology in integrating safety and ergonomics analysis to machinery design. Human modelling software was used to test ergonomic and safety characteristics of new workplace and device designs in joint projects with Finnish enterprises.

According to the report from the evaluators of the 'Workplace 2000' Program, this Program was evaluated as successful, with respect to both outcome and productivity.

## **Productivity**

The DOS carried out a considerable amount of research activities and service projects during the evaluation period 1997-2003. One Action Program was lead by the Department. The research activities are partially reflected in the numbers of scientific articles and research reports. The number of peer-reviewed articles and research reports per person-year in the period 1997-1999 was 1.0, and in the period 2000-2002 it was 1.2. These values are below the FIOH average of 1.25 and 1.6. In 2003, this figure went up to 1.9. However, it should be borne in mind that the person-years spent on research were substantially reduced in 2003 to 29%.

The number of popularized articles went down from 47 per year (1997-1999) to 42 per year (2000-2002), and to 23 in 2003. This certainly reflects the reduction in personnel in 2003 compared with earlier periods.

Service activities (on the basis of person-years) went down from 31% (1997) to 23% (2000) and rose to a remarkable 52% in 2003. The development and consultation projects on psychology of work and organizational psychology were given up completely after 1997, whereas activities in the field of occupational safety went down from 36 consultation projects in 1997 to 2 projects in 2000, and increased again to 29 projects in 2003. This reflects the ups and downs and interdependence of research and service activities expressed in the percentage of person-years, and therefore seem to be phase-shifted. In fact these fluctuations are especially prominent for smaller units and may also be linked to personnel fluctuations.

The percentage of person-years spent on training activities fell from 14% in 1997 to 12% in 2000, and to 7% in 2003. The number of courses organized by the DOS was 6 (1997); 6 (2000) and 5 (2003). Accordingly, the time spent on these training activities was 206 trainee days in 1997, 230 trainee days in 2000, and 107 trainee days in 2003. On the other hand, lectures given in courses, meetings and seminars organized by others went up from 141 in 1997 to 612 in 2000 and were kept at a relatively high level of 525 in 2003. To contribute with lectures to courses organized by other institutions is a very economic way of spreading information and knowledge, and seems to be a strategy that should be continued especially for smaller units.

Bearing in mind that in smaller units, fluctuations due to e.g. time-limited research programs will produce greater fluctuations in performance figures compared to larger units, the overall productivity of DOS must be valued as good.

## **Quality**

The quality of the Department's activities can be judged on different levels:

- Quality can be judged on a more scientific level as indicated by the number of peer-reviewed publications and the impact of these publications. The impact factor can give an orientation for this judgement, but one must bear in mind that there are journals in the natural and medical sciences with much higher impact factors than e.g. engineering and technology. With 0.7 for 1997-1999, 0.4 for 2000-2002, and 0.8 for 2003, the mean impact factors for the Department

correspond with the average values for the occupational safety discipline or are even above the average value.

- Quality can also be judged looking at cooperation links with other institutions. In this respect the Department has been very active in cooperation in Finland, in Europe and in North America and is highly valued by other institutions.
- Quality must also be judged on the basis of the impact the activities have on safety at the workplace. In this respect the Department has certainly carried out a number of highly valued practice-oriented activities helping industry, and especially SMEs, to improve their workplace situation.
- Finally, quality must be judged on the basis of the future orientation of work. As pointed out earlier, the Department has started some important future-oriented activities, e.g.:
  - studies in safe locomotion
  - intervention studies with the aim of reducing slip, trip and fall accidents
  - integrated safety, covering work safety, traffic safety, and safety at home
  - the virtual laboratory allowing early intervention in the safe design of workplaces.

Overall the quality of the Department’s activities must be judged as good.

## Relevance

### *Relevance to core processes*

Table 11 gives an overview of the distribution and development of the Department’s activities in relation to the core processes of the FIOH. All core processes are covered by the DOS. But as shown in the table, the percentage of ‘person-years by core processes’ varies considerably with time. These fluctuations may occur especially at the beginning and ending of larger research projects, such as Action Programs. In smaller Departments with fewer projects, such fluctuations are usually larger than in larger Departments, where normally various larger projects overlap.

*Table 11. Person-years (%) by core processes in 1997, 2000 and 2003*

Core process	1997	2000	2003
Research	47	54	29
Information	9	11	13
Services	31	23	52
Training	14	12	7
Total	100	100	100
N	29	36	24

The information and training activities of the Department are in the same order of magnitude compared with the FIOH as a whole. As pointed out earlier, the service and research activities of the Department show large fluctuations in different years. But at 43% for research and with 35% for services, the mean values for the period 1997-2003 are of the same order of magnitude as for the FIOH as a whole.

#### *Relevance to strategy and mission*

The work of the DOS is mainly focused on preventing accidents at work. With this approach it contributed to the strategies of the Ministry of Social Affairs and Health (1997-2000), especially to the following priorities:

- priority to preventive health policies
- measures to improve the functional capacity and work ability of people
- prevention of health and safety hazards at work
- development of good occupational health practices.

With respect to the ‘Occupational Accident Prevention Program 2001-2005’, the Department made considerable contributions to most of the objectives such as:

- steady reduction in the numbers and severity of accidents
- promoting health and functional capacity of workers
- improving performance, productivity and the quality of workplaces
- increasing the well-being of workers
- promoting high-standard safety culture at workplaces
- application of the zero-risk vision and its operational implications throughout Finnish working life.

#### *Relevance to future plans*

The incidence of occupational accidents has not changed significantly during the past few years. In some areas, such as construction, the accident rate is even growing. Every year about every tenth worker is involved in an accident at work or during commuting. With this in mind, the activities of the Department will be as important in the future as they were in the past.

With respect to the new Strategy for 2001-2007: ‘Towards a socially and economically sustainable society’, the work program of the Department contributes especially to the strategic line ‘Promotion of health and functional capacity’, supporting the objective of postponing the present average age of 59 at retirement by 2-3 years by the year 2010. The Department also contributes to the strategic line ‘making work more attractive’ by enhancing health and safety actions at the workplace and to the strategic line ‘providing efficient services and income security’ by ensuring the availability of workforce for the health and social sector through the development of working conditions and competence.

The new Act on Occupational Safety requires that safety management is carried out by workplaces on their own initiative. With its different developments for risk assessment and for the organization of appropriate occupational safety and health

monitoring systems, the Department supports this policy and particularly takes account of the fact that 99% of Finnish private enterprises have less than 50 employees. These small enterprises need special support which can be provided by the Regional Institutes and other OSH services, making use of the Department's developments.

### **Customer/Stakeholder relationships**

In many respects the DOS supports the Government's occupational health and safety policy:

- by taking up the elements of new European occupational health and safety legislation and transforming them into tools that can be applied easily by enterprises
- by supporting the different strategies of the Ministry of Social Affairs and Health with research, service and training activities, as pointed out earlier.

Many developments have been carried out in close cooperation with future customers and therefore, the developments of the DOS can easily be applied by the enterprises. However, it may well be that the number of enterprises using the tools is still very small compared to the number of potential customers in Finland.

### **Impact**

The impact of DOS activities in research, services, information and training on occupational safety and health at the workplace is manifold. DOS activities help to improve the situation at the workplace by giving support to those in the enterprise responsible for OSH, by helping SMEs to cope with requirements originating in EU legislation, and by directly influencing the management of OSH matters in the enterprises. At the same time, DOS activities help to reduce the efforts enterprises have to make in fulfilling the requirements of regulations.

So far, it has not been possible to demonstrate a major impact on the accident situation in the whole country. In that respect, the penetration of the field is far too limited. But, with an increase in basic knowledge of accident mechanisms as a result of the research activities, it will be possible to further improve practice-oriented methods. With the intervention programs described, it will be possible to demonstrate the effects in a number of case studies. This might help to promote a wider distribution of the methods; in the end, it might lead to measurable effects.

With respect to the new technologies applied in the virtual lab, one might expect that developers, getting more and more used to modern virtual design methods, will use the virtual laboratory in the future to improve the design of their products and the design of workplaces with respect to safety and ergonomics.

## Conclusions and recommendations

### *Conclusions*

From the accident statistics it is clear that occupational and commuting accidents are a major challenge to occupational safety and health, and form an enormous burden on society. Through its activities the DOS has made a major contribution to the strategy and aims of the Finnish government with respect to accident prevention. The DOS has all the potential associated with a relatively young, highly qualified staff. It has future-oriented concepts and demanding projects and programs. It has modern laboratories equipped with systems that are at the cutting edge of accident research. But, the analysis of the evaluation period shows that the DOS is a relatively small department with all the drawbacks of a relatively small unit. High fluctuations in the resources available due to time-limited activities such as projects or Action Programs are the result. As a consequence this may lead to fluctuations in staff, too, which makes continuity of work even more difficult.

In a relatively small department it is also difficult to allocate sufficient personnel in research activities at the same time, including publication of results in peer-reviewed scientific journals, in services in the field, in the dissemination of information, and training. If at the same time one has to search for funding, write applications for research projects and 'sell' the services and products developed at the Department, then continuity of work is almost impossible and work-overload is evident. On this basis, the following recommendations are made.

### *Recommendations*

47. The DOS has highly sophisticated research methods available and has developed a demanding research program for the near future. To ensure that the planned research projects can be carried out in a reasonable time and that the well-equipped modern laboratories now available are used properly, the IEG recommends further development of the important activity of accident prevention.
48. At the DOS, highly qualified research and service personnel are doing valuable research and service work in preventing occupational accidents. The Department should consider whether other persons with marketing skills would bring added value to the goal of generating and sharing useful tools and products.
49. The Department has already established functional cooperation with the Department of Physics in the field of postural stability, slips and falls. In this field, the same laboratory is used by both Departments. Both Departments are small compared with other Departments of the FIOH. For both Departments the lack of personnel has certain disadvantages with respect to the continuity of research and service activities. To improve this situation it is recommended that further cooperation be developed between the Departments.
50. At the DOS, valuable products for the prevention of accidents are developed. In cooperation with firms it was shown, that these products function within the enterprise and can be used in daily prevention work. In order to increase the use of these products it is recommended that the cooperation between the DOS

and the Regional Institutes be improved to make the instruments available throughout the country. At the same time, information about the workplace needs resulting from the field work of the Regional Institutes can be transmitted to the Department to further improve the instruments and to give impulses from the field to the research and development activities.

51. With the virtual reality lab, a research tool of high potential is available. In order to make full use of this potential it is recommended that a specific research program (Action Program) is developed, including other Departments of the FIOH, such as the Department of Psychology, the Department of Physiology and the Department of Physics. In addition, potential users, such as designers and manufacturers should be included in these projects to make sure that the potential of the new research tool is made available at the workplace as early as possible.

## **4.9 Department of Physics**

### **Brief description**

The Department of Physics investigates physical hazards in the fields of noise, vibration and non-ionizing radiation. The Department carries out research on postural stability, slips and falls, thermal environment, air quality and contaminant control. The Department provides services to prevent health risks at the workplace and especially in the field of Personal Protective Equipment (PPE). The Department is a Notified Body according to the European Directive for Personal Protective Equipment (PPE) and the Marine Equipment Directive and is an accredited testing laboratory on the basis of ISO 17025. The results are put into effect via training, information dissemination, and via participation in standardization.

### **Influence of the 1995-1997 evaluations**

The 1995-IEG recommended identifying a unit for the testing and certification of protective equipment, including related research and standardization work. The FIOH decided not to follow this proposal, but to continue to involve the experts at the Department in the testing and certification activities. It is seen as a great advantage that the Department's experts are at the same time active in research, testing and certification as well as in standardization work for PPE. This gives solid competence in the field and allows the transfer of know-how from one activity level to another.

The 1995-IEG also recommended that it would be of advantage to organize special pools of research lines for specific physical factors in which the critical mass of competence would be available. In order to clarify the relationship between the Central Institute and the Regional Institutes, it was recommended that specific Action Programs be developed in which the contributions of the Central Institute and Regional Institutes are clearly defined, and networks be created with the experts of the Central Institute and the Regional Institutes under the lead of the Department of Physics. As a result of this recommendation, two Action Programs were initiated by the Department and the networking between the experts of the Central Institute and the Regional Institutes was intensified. To increase the number of experts active in the different fields of physical hazards, the department tried to increase external funding to employ junior researchers in specific projects.

### **Influence of Ministerial and FIOH strategies**

The work of the Department of Physics mainly focuses on the prevention of occupational diseases. Thereby it was contributing to the strategies of the Ministry of Social Affairs and Health (1997-2000), especially to the following priorities:

- priority to preventive health policies
- measures to improve the functional capacity and workability of people
- prevention of health and safety hazards at work
- employability of ageing workers

By its activities in support of the enforcement of European Directives for PPE 89/686/EC and Marine Equipment 96/98/EEC and 98/85/EEC, the Department contributed also to the renewal of occupational health legislation.

## Management and resources

With 32 employees in 1997 and 2003 the Department of Physics is one of the smaller units in FIOH. The budget of the Department rose from EUR 1.7 million in 1997 via EUR 1.99 million in 2000 to EUR 2.19 million in 2003. With 57% state support and 43% own income, the Department is comparable with the FIOH average (60% state support, 40% own income).

## Staff competence and renewal

With nine PhDs (28%) at the present time, six associate professors and three junior scientists in the PhD program, the personnel of the Department is highly qualified. In 1997 the age structure of the Department was significantly younger than the average at the FIOH. This has changed during the evaluation period. Nonetheless, the age structure of the Department was not too problematic in 2003, although only 6% of the personnel were aged under 30 years (FIOH average: 10%). The group of those aged 30-49 years was with 59% comparably large (FIOH average 50%) and with 28% of staff in the group of 50-59 years the Department stayed below the FIOH average of 35%. With 6% in the age group 60-65 the Department was comparable with the FIOH average of 5%.

To maintain the skills and to further develop the competence, the staff is requested to participate in further education and training courses. The personnel training activities of the Department developed with 1.8% (1997-1999), 1.5% (2000-2002) and 0.9% (2003) of paid working-time in an unfavorable way and are below the average of 2.1% for all Departments and Regional Institutes.

## Key activities

With 41% of its activities the Department is focusing on the promotion of health and safety in the work environment. Seventeen percent of its activities are related to the prevention of occupational and work-related diseases and 8% to improving the quality and impact of occupational health (Table 12).

*Table 12. Person-years by focus area (%) in 2003*

Focus area	%
Preventing occupational and work-related diseases	17
Promoting health and safety in the work environment	41
Developing work organizations and the well-being of	0
Promoting work ability	0
Improving the quality and impact of occupational health	8
Other	33
Total	100
Number of persons	32

In detail the following activities were performed during the evaluation period:

### *Physical hazards*

With respect to physical hazards, the main fields of research are noise, vibration and non-ionizing radiation (NIR). The Action Program 'Prevention of Health Risks from Exposure to Non-Ionizing Radiation' (1998-2003) had the strategic goal of ensuring the health and safety of people occupationally exposed to various types of NIR.

#### Risk of hearing loss

Noise-induced hearing loss is still one of the predominant occupational diseases. The Department developed a model for the prediction of noise-induced hearing loss, taking into account lifestyle factors, hereditary factors and noise characteristics. A database and an expert program for the evaluation of total exposure to noise and the probability of hearing loss (NoiseScan) were developed. The expert program estimates present hearing loss and makes predictions on hearing capacity at five-year intervals. NoiseScan can be used effectively to demonstrate the efficiency of noise prevention and the use of hearing protectors.

#### Haematological effects due to vibration

Due to vibrations from hand held tools, such as chain saws, the "white finger disease" can develop. In an in vitro system the effect of vibration on red blood cells (RBCs) is investigated. Preliminary results indicate that RBCs rupture (haemolysis) under the effect of vibrational shocks. The mechanism behind the haemolysis has not yet been revealed. In principle high shear stresses near the wall of the accelerated test tube and cavitation due to sudden acceleration and deceleration can induce haemolysis.

### *Personal Protective Equipment (PPE)*

PPE is the last barrier of protecting the user from dangerous external influences, and it is absolutely necessary that the user can rely on the proper functioning of the PPE. Therefore, the European PPE Directive 89/686/EEC requests type testing and certification by a 'Notified Body' for most PPE used at the workplace. The Department of Physics is a Notified Body under Directive 89/686/EEC and Marine Equipment Directives 96/98/EEC and 98/85/EEC. With accredited test methods and test facilities covering practically all personal protective equipment relevant at the workplace, the Department of Physics is one of the leading Notified Bodies in Scandinavia and in Europe.

In the field of PPE the following research activities were carried out in the evaluation period:

#### Increasing the safety at work of fire fighters

The targets of the research projects on fire fighters were to develop a heat tolerance test, to develop guidelines on work and recovery times in smoke-diving tasks, and to set the safety limits for work when an impermeable chemical protective clothing system is worn.

#### Protective qualities of survival suits

An international cooperative study on thermal evaluation methods for life-saving appliances continued throughout the evaluation period. The purpose of the project was to acquire the basic knowledge needed to improve the protective qualities of survival suits in a real-life emergency situation at sea. Major efforts have been devoted to studying the effects of cold on victims of accidents at sea and the methods for treating mildly hypothermic persons. Prevention of accidental hypothermia is a special know-how at the Department.

#### Welding face-shields with dual filters

Welding arcs are intensive artificial sources of ultraviolet and visible radiation present in the workplace. In accordance with the European Standard EN 379, opaque face-shields with a dark filter are used to protect the welders' eyes and face. New types of welding masks containing a dual-shade face-shield have been developed. For this type of face shield, safe exposure times for the eyes and face were determined. The results indicate that the requirements of the present standard are too restrictive, preventing the use of welding face-shields with dual-filters which have distinct advantages at the workplace.

#### PPE and electric arc accidents

A study on protective clothing for electricians provided information about the significance of protective clothing in electric arc accidents. There are no harmonized European Standards available for this type of protective clothing. The results of the study helped to explain the required protection level and can guide enterprises in risk assessment during the selection of a suitable performance level for protective clothing. The results have also been utilized for the development of test methods and for the definition of the minimum requirement level for protective clothing in a Finnish standard (SFS 6002).

#### *Pedestrian safety: Slips, falls and postural stability*

Research in this area focuses on the assessment of risks, determination of slipperiness in different environmental conditions, and the assessment of mechanisms regulating balance. A portable test apparatus for the *in situ* measurement of slip resistance properties of different floorings in dry, wet, and contaminated conditions was developed and validated. The apparatus is used in a cooperative project with the Finnish Meteorological Institute aiming at weather forecasts for pedestrian slipperiness in winter. A virtual balance platform for the evaluation of risk of falls due to reduced postural control was developed in cooperation with Tampere University Hospital. The system is applied in a project on the 'Effect of styrene on balance and hearing' and on the 'Effects of GSM radiation on the inner ear'.

#### *Training activities*

The Department's training activities concentrate on information about PPE for manufacturers, dealers, suppliers and inspectors. Some activities were organized in the Baltic states. On the basis of EISOSH, the 'European Information System on Occupational Safety and Health', an information platform in Finnish has been set up to support workplaces in the correct selection and use of PPE.

## **Action Programs: Prevention of Health Risks from Exposure to Non-Ionizing Radiation (NIR, 1998-2003), Good Industrial Air (1998-2001)**

### *Prevention of Health Risks from Exposure to Non-Ionizing Radiation (NIR, 1998-2003)*

The Department of Physics was the responsible unit for the NIR Action Program, which was carried out in collaboration with the Departments of Epidemiology, Occupational Medicine and Physiology. The Program was also interconnected with Finnish and European research institutes, universities and enterprises. The following results were obtained:

#### Recommendations for safe use of mobile phones in hospitals

In one project the safety of using mobile telephones in hospitals was evaluated. It was found that disturbances depend highly on the frequency of the mobile phone. The lower the frequency, the more serious the interference caused by mobile phones to equipment critical to the vital functions of patients.

#### Mobile phone use and physiological reactions

It could be shown that there is no causal link between perceived hypersensitivity reactions and radiofrequency (RF) exposure. In contrast to some earlier findings from other groups, it could be shown that exposure to a cellular phone does not significantly alter human cardiovascular functions. There were no statistically significant differences in the blood pressure and heart rate recorded during RF exposure and sham exposure, at either 900 MHz or 1800 MHz.

The NIR program has attained its goals for producing and disseminating new information on the effects of exposure to NIR. The program strengthened the FIOH's internal cooperation and international networking.

### *Good Industrial Air (1998-2001)*

The Department of Physics was in charge of conduct of the Action Program 'Good Industrial Air'. The Action Program focused on the improvement of the indoor climate at workplaces. In the Action Program aspects such as 'Target levels for industrial air quality', 'Relationship between work environment and productivity', 'Modeling of air flow and contaminant patterns', 'Contaminant dispersion and visualization of exposure in the near field of the worker' and 'Small-scale particles in the work environment' were investigated.

Most projects were carried out in cooperation with Lappeenranta, Tampere, Turku and Uusimaa Regional Institutes. At the national level, cooperation was developed with Helsinki University, Helsinki University of Technology, University of Kuopio, Lappeenranta Technical University, Tampere Technical University, Satakunta Polytechnic, and VTT Technical Research Centre of Finland. At the international level the COST Action G3 "Industrial Ventilation", involving 15 European countries and Canada, Japan, Russia and the USA, was the most important forum for cooperation. The following projects were carried out in the Action Program:

#### Target level concept

One of the main results of the Action Program was the development of a target level concept relevant to industrial ventilation. The target levels (TL) of the contaminants are defined as the predetermined concentration to be achieved by air technology. Leading consulting engineering companies have adopted the target level process in their routine design work.

#### Environment and labor productivity

Intervention case studies were carried out in office and industrial environments in order to evaluate the relationship between the working environment and labor productivity. Generally, the results support the argument that working conditions are one productivity factor among several others.

#### Modeling of the flow field and contaminant transport

In addition to the computational modeling of the flow field and contaminant transport, an engineering model was developed to predict contaminant concentrations and workers' exposure. This model is based on the mass balance between zones with homogeneous concentrations. Both modeling tools support contaminant control in the system design phase and in ventilation equipment product development.

#### Visualization of exposure in the near field of the worker

Contaminant transport to the breathing zone of a worker and the efficiency of local ventilation was investigated in conditions where a contaminant source was located within an arm's length of a worker. Parallel with this research activity, workplace improvement through visualization (WISP) was further developed. The method allows the combination of exposure data, workplace expertise and contaminant control technology expertise.

#### Fine and ultrafine aerosol particles

There is increasing concern about the effect of small particles below 0.1  $\mu\text{m}$  in diameter (ultrafine particles) on human health, but currently little information is available on the critical aerosol properties. Fine (< 2.5  $\mu\text{m}$ ) and ultrafine aerosol particle number concentrations and size distributions were investigated in various occupational environments. Accompanying aerosol dynamic studies included new particle formation processes by nucleation from precursor vapors, particle growth by condensation and coagulation, and particle removal processes due to deposition.

The goals of the Action Program 'Good Industrial Air' (1998-2001) were mainly achieved. The Program produced advanced computation, modeling and analysis tools for the determining factors contributing to exposure to air contaminants. In addition, knowledge of the performance of industrial air technology was increased. The results of the Program are of importance for designers, developers, authorities, standardization bodies and health and safety professionals. The Program strengthened the FIOH's internal cooperation and international networking.

## Productivity

The Department of Physics carried out a considerable amount of research activities and services during the evaluation period 1997-2003. Two Action Programs were lead by the Department. The research activities on the basis of person-years (%) by core processes increased from 41% in 1997 to 55% in 2000, and to 60% in 2003. These activities are reflected in the numbers of scientific articles and research reports. The number of peer-reviewed articles and research reports per one year full-time equivalent in the period 1997-1999 was 1.0. In the period 2000-2002 it was 1.4. These values are below the FIOH average of 1.25 and 1.6. In 2003 this figure went down to 0.6. The number of other articles, research reports, and abstracts in scientific meetings went up from 39 per year (1997-1999) to 45 per year (2000-2002), and to 48 in 2003.

Service activities (on the basis of person-years) went down from 42% in 1997 to 27% in 2000, and 28% in 2003. This might reflect the demand for testing and certification by industry. In the mid-1990s there was an increased demand for testing and certification activities all over Europe, particularly in the field of Personal Protective Equipment (PPE), due to the enforcement of the new PPE Directive. During the evaluation period 1,524 type tests were performed and 1,399 certificates were issued by the Department.

The percentage of person-years for training activities was kept on a constant level of 5 to 6% during the evaluation period. The number of courses organized by the Department was 5 (1997); 8 (2000) and 11 (2003). The time spent on these training activities was 433 trainee days in 1997, 704 trainee days in 2000, and 538 trainee days in 2003. Lectures given in courses, meetings and seminars organized by others were 24 in 1997 and in 2000, and 25 in 2003.

## Quality

The quality of the Department's activities can be judged on different levels:

- Quality can be judged on a more scientific level as it is indicated by the number of peer-reviewed publications and the impact of these publications. The impact factor can give an orientation for this judgement, but one must keep in mind that natural and medical sciences have journals with much higher impact factors than e.g. engineering and technology. With its activities the Department of Physics should be compared with the average values given for the disciplines Occupational Safety and Occupational Hygiene. With 0.7 for 1997-1999 and 2.9 for 2000-2002 and 1.1 for 2003, the mean impact factors for the department are higher than the average values of the discipline Occupational Safety (0.6; 0.7; 0.5) and are in the same order of magnitude as the average values for the discipline Occupational Hygiene (1.0; 2.2; 1.4).
- Quality can also be judged by looking at the cooperation with other institutions. In this respect the Department has been very active in cooperation with other Departments and Regional Institutes of the FIOH, with university departments and other institutions in Finland and with departments in Europe and beyond.

- With respect to the impact the activities have on safety at the workplace, one can consider the activities of the Department to be of a high value for the prevention of occupational diseases. Beyond that, the Department gives important support to manufacturers of personal protective equipment who are active on the national and the European market.
- With respect to the ‘future orientation’ of work, particularly the activities in the fields of NIR and of ultrafine particles, will be of increasing importance in the future. Also, noise-induced hearing loss, which today is still one of the most important occupational diseases, will again be in the focus of interest, if society requests a longer working life.

Overall the quality of the Departments’ activities must be judged as good.

## Relevance

### *Relevance to core processes*

Table 13 gives an overview of the distribution and the development of the Department’s activities over the core processes of the FIOH. All core processes are covered by the Department and, except for ‘services’ in 1997, remain at a relatively constant level. With the proportion of research activities increasing from 41% to 55% and 60%, these activities are well beyond the average of the FIOH (38%, 39% and 38%). The corresponding values for services are except for 1997, much smaller than the FIOH average. Whereas information activities are comparable with the FIOH average, the training activities are about one half of the average values of the FIOH.

*Table 13. Person-years (%) by core processes in 1997, 2000 and 2003*

Core process	1997	2000	2003
Research	41	55	60
Information	11	12	7
Services	42	27	28
Training	6	6	5
Total	100	100	100
N	32	35	32

### *Relevance to strategy and mission*

The work of the Department of Physics focuses mainly on the prevention of occupational diseases. Thereby, it was contributing to the strategies of the Ministry of Social Affairs and Health (1997-2000) especially to the following priorities:

- priority to preventive health policies
- measures to improve the functional capacity and work ability of people
- prevention of health and safety hazards at work
- employability of ageing workers.

By its activities in support of the enforcement of European Directive for PPE 89/686/EC and Marine Equipment 96/98/EEC and 98/85/EEC, the Department contributed also to the renewal of occupational health legislation.

#### *Relevance to future plans*

With respect to the Ministry's strategy for 2001-2007, the Department contributes particularly to the strategic line 'Promotion of health and functional capacity'. The Department is supporting the objective to postpone the present average retirement age of 59 by 2-3 years by the year 2010. It contributes to the strategic lines 'Making work more attractive' by enhancing health and safety actions at the workplace. In this context physical hazards (noise, vibration, NIR) and air quality at the workplace play a dominant role.

### **Customer/Stakeholder relationships**

The Department of Physics supports the governmental occupational health and safety policy in many respects:

- by supporting the different strategies of the Ministry of Social Affairs and Health with research, service and training activities, as pointed out earlier.
- by supporting Finnish enterprises in product development on the basis of the requirements of the PPE Directive and the Marine Directive.
- by supporting market surveillance activities of the Government.

In 2003 the Department started a customer satisfaction inquiry for both domestic and foreign customers. The results show that the customers give the most credit for the competence, helpfulness and cooperation of the staff.

### **Impact**

The impact of the Department's activities on research, services, information and training in occupational safety and health at the workplace is manifold. The Department's activities help to improve the situation at the workplace by reducing physical hazards and by improving the air quality. The Department is one of the leading institutions in Europe for its activities in the fields of the PPE Directive and the Marine-Directive. It is of great value for the Finnish industry that manufactures PPE to receive advice from a Finnish Notified Body with a high reputation in Europe.

### **Conclusions and recommendations**

#### *Conclusions*

The Department of Physics covers a wide field of physical hazards which are relevant to the health situation at the workplace. At present, the European Commission sets in force Directives to prevent the adverse effects of vibration, noise and electromagnetic fields. Noise-induced hearing loss is still among the leading occupational diseases and remains a major challenge for future activities. The effects of shocks and vibration on the body are manifold. Not all mechanisms are completely

understood, and there is more to be done to reveal the mechanisms behind the adverse effects of vibrations and to prevent vibration-induced diseases. Non-ionizing radiation (NIR) plays an increasing role at the workplace. The spectrum of NIR reaches from the UV light via visible light to infrared-light, and further to microwaves and radiowaves. The effects on the organism vary considerably with frequency and are not yet understood completely. Also, the instruments used for generating and measuring the different frequency ranges show fundamental differences and require different qualifications on the part of the staff. Further specialization in the field of NIR is therefore desirable.

The air quality at the workplace is crucial for the well-being and health of the worker. The methods developed by the Department will help to improve the workplace situation with respect to pollutants. The role of ultrafine particles is not yet revealed completely. But there are indications that ultrafine particles might have an adverse effect on health. Therefore, it is important to develop the appropriate measuring techniques and to obtain information on the presence and properties of fine and ultrafine particles in various occupational environments. Also, aerosol dynamic studies such as particle formation processes, particle growth, and particle removal processes are of importance.

Testing and certification in the field of PPE, as well as research to improve the functioning and design of PPE, are important activities in respect of safety and health protection at the workplace and at the same time in respect of supporting the Finnish manufacturers of PPE.

On these bases, the following recommendations are given.

### *Recommendations*

52. There are a growing number of applications of NIR at the workplace and a need for more knowledge on possible health effects. Therefore, and because of the wide range of physical phenomena related to NIR, it is recommended that sufficient manpower be allocated to this subject, enabling the Department to set up specific research and testing lines for the different spectra of NIR. This would also contribute to the maintenance of international scientific networks and the consolidation of research resources focused on NIR.
53. The Department of Physics performs important research activities in the field of physical hazards, which, due to the European legislation, will in the future be even more relevant for enterprises. Otherwise the Department is comparably small and the critical mass cannot be reached in all fields of activities. But the Department of Physics has already established functional cooperation with the Department of Occupational Safety in the field of postural stability, slips and falls. In this field, the same laboratory is used by both Departments. Both Departments are small compared with other Departments of the FIOH. For both Departments a lack of personnel has certain disadvantages with regard to continuous research and service activities. To improve this situation, further development of the cooperation between the Departments is encouraged.

54. The Department of Physics developed measuring techniques for ultrafine particles. It investigated aerosol dynamics such as particle formation processes, particle growth, and particle removal processes, and performed research on the transport phenomena and the concentration distribution of ultrafine particles in various occupational environments. Since ultrafine particles are of general importance for occupational hygiene, an intense cooperation should be established with the relevant Departments of the FIOH (Department of Epidemiology and Biostatistics, Department of Industrial Hygiene and Toxicology) and the existing cooperation with the Regional Institutes and Helsinki University should be continued.

## **4.10 Department of Physiology**

### **Brief description**

The primary task of the Department of Physiology is to produce scientific knowledge on the potential and the limitations of the human being's psychophysiological working capacity. The research fields are work physiology, chronophysiology, musculoskeletal disorders and work activity. The research is multidisciplinary and the purpose is to reduce unhealthy features of work and to improve health by developing work content, organizations, work environment as well as individual resources. Some of the activities are directed at the ageing labor force.

The Department is responsible for training courses for physiotherapists and other professions in the occupational health services, as well as supervisors and managers in industries and the public sector. Research results are also disseminated to a broader public in leaflets, books and newsletters, and some services are given in the form of health assessment (a work ability profile).

### **Influence of the 1995-1997 evaluations**

The recommendations of the 1995 and 1997 evaluations have been taken into account. It was proposed that the already high level of activity in the Department be maintained and, if possible, developed, and chronophysiology and work physiology be developed further as they at that time were regarded as understaffed units. It was also recommended that the multidisciplinary approach be maintained.

The Action Program FinnAge was appreciated for its excellent quality, and a second phase was recommended in order to have the results implemented. A Finnish National Program on Ageing Workers was started in 1998, where the FIOH is one of the actors involved and the Department of Physiology coordinated the research activities.

Finally, it was recommended that the internal collaboration with other Departments be increased in order to transfer knowledge and tools. This has been in progress since 1997.

## **Influence of Ministerial and FIOH strategies**

The Department contributes to several of the FIOH prioritized areas. In equal proportion in terms of person-years: to the prevention of occupational and work-related diseases, to the development of work organization, to the promotion of work ability and functional capacity. A relatively minor contribution is made to the improvement of quality and impact of occupational health services and safety at work. Moreover, considerable effort is put into theoretical and empirical issues related to the ageing of the Finnish workforce.

## **Management and resources**

The Department is structured into four research units headed by a senior researcher: Chronophysiology, Work Activity Research, Musculoskeletal Research and Work Physiology Research. In total, 44 people were working in the Department at the end of 2003.

Personnel costs are secured by the state support (87% in 2003, compared with 70% in 1997) and the Department's own income (13% in 2003, compared with 30% in 1997). Total funding by the state support has increased in the last three years from 54% to 67%.

Most projects and studies need and apply for financial support from national funding organizations. Also large information/communications technology companies have given financial support. 47% of own income is derived from external resources for research, 26% is based on service production and about 22% comes from training courses. Compared with the FIOH as a whole, the percentage of external funding for research is slightly higher.

The FIOH has provided the equipment, hardware and maintenance for laboratory research. The Department has at its disposal three laboratories for experimental studies: one for musculoskeletal research, another for human functional resources (also giving services in the assessment of individual physical capacity) and a third for the study of psychophysiological limits of information-intensive work, the Brain@Work Laboratory. These laboratories offer important research possibilities. The Brain@Work Laboratory is a joint laboratory with the Department of Occupational Medicine. The laboratories provide additional value not only to maintain but also to develop high-level research, as was recommended by the former IEG in 1997, but also to facilitate the increased cooperation with the Department of Occupational Medicine that was also requested.

## **Staff competence and renewal**

The Department employs 44 people. Four are research professors, eight are university docents, 12 have a doctor's degree and nearly half have a master's degree. Compared with 1997, the competence of the staff has improved. Research competence is high. Their disciplinary background mirrors the multidisciplinary research of this department: a bare majority are physiologists, nearly a third are ergonomists, as are work psychologists and a few are epidemiologists.

Specialists in information, training and service are lacking. The mean age is high: nearly 50% are more than 50 years of age and five have reached the age of 60.

## **Key activities**

### *Optimization of sleep/wake rhythms in shift work*

The main purpose is to develop age-friendly systems, guidelines for the use of irregular shift systems and the placement of breaks to take into consideration the workers' need to recover within the working day and between days. Epidemiological approaches, laboratory experiments, and intervention field studies are used. Results are published in books, booklets, and scientific journals. Training courses and consultations have been given on shift work and work-related sleep disorders.

### *Systematic analysis of work processes for improving individual and organizational mastery of work*

Systematic analysis of work processes for improving individual and organizational mastery of work represents a reorientation of an earlier ergonomic tradition in the Department. The focus is on employees' possibilities to control work processes and thereby to improve their well-being at work. The purpose is to conceptualize the work process and operations, and to develop the participating worker's broader understanding of premises and conditions during work. Findings have laid the foundations of manuals and consultation services (for instance in the redesign of production processes in various industrial branches). One application concerns journalistic professions and procedural improvements in writing aimed at finding solutions for reducing stress, and rearranging the working environment physiologically, as well as culturally. Numerous courses and lectures on using the method have been given yearly.

### *Evidence for the prevention of work-related disorders of the neck, shoulders and upper extremities*

Evidence for the prevention of work-related disorders of the neck, shoulders and upper extremities is based on longitudinal epidemiological research on risk factors (physical and psychosocial) and on recently started laboratory-based work on biomechanical modeling for assessing exposure more specifically. The latter research work is aimed at creating a dynamic model of the forearm to be used for predictions of exposure effects in terms of strain responses in the muscle system. The effects of preventive measures have been explored and confirmed by intervention studies in real settings. Results are published in scientific readings as well as textbooks and guidelines. The results and conclusions have also had an impact on Finnish legislation on compensation for occupational illness.

### *Promotion of work ability in occupations with strong female participation*

Research is concentrated on cleaning and home care, occupations in need of better tools, techniques, improved control over work, and empowerment and influence on work organization. Participatory intervention projects are conducted. The most

effective solutions for health and work ability promotion are sought. Results have been published, and lectures and training for the management of cleaning firms have been offered. A number of NIVA courses on the topic have been organized. The laboratory of human functional resources is used for studying the relationship between perceived work ability and physiologically-assessed capacities.

#### *Ageing and work*

Ageing is analyzed in relation to the changes in work ability. It has been an ongoing theme for a decade in the Department, with researchers involved in Action Programs devoted to this issue, and with the present director of the Department as a leading partner. Results of practical significance concern the appropriate adjustment for physical and psychosocial well-being and ways to promote health, functional capacity and competence for older workers. The results have been published for various target groups and provided for the European Union. A validated assessment method for human work ability is available and translated into many languages.

### **Action Programs: Promoting Health, Safety and Work Ability in Security Occupations (1999-2003), Human Aspects of Work in the Information Society (2000-2004)**

The Department has been responsible for two Action Programs since 1999.

#### *Promoting Health, Safety and Work Ability in Security Occupations (1999-2003)*

Promoting Health, Safety and Work Ability in Security Occupations (1999-2003) had as its mission to plan and carry out feasible measures, practices and methods for promoting safety, work ability, health, and well-being in security occupations. Many R&D projects were initiated. The level of activity was high in the program and accelerated by the events of September 11, adaptation to EU regulations and organized crime threats from neighboring countries. Several academic achievements came out of this program (dissertations, scientific articles), as did guidebooks for improving practice. The results were disseminated in meetings with security organizations members and with occupational health service personnel. The work in the Program is being continued on a regular basis in the Department.

#### *Human Aspects of Work in the Information Society (2000-2004)*

The aim is to tackle changes in work and work organization arising from the use of information and communication technologies relevant to occupational health and well-being. The managerial ways of utilizing the time and workplace independencies these technologies allow do not always go together with a healthy working hours system and/or ergonomic quality. Visual and muscular discomforts emerging from the use of particular equipment are ergonomic problems to be solved. The Program has developed new working-time models, improvements to interfaces for visual usability, and identified the limits of cognitive capacity to handle the complexity of information-intensive work. Basic research is combined with applied studies.

Interventions have been carried out in real-life settings. A few results have hitherto been reported to scientific journals. Up to now information to the public has been given priority in the form of a large number of popularized publications and presentations in the mass media. The findings on the health effects of information work and the impact of working hours on work efficiency have been received with great interest. After the Program is terminated, there are plans to continue with a more specific focus on age-related questions in visual usability. To realize these plans more resources are needed.

## **Productivity**

The Department has been productive in publishing research articles in peer-reviewed scientific journals, other publications and research reports as well as in popularized documents. It has also published practical guidelines based on its own research findings. The overall picture of the Department's scientific publications shows since 1997 a growing trend of productivity in terms of one person-year invested in research (1.7 in 2003) and in terms of the mean impact factor (3.4 in 2003).

In terms of the number of popularized articles published since 1997, the trend has been the opposite to scientific publishing: 24 articles in 2003 compared with an average of 57 articles per year for the 1997-1999 period.

The health and work ability profile test service offered by the Laboratory of Human Functional Resources is being increasingly requested: 873 people were tested in 2003 compared with 240 in 1997. Other services performed include consultation projects in ergonomics and physiology.

In 2003 the Department organized 13 training courses giving more than 1,000 trainee days. The number of lectures at courses, seminars, etc. has steadily increased (up to 525 days in 2003), whereas the numbers of trainee days were comparatively larger in 1997 and 2000.

In conclusion, the productivity of the Department is high. The increase in scientific publications and the decrease in informative popularized articles are characteristics of long-term research cycles going from scientific aspects to information to the public.

## **Quality**

The research is published in the best scientific journals in this field. The researchers have contributed to international and national conferences with a large number of written communications and by taking the organizing roles of several international conferences. Over the years there have been strong efforts to popularize the research reporting in readable forms for laymen.

Innovative contributions coming from the research work are, for example, age-friendly shift systems, biomechanical modeling of the upper arm, new ways of doing analyses of the work process, testing methods of the autonomic nervous system and interventions for promoting work ability and health for older female workers in physically demanding occupations. The transfer of the research into practice includes practical guidelines and tools to be used at workplaces.

## Relevance

The staff of the Department of Physiology engages in each of the FIOH's core processes as is shown in table 14.

In 2003 time spent on information activities has increased markedly compared with previous years. It could be explained by the Action Programs coordinated by the Department, which have intensified the request for information about results and experiences. Correspondingly, a certain reduction in time spent on research during the last year has been the consequence. Nonetheless, research work is still the main activity.

Table 14. Person-years (%) by core processes in 1997, 2000 and 2003

Core process	1997	2000	2003
Research	48	58	38
Information	12	7	30
Services	18	25	20
Training	22	10	12
Total	100	100	100
N	45	50	44

The contribution of the Department to the FIOH's result areas shows that the health and work ability promotion and disease prevention research are dominant (60% in person-years in 2003). 22% of person-years were oriented towards the work environment and 18% towards analyses and improvement of work organizations. This distribution between the three result areas has been relatively constant since 1997.

## Customer/Stakeholder relationships

Apart from inter-departmental collaboration and academic contacts, the Department of Physiology has a number of engagements in international organizations, such as ICOH committees, the International Ergonomics Association (IEA), European Union standardization committees, and the Bilbao Agency. The Department provides reports for clients from forest companies and gives training courses to cleaning firms. Finnish companies have been interested in the ageing research. The two Action Programs are built on networks of research institutions and companies.

## Impact

The research performed in the Department has had various impacts, depending on the type of research.

The work physiology research on female workers' physical workload has had direct work-place effectiveness. The same is true for the work activity research on the

journalistic profession. Both are based on field studies, implying close contacts with the workers. Research in work-related musculoskeletal disorders has given important input for the national guidelines for the treatment of neck disorders and ergonomics in office work.

Passing on the results on shift work to the metal and chemical industries, hospitals and aviation companies has led to the adoption of some forward-rotating shift systems.

Some research achievements contribute to the knowledge-base needed before it is time for workplace interventions. This is the case with the laboratory research on the combined effects of working hours (shift length), work content and rest breaks on alertness and cognitive performance.

The Action Programs coordinated by the Department have had a broad impact on stakeholders and society by raising awareness and encouraging efforts to address security issues and the working conditions of security personnel. Also, the development of information and communication technologies by the Department has been future-oriented in addressing the needs of the older workers. It should be added that the Department has played a significant role in the European context as well, authoring and distributing an extensive book on the European and Finnish situation in ageing and work.

Finally, the research produced by the Department of Physiology has an obvious role in the international scientific networks in which the researchers participate.

## **Conclusions and recommendations**

### *Conclusions*

The Department of Physiology has contributed many innovative research orientations during the evaluation period. The research staff is highly skilled and very much respected inside and outside Finland. The research embraces a number of specific areas now reaching a more or less mature level. Concepts, tools and methods are developed. Research is future-oriented. In the interesting ongoing research on working hours and shift work the Department includes the recovery aspect (sufficient time for recovering) within and between working days. This aspect of work-related stress is a rather new perspective adopted in current stress research models. The Department intends to continue the development of concepts and models for furthering preventive knowledge on this issue. The new line of analyzing work processes is promising for improving workers' physiological health as well as work-related well-being, and the plans to extend the analyses to long-term effects of workers' increased consciousness of the work process are very relevant. The applications of ergonomic research on real work problems seem clearly useful. The research on information-intensive work in the Action program 'Human Aspects of Work in the Information Society' is important for increasing knowledge about health effects related to the use of modern information/communication tools and equipment. The approaches used in the Department, taking into consideration the combined effects of working hours, work content and rest breaks, are promising.

The Department of Physiology has made the strategic choice to concentrate on specific issues in the field of musculoskeletal research, namely neck and upper-limb disorders. Other specific musculoskeletal problems are covered by updating scientific knowledge from elsewhere, first of all from researchers working in other parts of the FIOH. However, the IEG notes that expert knowledge on musculoskeletal health problems is not yet adequately coordinated throughout the FIOH.

The Department emphasizes its explicit policy to disseminate information on research results into various forms and to transfer the research knowledge to target groups for training and services. There is a consensus on this general way of working with only a few exceptions of basic research activities not yet 'ready' to be shared by others than those involved. The demand for information and consultative services is increasingly high and seems to be surpassing the possibility that the Department can provide adequate specialists in services, comprehensive training, and development projects.

### *Recommendations*

55. The IEG recommends that the Department take initiatives to include musculoskeletal research, ergonomics, stress, and work activity analyses into workplace intervention projects covering the complexity of occupational health problems that exist and have to be solved at workplaces.
56. The IEG strongly recommends that the research on information-intensive work and its psychophysiological limits be integrated into the Department's forthcoming activities, as it will capture the problems concerning threats to health and offer solutions for the prevention of unhealthy ways of using information and communication tools.
57. The IEG recommends intensified collaboration by various Departments working in the broad and important field of musculoskeletal health. It would be desirable for the FIOH to provide resources to make a systematic investigation of all FIOH expertise in current research-based knowledge in musculoskeletal disorders and prevention methods and to build a common information system.
58. The IEG urges the management of the Department to seriously consider the present imbalance of the human resources in relation to the core processes information, training and services and to find measures to solve this problem.

## **4.11 Department of Psychology**

### **Brief description**

The general aim of the Department of Psychology is to promote the psychosocial quality of work life and well-being of the working-aged Finnish population. Research is carried out and training and development services are offered to improve work, organizations and workers' resources. A number of competence areas signify the Department's research orientation: the development of work organizations, the management of technological and other change processes; the promotion of psychological well-being at work; the promotion of gender equality and diversity; work career management; the psychological assessment and testing of work competencies and work ability; and the development of methods for measuring and improving psychosocial factors and well-being at work. The research is highly collaborative: concepts, methods and instruments are the outcome of close cooperation with Nordic sister institutes, the US National Institute of Occupational Health (NIOSH), other universities in Europe and the USA. Training and consultation are integrated steps in the research processes and offered to the organizations included in the studies.

The Department is responsible for training psychologists for occupational health services positions and for development of this education on a level corresponding to that of physicians and nurses (Occupational Safety and Health Act, 2002)

### **Influence of the 1995–1997 evaluations**

The Department was evaluated in 1995 and recommendations were followed up in 1997. Most of the recommendations had been considered at the time of the follow-up. The Department was encouraged to continue research activities on the psychosocial issues. As recommended, the Department has continued to expand the research on human conditions emerging from competitive organizational strategies.

The recommendation to develop a new Action Program in line with the recently terminated 'Learning Organizations Program' has also been realized. Four succeeding Action Programs aiming at identifying and promoting working conditions that could meet challenges from the increasingly competitive working life have produced a unique competence in the Department.

It was recommended that aspects of physical health be included in the psychosocial analyses to find out relationships between work related psychosocial factors and diseases, such as coronary heart disease and musculoskeletal diseases. It became possible to attach a skilled research group to the Department. The group has collaborated intensively internationally, and its main task is to collect and analyze large-scale prospective databases on the role of work-related psychosocial factors in the etiology and prognosis of various diseases and chronic conditions with relevance to public health.

The reorientation of research towards more implementation of results, which was recommended by the 1997 evaluators, has been pursued.

More active interdepartmental collaboration was also requested at the follow-up time. From around 2003 the Department has been in lively contact with Departments of Physiology, Occupational Medicine, Research and Development in Occupational Health Services, and the Training Centre.

### **Influence of Ministerial and FIOH strategies**

Developing work organizations is one of the focus areas of the FIOH. The Department is increasingly involved in development and consultation projects. Other contributions address the prevention of occupational and work-related diseases, promotion of work ability, and improvements in the quality and impact of occupational health services and safety at work

### **Management and resources**

The Department is headed by a research professor. The Department employs 57 people. It is structured into five sections: Occupational Health Psychology, Work and Organizational Psychology, Psychosocial Research, Organizational Development Consultancy, and Psychological Assessment and Selection. There is an open attitude towards intersectional cooperation. Added to these sections is a specialized research group directly related to the Director of the Department.

Personnel costs are secured by state support (65%) and by the Department's own income (35%). For most projects and studies, one has to apply to national funding organizations and companies for financial support. 32% of the Department's own income (external resources) is secured from research, up to 56% from services, and about 9% from training.

The premises are of a good size and the interior stimulates collaboration.

### **Staff competence and renewal**

Most of the academic personnel are psychologists specialized in work, organizational or health psychology. Eight of the researchers are docents at various Finnish universities, two are part-time professors at universities. Eight people have a doctoral degree. During the last six years, six researchers have completed their doctoral theses and eleven are currently writing one. A third of the personnel have a master's degree. Postgraduate professional specialization training in work and organizational psychology in Finland is led by a senior researcher/university professor.

The average age of the staff is 40 years. Four of the leading senior researchers will reach retirement in the next seven years. As the research staff's academic competence is well developed, there is an optimistic attitude to the future careers of the research personnel.

The Department of Psychology forms a cluster with the Department of Physiology ('Functioning of the employee and the working community') of the FIOH Executive Committee.

## **Key activities**

The results achieved by the Department since the last evaluation in 1997 are related to different themes.

### *From work organization research and methods development to participatory intervention practice*

Based on experiences from early activities, a 'healthy work organization model' was designed for subsequent organizational research. In order to implement the model, three types of questionnaires were developed in cross-national cooperation and for different use. 'The Nordic Questionnaire for Psychological and Social Factors' and 'The Healthy Work Questionnaire' were aimed at research. A shorter version of the latter, 'Work Organization and Well-Being Barometer', was constructed and validated for use by occupational health services practitioners and for consultants. The section for Organizational Development Consultancy uses this 'Barometer' for survey services.

The research questionnaires are used in studies on small and middle-sized enterprises and organizational changes as tools for assessing intervention effectiveness. They have become the core instruments in the Department's investigations of psychosocial conditions.

### *Flexible organization of work*

The Department has paved the way for scientific knowledge on the effects on health of various competitive flexibility strategies launched in management practices. Working hours arrangements, eWork and work contracts, etc., were compared and longitudinal case studies were conducted. Subsequent study approaches included large samples, and hundreds of companies participated. Results were disseminated in scientific journals, guidebooks, meetings and reports to the stakeholders: the Fifth Framework Programme of EU, the Saltsa Program and European Foundation for Living and Working Conditions.

### *Gender mainstreaming in research, development and practice on occupational safety and health*

The issue is the promotion of the knowledge of women's conditions and especially their occupational safety and health. The platform is, to a large extent, the European Union and its committees, agencies and programs. Two significant and widespread reports were produced. To come to terms with women's and men's ill-health, gender diversity thinking has been launched (instead of that of gender neutrality) as a better working concept for politicians and occupational health professionals.

### *Impact of a psychosocial work environment on the health of employees*

Impact of a psychosocial work environment on the health of employees is a line of research trying to find out the relationships between ill-health such as cardiovascular disease, sickness absenteeism, mortality and psychosocial factors. Register data

and survey data from large materials are used. Also new psychosocial determinants are looked for.

#### *Working career management and prevention of exclusion from working life*

Working career management and prevention of exclusion from working life is a large-scale intervention project aimed at facilitating a return to work by introducing mental health prevention activities. Target groups are people in various transitional stages: unemployed workers, graduates of comprehensive schools, older school children. The idea is that good mental health is important in job-search. The Department is responsible for the coordination of all intervention activities, for invention research study, for producing tools to training teams in vocational guidance and for creating instructive tools for unemployed participants.

#### *Monitoring and prevention of burnout*

Monitoring and prevention of burnout started with a review showing a high prevalence of burnout in Finland. A package for educational purpose was distributed to prevent burnout in organizations. The self-reports questionnaire “Maslach Burnout Inventory – General Survey” was translated into Finnish. These achievements created the basis for many research projects, among them an eight-year prospective study.

#### *Recognition and prevention of workplace bullying*

The main aim has been to give an insight into bullying behavior, to increase recognition of bullying and to activate non-bullying policies. Studies on the prevalence of bullying and on health effects have been conducted. Training has been given to work units, supervisors and occupational health service personnel. In the 2002 Occupational Safety and Health Act, the employers are obliged to remedy situations, and employees are obliged to avoid such behavior.

#### *Psychological assessment of work competencies and work ability*

The assessment of work competencies and work ability deals mainly with the compatibility between the employee, work and the workplace. This service is aimed at producing personnel assessment services in (a) recruitment and in job/role shifts concerning demanding positions, including management, international assignments and rescue occupations; historically this is the first psychology activity established at the FIOH, and (b) the assessment of work ability, which is related to health problems; this service deals with the assessment of working capacity in pervasive work-related problems.

**Action Programs: Learning Organizations- Innovativeness and New Information Technology (1997-2001), Human Resources for Work (1997-2000), Decent Work – a Sound Life (2001–2002), Changes, Flexible Solutions, and Well-Being at Work (2003–2007)**

Since 1997 the Department has responsibility and leadership for three terminated Action Programs and one that is ongoing to 2007.

*Learning Organizations - Innovativeness and New Information Technology (1997-2001)*

The goal was threefold: to develop organizations to cope successfully with changes, to produce high quality goods and services, and to take care of their personnel. Key concepts were information technology applications, new forms of organizing work, stress, healthy work and learning. A joint study with Lund University, Sweden, on restructuring, downsizing and mergers pointed towards the need for increased awareness of negative health effects. Findings from the Program are published in international scientific articles and in national reports and guidebooks.

*Human Resources for Work (1997-2000)*

The aim was to concentrate on the increases in haste, stress and mental load. The focus was on burnout, and human competence and health resources. Empirical studies were made in the forest industry (see next Program).

*Decent Work – a Sound Life (2001-2002)*

The Program was a continuation of the former Action Program. The aim was to cover IT professionals, school administrators, teachers, hotel and restaurant personnel, industrial workers, employees in merging organizations and small workplaces. A 10 year follow-up was used. Psychosocial factors were associated with subsequent sickness absences, a partly gender-specific relationship. Life-course prospective studies were used. Consultation models were offered to reduce burnout. Finally, large prospective trans-national studies were planned to explore the psychosocial effects of organizational mergers.

*Changes, Flexible Solutions, and Well-Being at Work (2003-2007)*

The main task of the Program is to compile and transmit research data and good practices that apply to changes in the structure of working life and the workforce. The purpose is to affect changes in working life by introducing research data to decision-making, the development of occupational safety and occupational health services. The Program is conducted in collaboration with several other FIOH research Departments, the Training Centre, Uusimaa Regional Institute, The City of Oulu and the Call Centre and Telephone Bank of a Finnish bank. Four studies are in progress.

The Department's activities are distinguished by their substantial breadth. The high number of international contacts has been favorable. Dividing the Department into

three research sections and two sections for consultancy services is strategic: it relieves the pressure on the research and creates channels for contact with work life.

### **Productivity**

The research documentation comes at a high rate. During the last six years peer-reviewed articles and research reports increased in number (in 2003 to 47). A high number of popularized articles has been published (about 44 yearly). The contents of the research activities imply a combination with services. A clear increase in development and consultation projects can be noticed (52 in 2003). The number of people going through selection assessment had its peak in 2000 (4,217 people), whereas in 2003 it was 1,035 people. The Department has considerably increased training activities since 1997: the number of trainee days has gone up from 169 to 787 in 2003, and the number of lectures has gone up from 292 to 503.

### **Quality**

The research is published in a broad range of well-known international scientific journals. The researchers have been active at many international conferences. The competence is broad in research methodology for psychosocial research: epidemiological statistics, statistics for small group analyses, longitudinal data analyses, intervention methods on combined levels, methods in R&D development, in qualitative organizational analysis and in the grounded theory approach. The psychosocial concepts, models and paradigms used are in the mainstream, which facilitates collaboration with similar research teams in other countries. However, some renewal in thinking and approaches is probably needed to cover young age groups' lifestyles and elderly people's views on life.

### **Relevance**

The research achievements for improving work organizations are the most dominant (87% in person-years were involved in 2003). The plans for the future do not indicate any change in this profile.

The staff of the Department of Psychology engages in each of the FIOH's core processes as shown in table 15.

*Table 15. Person-years (%) by core processes in 1997, 2000 and 2003*

<b>Core process</b>	<b>1997</b>	<b>2000</b>	<b>2003</b>
Research	58	40	38
Information	5	7	9
Services	27	42	42
Training	10	12	10
Total	100	100	100
N	55	57	57

The amount of research has decreased, in favor of services, which have increased considerably with the establishment of the Organization Development Consultancy Section in 2000, and by request for services integrated into research activities.

### **Customer/Stakeholder relationships**

The Department has been in close contact with organizations that have been customers of psychosocial interventions. Customer satisfaction is evaluated by the researchers involved.

The Department has collaborative networks with a number of institutions in Europe and in the USA: for stress and burnout with universities in Valencia and Utrecht, for organizational development interventions with the universities of Lund and Wisconsin, and with NIOSH, for research on sickness absenteeism with the universities of Nottingham and Surrey, and the Whitehall II study group in the UK.

The gender equality research group produces reviews and research report at the request of the European foundation, The European Agency for Safety and Health at Work, and the Fifth EU Framework Programme.

The Department's research involves a strong influence from participating companies and organizations.

### **Impact**

A few examples of the influences on society are mentioned here. Investigation on bullying and the information disseminated was taken into consideration in the new Act on Occupational Safety and Health. Also, the research on gender mainstreaming led to inclusion of this issue in the Act. A direct impact on a reduction of ill-health is not always possible to identify, but the reviews on the prevalence of burnout and the educational packages have increased awareness of the problem and influenced workplaces and organizations. Another indirect impact is the new knowledge coming out of the intervention research, for instance on small and medium-sized enterprises' practices thanks to appropriate measures to handle flexibility strategies. Many interventions aim at direct impacts on individual workplaces and organizations as with a number of organizational development projects. The information published in guidebooks is useful for occupational health services in their relations with clients and patients. Finally, the return-to-work intervention program helps people to cope with insecurity and lack of self-esteem in periods of job searching. This project is built on a health prevention concept in vocational guidance contexts and on direct and lasting contacts with unemployed people.

### **Conclusions and recommendations**

#### *Conclusions*

To promote psychosocial quality of work life, well-being and health, the Department has gone in for a wide spectrum of activities. Current working conditions are scrutinized, future working conditions are anticipated, and certain health dimensions

examined within the psychosocial domain, such as the burnout syndrome, and within the psychiatry domain such as depression. Well-being dimensions have to do with control, influence and participation in work, and with being socially valued and respected. The multidimensionality of psychic health–ill health should, however, be given more consideration and the choice of dimensions should be more well-grounded and theoretically justified.

The international collaboration seems to have been very fruitful. The health registers of the Finnish population make Finland unique in epidemiology research. This resource has been excellently used.

Action Programs have been on the agenda continuously. The most recently started program, ‘Changes, Flexible Solutions, and Well-Being at Work’ (2003-2007), concentrates on organizational events particularly important to employees. To make the intended impact this Program seems to be understaffed in relation to its mission and planned projects.

Considerable efforts have been given to producing valid questionnaires for psychological and social well-being and psychosocial conditions, among them the widespread ‘General Nordic Questionnaire (QPS Nordic) for Psychological and Social Factors at Work’. There is a need for reliable questionnaires adapted and validated for ageing employees, for research on job demands and ageing.

The Department concentrates on women’s work and life conditions in Finland and other European countries. The researchers have given interesting analyses and are active in policy making work on gender equality. The line is to abandon a gender neutrality view for a more decisive gender-mainstreaming, i.e. to focus consistently on the different working conditions women have compared with men. However, the consequences of current equality policies and practices for men’s work and private everyday life are not well-known.

A long-term intervention project concerning support for unemployed people and other categories in periods of job-searching is being conducted, including training teams who give vocational guidance and mental health support to clients. The program engages the researchers intensively and includes a considerable organizational and administrative effort. It is difficult to schedule such intervention programs and give them the right dimension in advance, and they bear a risk of work overload.

The development of educating and training psychologists in occupational health services is the responsibility of the Department, as according to the new law psychologists are defined as experts in occupational health services. The FIOH has arranged three courses and the programs have been continuously revised and evaluated. An official training curriculum is now under process.

The issue of mental health and related work disability in the Finnish working population continues to need even more attention, including positive and negative contributions from the work environment on e.g. adjustment disorders, burnout, depression, anxiety disorders, attention deficits/hyperactivity disorders (ADHD), personality disorders and addiction. There is a need for clinical and preventive recommendations, such as in the form of evidence-based practice guidelines for

occupational health professionals. In addition, there is a need for the evaluation of rehabilitation efforts intended to promote work ability and job retention. Close cooperation with clinical institutions and universities inside and outside Finland can accelerate progress in this area.

### *Recommendations*

59. The IEG supports the emphasis at the FIOH on developing work organizations. Continued emphasis should have a high priority as the impact of psychosocial conditions on health and the well-being of employees is high.
60. The IEG suggests that the Department develops a special version of 'QPS Nordic' that is valid for monitoring the needs and work preferences of elderly employees approaching 60 years of age.
61. The IEG recommends paying attention to and analyzing changes to and the consequences of the current equality policies and practices for men's work and private everyday life.
62. To avoid (unexpected) work overload during the implementation of complex, long-lasting intervention programs, the IEG recommends paying due attention to this aspect in the planning phase.
63. The IEG recommends the continuous development of education and training of psychologists in occupational health services correspondingly with ongoing changes in working life.
64. The IEG encourages the Department to pay even more attention to the issue of mental health and related work disability. Positive and negative contributions from the work environment should be studied and elaborated towards practical recommendations for occupational health professionals. A FIOH task group on mental health could be started to coordinate the efforts.

## **4.12 Department of Research and Development in Occupational Health Services (OHS)**

### **Brief description**

The Department started in 2001, following a recommendation of the international evaluation of the FIOH in 1995 to convert a FIOH Action Program on the development of occupational health services (OHS) into a more permanent entity, and a subsequent positive evaluation from the National R&D Centre for Welfare and Health in 2000. The main tasks are research, development, assessment and evaluation of occupational health services. These tasks are needed as the OHS in Finland will meet many challenges in the near future, such as outsourcing, more regional cooperation, new objectives and methods, new EU legislation such as on chemical exposure, more attention to competencies and education of the OHS professionals.

In addition, information, training and services are provided for occupational health services personnel, employees and companies. Many activities are completed in close collaboration with the Ministry of Social Affairs and Health and with various organizations in society. The unit is leading the national Action Program 'Youth and Work' and houses the National Centre for Agricultural Health, the Computer-Assisted Telephone Interviewing Unit (CATI) and the follow-up of the Asbestos Program 1992-2003. The location is partly in Kuopio and partly in Helsinki.

### **Management and resources**

Management and resources are adequate. Budgetary resources in 2003 are on the same level as at the start of the Department with an increased proportion of state support funding. The Department employs 41 people. As the Department has many different tasks to fulfill, and the personnel have been separated over three workplaces, management has an important role in encouraging cohesion. Staff competence is at a relatively high level with three professors, one docent and five PhDs at the Department. In 2004, six PhDs are in progress within the Department. The Department is part of the planned Research School in Occupational Medicine, a joint activity between all Finnish medical schools. The age distribution at the Department is relatively good, 26% are over 50 year compared with 40% for the FIOH as a whole. The staff has excellent network capabilities.

### **Key activities**

Research activities and publications are divided over many areas, reflecting various topics the Department is covering. Topics covered include farmers' occupational health care, the quality of the OHS in general, youth and work, equity, work ability, ageing, vocational rehabilitation, the effects of asbestos exposure, skin diseases and biological monitoring.

A Survey on OHS services is organized every 2-3 years in close collaboration with the Ministry, collecting and reporting data on input, process and output. The increase

in OHS units at private medical centers and competencies in OHS could be monitored. The Department organizes other comprehensive information data collections such as the 'Barometer of Maintenance of Work Ability (MWA Barometer)' (more than 2,400 people interviewed including 882 managers, 813 employees and 743 occupational health service personnel) and the 'National Work and Health' survey, triannually each. The results of the MWA Barometer show that a high proportion of the working population has access to at least some kind of maintenance of work ability (MWA) activity and that MWA activities seem to be increasing. MWA was widely considered in the MWA barometer as profitable for the organization, and its cost-benefit ratio was regarded as good. The barometer is one of the indicators used in the Finnish National Health Program, Health 2015. Promotion of work ability is related with the coordination of the European Network of Workplace Health Promotion, a network of national occupational health and safety institutes. The National Work and Health survey is conducted every third year. The survey covers working conditions, health, work ability and occupational health services. It consists of a telephone interview (CATI) to a random sample of working-aged people. Altogether about 200 of the respondents are at work. One of the outcomes is that the need for OHS support for an individual's work ability increases with age: one third under the age of 35 perceived such needs, compared with two-thirds of the age group 55-64 years. The data collection for all these three surveys is done by the CATI unit.

The Department is active in the training and education of occupational health services professionals in close collaboration with the Training Centre. During 2001 and 2002 many courses were organized on the new Occupational Health Care Act and on the early detection of the need for professional rehabilitation (participants respectively 1,600 and 888). A University Policlinic for OHS training, research and development was started in collaboration with the University of Helsinki. In December 2003, 159 physicians were specializing in OHS. A new module-based training program for the training of specialist OHS physicians was developed and launched in 2003 at nine OHS clinics. Schemes are being developed to improve the professional education over the country. Actual competencies of the professionals are studied as a first step in an intensive training program. A new curriculum for occupational physicians is under proposal, including new skills and knowledge on working life. Teamwork will be more important, the strong role of nurses will be continued. Universities, the OHS and the FIOH have to play different roles. E-learning will be used.

The Cochrane Collaboration, founded in 1993, is an independent international non-profit organization dedicated to making up-to-date, accurate information about the effects of health care readily available world-wide. It produces and disseminates systematic reviews on the effectiveness of intervention in health care and promotes the search for evidence in the form of clinical trials and other studies of interventions (see [www.cochrane.org](http://www.cochrane.org)). The Cochrane Collaboration maintains the Cochrane Database of Systematic Reviews, published quarterly as part of the Cochrane Library. Other databases include abstracts of non-Cochrane reviews of effectiveness and controlled trials. Within the organization Centers, Review Groups, Methods Groups and Fields/Networks are active.

The Department, acting in close cooperation with and supported by other institutes in Finland and in other countries, has taken the initiative in founding a Cochrane Field for Occupational Health. The aim of this Field is to gather evidence on the effectiveness of occupational health, to stimulate systematic reviews on such interventions and to guarantee optimal accessibility to the results. Participating in the Collaboration will foster international and interdisciplinary cooperation. Concrete products will be one database of trials on occupational health interventions, and one of reviews on occupational health topics.

A related initiative of the Department is the development of evidence-based practice guidelines for occupational physicians in cooperation with providers of services and the scientific association of Finnish medical doctors, Duodecim. International collaboration has been sought to accelerate progress.

The National Centre for Agricultural Health, which is an integral part of the Department located in Kuopio, organized many meetings, training days, bulletins, articles, and a guideline to improve the quality of care and coverage (32% of all insured farmers in 1999, 39% in 2002). More farmers are reached compared with 1996. The target is to increase the coverage to 50% of all insured farmers.

The Action Program 'Youth and Work' on the transition between school and working life started in 2002 and will continue until 2007. In this ambitious Program, including 19 research and development projects, many organizations cooperate to improve the working life of young people. During 2003 two influential networks were built, one to support the Program and one on surveys and statistics. The first results of studies were published in 2003 and much publicity was organized.

The follow-up of the FIOH's Asbestos Program 1992-2003 is one of the tasks of the Department. In 2002-2003 a coordination group on asbestos-related diseases drew up a project plan as a basis for case studies that will continue to the end of 2004. A high number of new asbestos-related diseases is still to be considered. In 2002, 88 cases of asbestosis were assessed, 346 cases of pleural changes and 132 cases of cancers. The number of asbestos-related cancers will still increase and will peak in the next 5-10 years. The number of people under surveillance and follow-up decreased from more than 20,000 in 1992 to about 5,000 in 2003, because of problems in organizing a high level of surveillance and follow-up. Discussion is going on about the relevance of the lung cancer screening.

## **Productivity**

Research activities and publications are divided over many areas. As the Department has only recently started, research results are expected to increase in the coming years. The planned establishment of a research school in occupational medicine in close collaboration with several universities could be an important step forward. Of interest is the research on social capital in companies, executed as part of a program of the Finnish Academy. Many training and information activities and services are provided. The outcomes of the Department are in general innovative and client-oriented.

## Quality

The annual mean number of publications in peer-reviewed journals (2001-2002) was 1.3 per person-year invested in research. In 2003, this number was 0.7, which could mean that attention has to be paid to the productivity. The mean impact factor was quite high, 2.0 (2001-2002) and 1.5 (2003). Many publications are in the Finnish language, reflecting the national context of a number of projects in the Department. Nevertheless, further use of international publications would foster even more international synergy and quality.

## Relevance

The Department has relevant activities in all core processes (Table 16). Relatively much effort has been put into training. Contributions to innovations in occupational health care are highly relevant, as the organization and content of the OHS are expected to change in the near future. The development of new methods and instruments for interventions, complemented by systematic evaluation research has a high priority. New methods being applied by the Department are a participatory approach in research and qualitative research. The training of the OHS professionals is especially relevant because of the new legislation on occupational health services.

*Table 16. Person-years (%) by core processes in 2003*

Core process	2003
Research	51
Information	13
Services	19
Training	17
Total	100
N	41

The 'Youth and Work Program' is in the first phase now and has the potential to become a development program that will be well integrated in society. The program involves many FIOH Departments and might have a large impact. The relevance of the 'Asbestos Program' is related to the care for patients mostly exposed in the past.

## Customer/Stakeholder relationships

There are well-developed and productive relations with the OHS, with the employer and employee organizations, and with many other organizations in society to which the recommendations and services provided are relevant. There are, in particular, good relations with farmers' organizations.

An example of a broad vision is the Program 'Youth and Work'. This Action Program allows the FIOH to implement useful interventions as various organizations from society such as the OHS, employers, employees, pension funds, patients and youth

organizations are invited to express their interests and perspectives, being active partners in the Program. In activities promoting work ability there are close relations with companies' human resources management and with small and medium-sized enterprises.

## **Impact**

Staff members of the Department were involved through the results of research and information in the preparation of the New OHS Act 2001 including good occupational health practice. The impact of the former Action Program and subsequently of the present Department on the quality of OHS is high, e.g. three-quarters of the OHS physicians, over 80% of the nurses and two-thirds of the physiotherapists (of the full-time posts) completed a supplementary training course in OHS. Good attention is being paid to the social context of OHS interventions, such as the role of vocational training for young people to improve their working life, which is essential for future impact.

Various monitoring instruments such as the MWA Barometer, OHS in Finland, Work and Health in Finland, and indicators provided by the unit are used to assess the impact of activities of the FIOH and the OHS.

## **Conclusions and recommendations**

### *Conclusions*

Research, training activities, the National Centre for Agricultural Health and facilities such as the Computer Assisted Telephone Interviewing (CATI) unit are of great value for FIOH core processes, and should be continued. The Department has an important role in networking within and outside the FIOH, which should be continued.

### *Recommendations*

65. As OHS organizations in Finland will meet many challenges in the near future, monitoring, development and evaluation of the OHS should be continued, as these activities can be of great value for companies and for the health and well-being of the employees.
66. Research in the Department can be more focused on the evaluation of activities and impact of occupational health services and of intervention programs provided by the FIOH. Quantitative and qualitative research methods can be applied. Pilot studies might be performed to explore new evaluation methodologies. Within the Department, research can be concentrated in larger units to enhance effectiveness and output. Close cooperation with scientists in other FIOH units is essential to stimulate quality and to implement new findings and methods within and outside the Institute.
67. The IEG recommends that the Department coordinate the efforts on work ability assessments performed by FIOH Departments and Regional Institutes.

68. A Cochrane Field for Occupational Health is a new initiative and should be developed further to improve access to evidence-based knowledge about the effectiveness of occupational health interventions.
69. The national Action Program 'Youth and Work' has the potential to become a comprehensive development program that is well integrated in society and in the FIOH. The IEG recommends that the FIOH continue to support this program.

## **4.13 Kuopio Regional Institute**

### **Brief description**

The Kuopio Regional Institute of Occupational Health (KRIOH) is responsible for providing expert services, training and information in occupational health and safety in the provinces of Central Finland, Kuopio and North Karelia. The population in the area covered is 700,000, and the workforce numbers some 300,000. The main manufacturing in the central and eastern parts of Finland include forestry-related, metal, food and textile industries; agriculture and forestry also have an important role in the area. The mission of the KRIOH is to create healthier and safer working conditions and to promote the work ability and well-being of employees. The KRIOH targets its activities both regionally, in response to local occupational health and safety needs, and nationally, to promote health and safe working conditions in agriculture and forestry, with particular expertise in pesticide analysis and microbiology. Upon the establishment of the Department of Research and Development in Occupational Health Services, some KRIOH personnel were transferred to this new Department.

### **Influence of the 1995-1997 evaluations**

There were four recommendations in the 1997 evaluations. A further strengthening on the relationships of the KRIOH with the Public Health Institute and the University of Kuopio was considered important. This has been fulfilled through fruitful connections established at many levels, including joint appointments to the University. Units of ergonomics and physics were considered too small and possessing limited competence, but these have gained more competent staff and the publication record is good; both units have found areas of specialty and competence. Results of the work organization research were recommended to be published in peer-review journals. However, the publication activity from the work organization research has been limited because most of the activity is service on demand and there are no large resources for scientific research. As a final recommendation, occupational health services research should have been given a higher priority at the national level. A new Department has been established to host occupational health services research. In conclusion, the recommendations have led to positive solutions, except that in work organization research the balance between scientific tasks and service work remains in favor of the latter. This is not only a problem for the KRIOH, but should be viewed at the FIOH level.

## **Influence of the Ministerial and FIOH strategic goals**

The KRIOH covers both goals well, but the extent of service activities is so large that the concerns about priorities, also discussed in the section under Services, need to be considered carefully. The strategy of the KRIOH is that the set aims should be achieved by research (30% of the total work input), expert services (55%), training and education (12%), and the dissemination of information (5%). These activities are carried out in three strategic focus areas: promotion of occupational health (40%), development of the working environment (34%) and development of work organizations (4%).

## **Management and resources**

According to the devised strategy, most resources at the KRIOH are put into expert services, and those services aimed at improving working conditions are most important. Services are offered in the occupational fields of hygiene, medicine, toxicology, safety, ergonomics and psychology. The main clients of the services are workplaces, occupational health care units, occupational safety and health inspectorates and manufacturers.

In 2003 a total of 52 employees worked at the KRIOH, 40% on state funding and 60% on own income. The KRIOH is located next to the university campus in a building shared by the National Public Health Institute and the National Veterinary and Food Research Institute. The space is over 2,200 m<sup>2</sup> and the instrumentation up-to-date.

## **Staff competence and renewal**

The staff competence has increased over the years and is quite impressive: 31% have a doctoral degree and 33% have a master's degree. Staff renewal has not been large; in 2003, 60% of the staff are in the age bracket 30-49 years, implying that that the average age is younger than in the FIOH at large. However, the Director will be retiring next year.

The KRIOH has supported post-graduate studies, and in 1997-2003 altogether 12 doctoral dissertations were presented from the KRIOH, most of them dealing with working environments. Eight of these doctors continue to work at the KRIOH. In the past five years, five new titles of docent (associate professor) have been earned by the staff. In addition, two of the staff have a part-time position of professor at the University of Kuopio. Staff competence has also been increased through seven professional examinations. Five of those comprise educational competence, one is a certificate in organizational dynamics and consultative competence, and one is the certification of a special industrial hygienist. The KRIOH devotes 2-3% of its total annual work input to training its personnel.

## **Key activities**

### *Regional activities*

The geographical area of the KRIOH covers three occupational safety and health inspectorates. Representatives of the inspectorates are members of the KRIOH's advisory board, and the KRIOH has representatives on the advisory boards of the occupational safety and health inspectorates. The KRIOH holds 1-2 meetings annually with the staff of inspectorates, at which cooperative actions and needs are discussed. Thanks to such cooperation, several joint projects have been completed during the past few years. Workplaces and working conditions have been studied and improved in photography studios, X-ray laboratories, bakeries, greenhouses and the metal industry. Occupational safety and health inspectorates have also participated in the dermal exposure studies conducted at the KRIOH during the past two years. The workplaces involved are mainly small enterprises. Recently, methods for the evaluation of work organizations have been worked out together with inspectorates. The first questionnaire method, 'Prediction and identification of work community crisis' was supplemented for the use of labor protection inspectors in 1998. It included 14 items, which cover the main areas of work organizations. The second was the survey method, 'Assessment of the functioning of the work community' completed in 2000.

The following laboratories and units of the KRIOH provided expert services:

The Laboratory of Environmental Microbiology provided the following expert services in occupational hygiene: sampling of microbes and mites in work environments, microbe and mite analysis, biomonitoring services (IgG and IgE antibodies against moulds and mites), and occupational hygienic consultations and risk assessment related to microbiological agents

During the past two years the Laboratory of Environmental Microbiology performed 40 indoor air and 10 occupational hygiene surveys, 8,000 microbe, mite and allergen analyses from environmental samples, and about 8,000 immunological analyses. The immunological services and some of the other expert services were used nationwide. In the development of methods, there has been close collaboration with Kuopio University Hospital, the National Public Health Institute and various occupational health care units. The range of services provided has been expanded and updated. Occupational exposure to microbiological agents affects almost a million workers through industrial work processes and moisture-damaged buildings. New methodological developments improve the reliability of the diagnosis of occupational and work-related diseases. The goal is that the quantitative updated biomonitoring method will be used widely in Finland by occupational health care units and hospitals, and that demand will exceed the present level of 8,000 blood samples a year.

The Section of Occupational Hygiene and Toxicology provided expert services on occupational hygiene, sampling of gas, vapors and particles, analysis and biomonitoring services, occupational hygiene consultation and risk assessment related to chemical agents and control measures.

The Section of Occupational Hygiene and Toxicology produced about 50 chemical exposure assessment reports a year, 50% of which were accredited. The Section's laboratory also offered accredited biomonitoring services for lead and acetyl- and pseudocholinesterase in the blood and the following acids in the urine: mandelic, phenylglyoxylic, ethoxyacetic (previously up to 2003) and butoxyacetic (previously up to 2003). The total number of biomonitoring analyses per year was about 600, 75% of which were accredited. The other main services were analysis of endotoxins, metals, volatile organic compounds and inhalable dust. The total annual number of chemical analyses was about 4,000. The laboratory responded to practical problems at workplaces, establishing new biomonitoring methods, improving dermal exposure assessment, developing techniques to detect new contaminants from indoor air, finding new control measures for the better handling of metal working fluids in the metal industry and participating in the construction of exposure assessment models.

The Laboratory of Physics provided expert services in the assessment of exposure to physical hazards (noise, vibration, non-ionizing radiation, lighting and thermal conditions), noise control, noise and vibration testing of equipment at the accredited acoustics laboratory and development of products related to noise.

The Laboratory's activities emphasized noise and noise control, testing and the development of products, which together covered about 90% of all the services provided. The computer program Odeon was used to simulate the effects of noise control measures at industrial workplaces. The intensity method was used to localize noise sources and to measure the sound power levels of machines. Most of the reports included control recommendations. The Laboratory performed an average of 20 surveys a year and analyzed 500-2,000 noise and vibration samples. The accredited acoustics laboratory tested sound power levels and vibration of machines, mainly for the EC declaration of conformity. About 20 test reports were prepared for machine manufacturers and about 130 single tests were done annually. The product development done in the Laboratory included work on the development of optimal noise control enclosures, optimizing sound insulation in the cabin of forest tractors and reducing the noise from cooling systems.

The Ergonomics Unit provided expert services in the developmental projects on ergonomics, assessments of ergonomics and usability of products and work equipment, measurement of the physical load and strain of workers and measurement of the physical capacity of workers, in addition to consultations and training in ergonomics.

The expert services were carried out both at workplaces and in the Ergonomics Laboratory. With the support of the European Social Fund, four multidisciplinary developmental projects were conducted. All the developmental projects included several different expert services, mostly training and consultation. A new study area on physically disabled workers was established at the KRIOH in cooperation with national partners, showing that very few adaptive measures at work were carried out in Finland to improve the work ability and equality of workers with permanent physical disabilities. Ergonomic redesign measures have proved to be effective and essential forms of tertiary prevention to enhance the independence of workers with physical disabilities. A simple method (ERGODIS) was developed for the occupational health services and rehabilitation personnel to use in assessing the

need for redesign measures at workplaces employing people with permanent disabilities. Another new expert service was developed to assess the ergonomics and usability of work equipment, furniture and mobility aids used at work. The aim was to test the match between the product and its users in the context of the relevant work task.

The Work Organization Development Unit provided expert services regarding surveys of and interviews with personnel, consultation with management and workers, individual guidance of managers in their leadership problems, group guidance of personnel, team-building and training activities.

Developing work organizations and the well-being of their personnel consisted of tailored projects to meet needs. The projects included various developmental processes in cooperation with the personnel, such as conflict-solving, helping management with change, training in good leadership practices, supporting a good work unit climate, and enhancing work mastery and well-being. Since 1997, over 40 organizational development projects have been successfully completed. Approximately 50% of the service projects were carried out in private enterprises and 50% in public-sector organizations. Clients were asked to supply feedback after the projects. This feedback has been mainly positive, and is used in evaluating and improving the methods used in the projects. The demand for all services remained stable, though problems at workplaces became more varied and complex.

The Section of Occupational Medicine provides consultations associated with occupational diseases for the occupational medicine clinic at Kuopio University Hospital. It also provides expert services in risk assessment for the local units of occupational health services, especially in indoor air problems. The KRIOH annually trains 1-3 physicians specializing in occupational health.

KRIOH training consists mainly of courses, some of which are open to everybody and others are ordered by companies and organizations (in 2003 the number of participants was 1,256 and the number of training days was 1,992). The average length of the courses is two days. Furthermore, special lectures are given at universities and other educational institutions. The main themes of recent courses and other training included: good occupational health practices, promotion of work ability, practical occupational hygiene, occupational safety and health (especially in agriculture) and intervention in organizational development. In 2001-2003 training was also offered in 120 companies within the Network of Professional Competence project.

Most participants in the courses were occupational health service personnel (about 50%). Other important groups were agricultural advisers (20%) and occupational safety representatives from workplaces and occupational safety inspectors (8%). The organization-tailored courses included various types of participants. The quality of courses has been assessed by questionnaires, which continue to give positive feedback. The nature of training has shifted from fixed courses towards more flexible training programs. Cooperation with universities and authorities has increased and generated tailored courses.

The Regional Institutes of Kuopio, Lappeenranta and Oulu and the Department of Research and Development in Occupational Health Services have continued to arrange training programs in occupational health and safety in the Karelian Republic in Russia.

### *Special areas*

#### Agriculture

In the past few years, there has been rapid structural change in Finnish agriculture. The number of active farms has decreased, and the average farm size has grown. The growth in farm size has many effects on the working environment and the physical and mental workload of farmers. The purpose of the agricultural research done is to study working methods and conditions resulting from such changes in agriculture. The aim is to gain information about health hazards and their prevention in farming. Among dairy farmers, specific exposures examined were total dust, bovine allergens, micro-organisms, endotoxins and gases. Ventilation was also studied. Large modern cowhouses were studied in 2002-03 and preliminary results show that the trend in the exposure pattern continues to decrease. According to this study, farmers experienced a high mental workload. On the basis of these studies, a support program for farmers was established. Occupationally oriented medical rehabilitation courses and environmental measures seemed to be feasible ways of improving the ergonomics of dairy farming. Among pig farming, the size of farms is also increasing, resulting in problems for workers and environmental problems for the neighborhood. In barns where sawdust, peat or straw are used as bedding material, farmers' exposure to volatile organic compounds and different types of dust was studied. Storage mites were analyzed on agricultural premises, where high densities were found (especially in poultry yards) compared with stores, restaurants, textile factories and bakeries.

#### Forestry

During the past two decades, the number of forestry workers has decreased drastically, primary because mechanical harvesting has replaced manual logging. This structural change in forestry has given rise to a need for psychosocial studies as well as for identification of new environmental factors resulting from the use of modern forest machinery in logging operations. At the beginning of 1990, job stress and mental symptoms were evidently no more prevalent in forestry occupations than in other occupations, but since then the work of harvester operators has become extremely stressful mentally. Every fourth harvester operator considers that his responsibility and workload are unbearable. Mechanical timber harvesters' exposure to biological fungicides and biodegradable oils, for instance, and the prevalence and characteristics of dermal and respiratory symptoms were studied using occupational hygiene field surveys and telephone interviews, respectively. Harvester operators showed a higher prevalence of diagnosed asthma and various other respiratory symptoms than the controls. Plant-protection products have been studied, especially of tree nurseries together with the Finnish Forest Research Institute. Chemical safety has been developed for existing and experimental pesticide application methods.

## **Action Program: Work Environment 2005 (2001-2006)**

Several studies published in 2000 and 2001 have shown that the improvement in working conditions in Finland, and in Europe in general, has not been as fast and positive as anticipated. Chemicals are still the main single reason for occupational diseases (2,000 cases, 40% of the total number) registered in Finland. Data on occupational exposure to chemical, biological and physical factors is not reliable in all cases. New legislation requires exposure and risk assessment by companies, but practical tools and suitable training for health and safety personnel are lacking. The aims of this Program are to collect reliable data on occupational exposure (chemical, physical and biological), to support risk assessment activities at company level, and to integrate occupational and health issues in order to help the strategic planning in companies.

The "Working Environment 2005 Program" is implemented in four modules, the aims of which are exposure assessment, health risk assessment, risk management and education and information.

## **Productivity**

The KRIOH has published annually between 25 and 31 scientific, mostly peer-reviewed papers during the period 1997-2003, corresponding to 1.5 to 2 papers per person-year in research. The mean impact was stated to range from 0.9 to 1.6. The papers have covered most of the activity areas of the KRIOH. 'Other scientific articles and research reports' have numbered 25-29 annually. Compared with other institutes in the area of occupational and public health the level of production is good. Compared with the evaluation in 1995, there has been an improvement in the numbers of papers and in their wide subject areas.

The productivity of expert services, highlighted under 'Key activities' (see above), has also been very good, covering for example in 2003 over 16,000 analyses in the work environment and over 13,000 analyses for research and quality control purposes.

## **Quality**

The published scientific work has come out in respectable professional journals. It is particularly encouraging that the scope of published work has been expanded to ergonomic, physical, psychosocial and work organizational factors from the traditionally strong areas of industrial hygiene, toxicology and occupational health.

Many of the analytical methods were developed at the KRIOH and have been validated in scientific publications. Analytical services carry out normal quality control schemes and take part in scientific studies, which adds to the assurance of high quality. Some biomonitoring and noise analysis have been accredited and thus should possess an assured quality. The quality of other services, such as occupational health, consultations and training cannot be assessed, but customer satisfaction surveys are overwhelmingly positive.

## Relevance

### *Relevance to core processes*

Table 17. Person-years (%) by core processes in 1997, 2000 and 2003

Core process	1997	2000	2003
Research	22	29	33
Information	4	7	5
Services	61	54	49
Training	13	10	12
Total	100	100	100
N	62	58	52

Table 17 shows the distribution of person-years by core processes. Considering the core processes of the FIOH, the activities of the KRIOH have been highly relevant. Compared with the FIOH average, the KRIOH uses a relatively large amount of resources for service and training, at the expense of the other core processes. However, the difference is small. The only question of concern is the large amount of service production, which may have negative effects on other activities.

### *Relevance to mission and strategy*

The mission of the FIOH is to promote the work ability and functional capacity, general health and quality of life of Finnish people of working age. The overall strategy is to produce, compile and disseminate scientific information on the relationship between work and health and to promote its utilization. The KRIOH has specified that these aims be achieved by research (30% of the total work input), expert services (55%), training and education (12%), and the dissemination of information (5%). These activities are carried out in three strategic focus areas: promotion of occupational health (40%), development of the working environment (34%) and development of work organizations (4%). The activities of the KRIOH are very relevant in terms of these goals.

### *Relevance to future plans*

The KRIOH has been able to establish full-scale services for workplaces, occupational safety and health inspectorates and occupational health care units. In coming years, services and training of the KRIOH will include even more cooperation with occupational health care personnel to recognize and assess working environment risks and further increase their experience of practical risk assessment. The methodology for risk assessment will be further developed at the KRIOH, especially in the field of exposure assessment. In the future, the development of work organization obviously needs higher priority than today. The proper balance between research and services is a challenge to the KRIOH. A reasonable part of the research must be used for the development of services. Structural changes will

continue in agriculture and forestry and it is KRIOH's task to follow and predict how these changes will influence the farmers and forest workers' work environment and the physical and mental workload. A key area for future research and expert service work will be health technology and its usability with physically impaired workers. The participation in the EU research projects requires qualified science and publications, good international relationships, and the active participation in scientific meetings at the European level. In conclusion, the KRIOH has a clear vision of the future challenges.

### **Customer/Stakeholder relationships**

The KRIOH has close contacts with the occupational and health inspectorates through mutual mandates on the advisory boards. The KRIOH also has good contacts with the organizations in its special areas of agriculture and forestry, and the personnel have served in expert and consultation functions. Occupational health and safety personnel are consulting widely at the regional level.

The Laboratory of Environmental Microbiology, the Laboratory of Acoustics, and the Occupational Hygiene and Toxicology Section carried out a client satisfaction survey in 2001, covering about 200 clients who had used the occupational hygienic services of the KRIOH in the previous two years. Overall, clients were satisfied with services. Sometimes, clients had difficulties in reaching the right employee, and the test reports were occasionally too complicated to understand and delivery times too long. Clients also wanted more information about the service range. The survey provided feedback for improvements.

### **Impact**

Expert services have remained the most important activity at the KRIOH. The KRIOH has shown exemplary responsiveness in the area. In the mid-1990s, the resources for the Laboratory of Environmental Microbiology were increased because demands from workplaces and society for such services and for research had grown very rapidly. The number of serological analyses rose from 5000 in 1995 to 20,000 in 1997. The present expert role of the KRIOH in the field of indoor air is consolidated.

The KRIOH's research work on occupational health and safety in agriculture and forestry has proved important for authorities and occupational health care personnel because of the large structural changes that have occurred in these occupational sectors. Finnish agriculture will remain in a state of continuous transition in the future. Research work to monitor the working conditions and well-being of the farmers is therefore necessary. Dermal exposure is gaining more attention in the European Union, and an estimation of dermal exposure is also needed for risk assessment. It has been important for the KRIOH to represent the Nordic Dimension in European research teams, in which measurements and modeling of dermal exposure have been developed. The proposed new directive on industrial chemicals will increase the importance of this work.

Research and development associated with disabilities and work have been relevant and innovative because each EU Member State has adopted a range of measures to promote the integration and employment of people with disabilities. The KRIOH will continue to improve the competence of health and safety personnel, employers and disabled people in developing working methods and environments that are more accessible and ergonomic for workers with disabilities.

In conclusion, the KRIOH has had an impact beyond its strategic areas nationally, and it has been able to influence expert opinions in relevant areas at the EU level.

## **Conclusions and recommendations**

### *Conclusions*

The KRIOH has a special mandate in forestry and agriculture and in environmental microbiology and bioaerosols, particularly in relation to moisture-damaged buildings and indoor air quality. Other activities include service and research on industrial hygiene, biomonitoring, occupational medical services, development of work organizations, occupational health problems in small enterprises, ergonomics, physical exposures (noise and vibration), ageing and disabled populations. The KRIOH occupies modern research facilities and it enjoys mutually nourishing relationships with sister departments at Kuopio University and the National Public Health Institute. The evaluation of 1995/1997 commented on the low activity of the physics and ergonomics laboratories. These laboratories have expanded in staff and they have reached a good level of activity and scientific production. The lack of scientific publications in the area of work organization has been only partially improved.

The KRIOH has continued to fulfill in a qualified way the requirements for service and science activity in a Regional Institute. The activity should be allowed to continue largely in its present form. The director will retire in a year's time and an appropriate replacement needs to be found.

### *Recommendations*

70. Microbiological service and research has national and international importance, and these need to be maintained as a focal area, with further emphasis on the typing of microbes and on type-specific effects.
71. A further strengthening of work organization research and services in this area is recommended.

## **4.14 Lappeenranta Regional Institute**

### **Brief description**

The LRIOH is the youngest and smallest of the Regional Institutes. It covers a region with a population of 433,000, which is 8.3% of the Finnish population. A total of 170,000 people work in the region's 20,000 enterprises. 40% of Finnish pulp and paper is produced in this region.

The LRIOH focuses on supporting health, safety, and well-being by developing working conditions and work communities and by promoting and maintaining work ability. Support is given by carrying out services, training, and research and by disseminating information. At the national level, the LRIOH specializes in occupational health in the forest industry, including pulp and paper and the wood products industries. Other fields of research and development are working conditions in the hotel and restaurant sector and in the road and transport sector, the quality of the indoor environment, control of hazards, and exposure assessment to carcinogens in the Kymi region.

The LRIOH has established an EU cabinet for testing hazardous emissions from new processes and machines, which has provided Finland with a unique and powerful facility for research and service in prevention of hazardous airborne substances.

The LRIOH has participated in three action programs and is presently participating in the Action Programs 'Work Environment', (2001-2006), 'Wood Dust - Exposure Assessment and Health Effects' (2002-2006), and 'Support for Occupational Safety and Health Activities' (2003-2005). The LRIOH has participated in three EU funded research projects.

### **Influence of the 1995-1997 evaluations**

As a result of the recommendations, the LRIOH has put more emphasis on the needs of clients and on direct preventive intervention. For example, the LRIOH has extended its competence so that the psychosocial dimension can be included in solving an indoor environment problem and regularly carries out preventive interventions using participative methods and evaluating the impact.

LRIOH has not initiated the recommended activity on violence at the workplace since the Department of Occupational Safety has activities in this field.

During the period the staff has been increased by one psychologist, two ventilation engineers and one chemist. Also, the director of the department was changed during the period.

### **Influence of Ministerial and FIOH strategic goals**

The LRIOH has contributed to three specific focus areas: 'Promoting health and safety in the work environment', 'Preventing occupational and work-related diseases', and 'Developing work organizations and the well-being of personnel', while work on 'Other' areas amounted to almost half of their person-years. The

person-years have been allocated to improving the working environment (slightly more than half), workers' health (one third), and to work organizations (less than 10%).

Because of their proximity to Eastern European countries, the LRIOH as well as the KRIOH and the ORIOH have a special mission to promote the stabilization process in these countries. Thus, together with the Finnish authorities, training courses and seminars have been organized for authorities, researchers and occupational health and safety experts in the Republic of Karelia (in Russia).

## **Management and resources**

The LRIOH has 20 permanent and 2-4 short-term employees. 41-51% of the funding has been own income, to which services contributed 51% in 2003, up from 28% in 1997. In 2003 the staff included two physicians, one psychologist, one occupational physiotherapist, one occupational health nurse, five engineers, three chemists, one occupational hygienist, three occupational hygiene technicians, one physicist, two laboratory technicians, one clerk and two office secretaries. Of the staff members, two have a doctorate, one is a licentiate, nine have a master's degree and 4-5 are working for their doctorate. One doctoral dissertation was written during the evaluation period.

The LRIOH has advanced and strategically well-chosen instruments and facilities for dust and fume exposure characterization, source identification and emission measurements, and it is also particularly well equipped for noise level and on-site sound power measurements. The LRIOH cooperates with other Regional Institutes over joint purchases and the sharing of less frequently used field equipment. The Chemical Laboratory is well equipped and has sufficient analytical capacity.

The LRIOH has functioned in close collaboration with the South Karelia Central Hospital to improve the diagnostics of occupational and work-related diseases. In 2003, the establishment of the Occupational Medicine Department at the South Karelia Central Hospital further activated this cooperation. This new Occupational Medicine Department activity has increased the annual number of physicians training to acquire the occupational specialty from two to four.

The LRIOH can draw on a network of experts and consultants, and other FIOH units provide expertise and support. The most important partners in research projects have been the Technical Research Centre of Finland and the Universities of Kuopio, Lappeenranta and Tampere. To obtain the necessary competence in ventilation research, tasks have been divided. The LRIOH specializes in local and the TuRIOH in general ventilation. Due to the limited demand for NIR and vibration measurements, the LRIOH only maintains a readiness for such measurements and draws on support from the Department of Physics for method development and shares field equipment with other Regional Institutes. However, the need remains for each expert to cover a broad field of expertise and this has created overload problems.

Staff training takes up 3.7% of the paid working time. An internal action program has been started to improve the skills needed in the future.

One third of the staff will retire within 10 years. This generation shift needs careful consideration of the new challenges that the LRIOH will face in the future.

### **Key activities**

The LRIOH provides expert services in:

- occupational exposure and risk assessments
- control of exposure
- emissions from machines
- ergonomic and physiological consultations
- measurements of physical capacity
- occupational medical statements
- occupational medical consultations
- psychological and organizational consultations.

LRIOH's indoor air group consists of medical, hygienic, ventilation, and building construction experts (external partner). The group uses a multidisciplinary approach, involving representatives of customers, occupational health services, safety, builders, and ventilation maintenance personnel. It utilizes questionnaires on indoor air, surveys of air quality and thermal conditions, ventilation performance, and studies of building conditions.

Typical examples of exposure assessments of chemical hazards have been dust exposure, allergic and sensitizing chemicals and volatile organic compounds. Time-resolved exposure surveys and exposure visualization are used to identify high-risk worker groups and working practices.

Services related to noise include noise exposure surveys, environmental noise surveys, noise measurements for product specifications, and mapping noise sources in buildings and machines. Simulation programs are used in predicting noise levels after noise control measures and in selecting the most effective means of control, thus enabling industry to take noise into account at the designing phase.

A few services related to vibration and non-ionizing radiation are performed each year.

Psychological consultation services offer tailor-made participative training. Services dealing with ergonomics and physical workload have shifted the emphasis from the single-workplace level to the solving of national problems.

The LRIOH has special expertise in chemical analysis of lead and PCB in flexible silicon-based jointing materials, low concentrations of organic vapors, chemical markers for different wood species, and environmental tobacco smoke.

Particle emissions from new welding methods, laser cutting of various materials, and surface-finishing processes of particles are quantified in an EU test-bench.

The LRIOH arranges training events in conjunction with the FIOH training program, and in the form of tailor-made courses. The target groups are regional occupational health care and safety personnel, human resources staff, managers, and various

authorities. The main training topics have been the development of the work community and the promotion of work ability, but training on environmental risk assessment and safety in maintenance has also been offered. Many participative training courses in risk assessment and control have been conducted at paper mills. In order to disseminate research results, 1-2 training courses per year have been arranged on current topics, such as wood dust and its control.

The LRIOH has not been in charge of Action Programs, but has participated in the following:

- Indoor Air and Environment (1994-1998)
- Small Workplaces (1995-2000)
- Good Industrial Air (1998-2001)
- Work Environment (2001-2006)
- Wood Dust - Exposure Assessment and Health Effects (2002-2006)
- Support for Occupational Safety and Health Activities (2003-2005),

The LRIOH has also participated in the following three EU funded research projects:

- Pilot studies of CEN protocols for evaluating the emission of airborne hazardous substances from machines (EU SMT)
- ENVICUT, Human and environmentally friendly milling and cutting of materials (EU Growth)
- WOOD-RISK, Risk assessment of wood dust: assessment of exposure, health effects and biological mechanisms (EU Life).

The LRIOH has special expertise in the forest industry, risk assessment in the paper industry, and in the use of the exposure matrix (PAPDEM) for cancer-related hazards for epidemiological studies of cancer in the pulp and paper industry. Other activities include working conditions in the hotel and restaurant sector and in the road and transport sector, the quality of indoor air, and control of hazards through a specialized ventilation solution. The newly created regional carcinogen exposure database, KymCarex, has been used for assessing exposure to carcinogens in the Kymi region.

## **Productivity**

Each year, the LRIOH performs about 120-160 exposure risk assessments. Surveys of indoor air quality and chemical hazards have been in great demand, 40-50 and 50-60 per year, respectively, as well as 10-20 noise assessments and 2,000-2,400 chemical analyses. The number of occupational medical statements has risen from 50 to around 100. Only 4% of customers for chemical surveys have come from small-scale industry.

The LRIOH has given high priority to service and has directed its manpower accordingly. This limits the opportunities to reserve uninterrupted periods of time for research, which in turn reduces productivity and creativity. There are only two full-time researchers, both employed short term. The research group is thus below critical mass, and this explains the low number of peer-reviewed publications per researcher year (an average of 0.3 for the period). The LRIOH cooperates with other Regional Institutes in exploiting their data for scientific work, and one of the results of this during the period 1997-2003 has been a doctoral dissertation.

Each year, the LRIOH arranges about 20 training events in conjunction with the FIOH training program and as tailor-made courses to meet customers' needs. Many participative training courses in risk assessment and control have been conducted at paper mills.

## Quality

The industrial hygiene services of the LRIOH and their facilities for dust characterization are in high demand, which is a document of their quality. The scientific papers have been published in leading peer-reviewed journals, and their impact factors are close to the average for leading industrial hygiene journals. Participation of the LRIOH in three EU funded projects further documents the high quality of the research.

## Relevance

### *Relevance to core processes*

Due to the small size of the LRIOH, the distribution of person-years by core processes shows considerable annual fluctuations (Table 18). There appears to be an increasing trend in service and a decreasing trend in information activities. The number of lectures at courses, meetings and seminars has decreased from an impressive 944 in 1997 to 164 in 2003. One explanation for this decrease is the strong focus on training activities in the 1990s by the previous director of the LRIOH. Because of its small size, the LRIOH has had to focus its activities, and has focused on occupational hygiene. This has been in agreement with customer demands for this service and also resulted in original contributions to the science of occupational hygiene.

The LRIOH only has one psychologist, and this has created problems in meeting the increasing demand for solving indoor environment problems and for training enterprises in the management of change, coping with crises, conflict-solving, and promotion of well-being.

*Table 18. Person-years (%) by core processes in 1997, 2000 and 2003*

Core process	1997	2000	2003
Research	23	42	24
Information	17	5	7
Services	36	39	49
Training	25	13	20
Total	100	100	100
N	24	26	23

### *Relevance to strategy and mission*

The LRIOH contributes to the FIOH strategy and mission goals by developing effective technical prevention, by directing its work towards the use of participatory approaches to problem solving with follow-up as an integral part, and by providing tailor-made participative training. The LRIOH actively improves its skills in knowledge management, cooperation, and networking.

### *Relevance to future plans*

The LRIOH is well aware of the needs to study the impact of interventions in the work community and in the work environment and to prepare general guidelines for the occupational health services, and it has a clear strategy for the future.

The LRIOH plans to further increase the cooperation and networking with workplaces, other units of the FIOH, the OHS, the occupational safety authorities and other research units.

LRIOH intends to act more proactively by influencing the design of machines, premises, processes and ventilation systems, by contributing to the setting of target levels for noise and chemical hazards, and by developing new methods for determining process emissions in industrial plants. As a consequence, the LRIOH intends to improve its own skills in e.g. modeling exposure and airflow patterns. The LRIOH will continue to produce 'Good Practice' web pages for the European Agency for Safety and Health at Work.

The need for analyses of e.g. sensitizing chemicals has increased, as has the need for assessing exposure to reproductive-toxic chemicals, due to the legislation concerning female workers. The requirements of the European Commission related to the risk assessment of new notified substances are expected to increase the need for workplace exposure assessments. The LRIOH also expects an increased demand for testing in the EU cabinet when new EU legislation is enacted on declaration of machine emissions.

## **Customer/Stakeholder relationships**

Occupational hygiene services were surveyed in a client satisfaction survey in 2002. 96% of the respondents (n=45) were very satisfied with their services.

The LRIOH customers are workplaces, occupational health service units, manufacturers, designers and authorities situated within their region. The need for LRIOH services is illustrated by the steady increase in income from services by EUR 100,000 per year during the evaluation period.

## **Impact**

The LRIOH has actively targeted effectiveness. As a result, the LRIOH has changed to applying participatory approaches to problem solving, and to following up on the results. Time-resolved exposure surveys and exposure visualization are used to identify high-risk worker groups and working practices and these are excellent

methods for worker involvement in problem solving. Noise simulation programs are used to predict noise levels after noise control measures and for selecting the most effective means of control, thus enabling industry to take noise into account in the designing phase. The LRIOH has also developed exhaust controls for stationary wood-working machines and for hand-powered tools that have achieved impressive reductions in dust emission. In a task assigned by the Ministry, web pages are produced on technical interventions that work (good practice). These results are also used by the European Agency for Safety and Health at Work.

## **Conclusions and recommendations**

### *Conclusions*

The LRIOH is a well-functioning institute with good laboratories and facilities. It contributes to several strategic areas and has focus on occupational hygiene. The LRIOH is the smallest of the Regional Institutes. It gives both high priority to service and has been able to achieve high-quality scientific results. However, the staff is below the critical mass and this has limited the productivity in research in its present fields of expertise. Furthermore, the LRIOH only has one psychologist and thus has difficulties in properly meeting the increasing demand for development and service in the new problem areas. As there is no university hospital in Lappeenranta, the direct contact with occupational and work-related disease cases is not optimal.

### *Recommendations*

72. The IEG recognizes that the size of the LRIOH is below the critical mass for research and development and recommends that the FIOH evaluate this situation to decide how the LRIOH can be helped.
73. The IEG recommends that the LRIOH continue specializing even further in the analytical service and that the LRIOH rely on its network for expertise in modeling airflow patterns.

## **4.15 Oulu Regional Institute**

### **Brief description**

The Oulu Regional Institute of Occupational Health (ORIOH) is responsible for promoting health, work ability and well-being of the working-age population in northern Finland. The activities also help to support measures to develop working conditions and work communities. The area covers the region of Oulu Province and Lapland, nearly half of the total area of Finland but a population of 645,000, 12.4% of the total. The 247,000 employed people account for 11% of the Finnish workforce. The unemployment rate is about 5 percentage points higher than the national average (approximately 10%). The ORIOH offers research specialization in the promotion of health and working capacity in cold working conditions and a cold climate. Sectors important to northern Finland, such as mining and metallurgy and the electronics industry, also constitute an important focus of research work. The Northern Finland birth cohort of 1966, and soldiers' health, performance and cold protection are other research activities.

### **Influence of the 1995-1997 evaluations**

There were three recommendations in the 1995 evaluation, on resources, collaboration and telephone consultation, and these were properly dealt with by the 1997 evaluation.

### **Influence of Ministerial and FIOH strategic goals**

The ORIOH covers both goals well in a reasonable, balanced way. Resources are well directed towards the special challenges facing this northernmost Regional Institute, which covers a vast area of land.

### **Management and resources**

According to the applied strategy, the resources at the ORIOH are divided between expert services and research. Services are offered in a wide range of fields, including hygiene, medicine, safety, ergonomics and psychology. There has been some fluctuation in own income, mainly depending on research funding.

In 2003, a total of 47 employees worked at the ORIOH, 65% on state funding and 35% on own income. The ORIOH feels that the staff is too small to maintain all the strategic areas and efficiently exploit all the laboratory facilities at the research centre. Additional resources have been arranged through temporary, short-term solutions. Expert areas such as microbiology, clothing research, cognitive ergonomics and organization development services are covered by temporary personnel. Important additions in recent years are an educational planner and a cold-physician. The physical resources are good. The ORIOH is located at the new Kastelli research center, shared by some university departments. The instrumentation is up-to-date.

## **Staff competence and renewal**

Staff competence has increased over the years and it is reassuring: 23% have a doctoral degree and 45% have a master's degree. Loss of staff to better-paid jobs has been a problem, but the positive side of this trend has been the relatively young workforce as compared with the rest of the FIOH. In 2003, 64% of the ORIOH staff were in the age bracket 30-49 years, the highest proportion in the FIOH.

ORIOH staff has received academic merits during the past 7 years, in the form of 3 dissertations and 3 docentship (associate professors). The ORIOH will continue to motivate the staff to acquire individual qualifications which support their own function and the work community. Personnel training will be better organized by charting the fields of know-how and using the results in development discussions.

## **Key activities**

### *Regional activities*

Services and development in the work environment include the main areas such as indoor air quality, especially biological hazards, exposure assessment to chemical and physical hazards, especially noise, dust and volatile organic chemicals (VOC), risk analysis and management, ergonomics, system analysis on ventilation systems, clothing design and testing, product development, especially for cold protection and ventilation design, occupational accident prevention, and occupational safety management.

Service processes can be either project based or phone call services. Both are covered by a quality management system. The service often includes training for employees. The indoor air quality service is based on a multidisciplinary approach, including specialists and representatives of customers, builders and ventilation experts. Problems have mainly been related to moulds, VOC, glass fibers, thermal conditions and ventilation measurements. Each year the Institute performs 160-180 exposure risk assessments, which have remained at a constant level. Most (55%) of the service volume relate to indoor air quality and microbes. Chemical risk assessments accounted for about 30 % and physical risks for 15%.

In companies the comprehensive chemical risk assessment includes checking the chemical list, checking the consumption of chemicals, and risk assessment of exposure to chemical substances in the workplace. Noise surveys relate to developing noise control programs at companies. They consist of noise exposure measurements, noise mapping of halls, and noise control plans and their priority in cost efficiency. Preventive plans also often relate to vibration, thermal environment, electromagnetic fields and ventilation. Typical customers comprised industrial enterprises and city engineer's offices. Ergonomic evaluations are carried out mostly as parts of larger projects concerning specific sectors of industry or occupations. Good results were obtained in the projects, in which the work ability of professional cleaners was improved by interventions. The effects of cold and the usability of hand tools were studied among those who work in physically high positions, such as electrical line builders and mast men at teleoperator companies. Knowledge of ergonomics and human models were used in the planning of workplaces and work stations. A totally

new research area in ergonomics is usability testing, the adaptation of a product meant for human use.

Safety research recorded the incidence of accidents, sources of injury and relevant background factors. Product development and test services were provided on cold-protective clothing, and simulation models for physiological responses and frostbite were made. Work in occupational safety management concerned human resources and occupational safety Action Programs. The systems designed and tested were distributed for common use in national projects, with good results. Interventions to improve work ability were carried out in, for example, electronics and metal industries.

Changes between 1997 and 2003 include the use of a quality management system and an increase in mould analysis. Risk assessments and safety management consultation are also new activities. Improvements in instrumentation include an infrared camera, a thermal manikin, air flow measurement devices, and new data-logger systems for cold measurements.

Chemical and microbiological analyses have special areas in the analysis of metals, poly-aromatic hydrocarbons, VOC, asbestos/fibers and mould. The analytical data is used to support risk assessment and reduce exposure. The laboratory analyses about 5,300 occupational hygiene samples per year. The number of mould samples doubled during the 1998 – 2003 period.

The main customers are the FIOH itself, occupational health care units, municipal and state authorities, industry, consulting firms and private persons.

Occupational medicine services have been carried out in close partnership with the Oulu University Hospital. In the Hospital's outpatient ward for occupational medicine, the number of visits to medical specialists due to occupational and work-related diseases increased. The ORIOH has provided the expertise in occupational medicine and working conditions needed for diagnoses, together with counseling for occupational health professionals in the recognition of work-related diseases in occupational health care. This collaboration with the Hospital's specialists in occupational medicine has improved the quality of diagnosis of occupational diseases in northern Finland. Due to the increased collaboration with the University of Oulu in occupational medicine, the evaluation of work ability services has been transferred to the Hospital's outpatient ward for rehabilitation assessment.

Work organizational services suffered from staff shortages (especially in psychology), but in 2001 enough resources became available, and these activities have included work climate surveys as well as development projects and processes, including crisis interventions in organizations. Special attention was devoted to developing methods for training in executive conflict management processes and leadership styles. In 2003, altogether 25 organizational development services were provided, and the need for organizational development activities seems to be growing.

Training is an important part of activities at the ORIOH. Each year the ORIOH arranged about 15 events as part of FIOH training programs and tailored courses. The biggest customer group on these courses consisted of occupational health care

personnel (about 70%). Other important groups were safety personnel, laboratory personnel and human resource staff. The main training topics were development of occupational health care, promotion of work ability, environmental risk assessment, safety at work, and organizational development. In cooperating with the University of Oulu, the ORIOH also organized basic education and specialist training for doctors. The annual number of trainee days has been 1,474 on average, the average number of participants being 422. The ORIOH was also involved in organizing nine international courses, congresses, and workshops.

### *Special areas*

#### Work in the cold

The ORIOH's expertise in the area 'work in the cold' covers health aspects of cold, thermophysiology and performance in the cold, clothing physiology and technical prevention of cold problems. Most of this work is research, but the ORIOH also does development work, disseminates information, and provides training courses and service. Cold research is mainly done at the versatile and high-quality climatic laboratories. Neuromuscular performance and musculoskeletal problems in the cold is one of the study areas. Experimental studies have shown that the greater physical strain and lower performance are partly caused by the increased activity of the antagonist muscles in each agonist-antagonist muscle group. Work in the cold causes higher physical strain and earlier and greater fatigue than similar work in the warm. Blood pressure also responds to the cold. The effect of cold in increasing blood pressure was studied in young, healthy, middle-aged hypertensive and ageing subjects in different cold exposures. The results show that face cooling is usually the first and main reason for an increase in blood pressure, while light exercise decreases or even eliminates any increase. Quantification of heat loss via different avenues was assessed in order to gain a better understanding of body heat balance and correct cold protection. Two large-scale international projects assessed convective cooling (heat loss due to wind) and conductive heat loss (heat loss due to contact with cold items). The results have been used in the preparation of standards on safety limits for cold surfaces in industry and for the development of wind chill indices.

Whole-body protective garments used against radioactive, chemical and biological hazardous substances are partly or totally water vapor impermeable, so heat strain is a common consequence among users. Because thermal strain was not known in cold conditions, experimental work simulations were carried out in both the laboratory and the field. The results showed that in heavy work the risk of heat strain may continue even at temperatures as low as -25 °C. The Finnish Defense Forces have been instructed on the proper selection of conscripts working in cold conditions, to minimize performance loss in cold and to improve cold protection by using clothing and technical means. Extensive studies have been carried out on clothing physiology and the suitability of different clothing items, from footwear to head gear. Based on both material and model tests, the best clothing solutions were developed. The utility range of clothing developed in different occupations, e.g. soldiers, forest workers, post carriers, food industry workers, tourists, construction workers, was given. A 'cold climate rest jacket' was developed and distributed to forest workers. Technical methods for the prevention of cold exposure have also been the subject of study.

### Mining and metallurgy

The ORIOH has developed biological monitoring of arsenic, and biological and ambient monitoring of polycyclic aromatic hydrocarbons (PAH) used in these industries. The research project dealing with PAH exposure at Finland's only coking plant has contributed to reducing exposure among coking workers. Research has continued to cover dermal exposure and to show its significance. In recent years the resources used for research on mining and metallurgy have decreased, as have these industries. Instead, resources have been devoted to the electronics industry, which has been growing in the Oulu area.

### Birth cohort 1996

As an additional resource, the Northern Finland birth cohort 1966 (NFBC 1966) has been used by researchers at the ORIOH. This population-based, geographically defined study was launched the mid-1960s by collecting data during the mother's pregnancy and at birth, at 1 year, and at 14 years. The latest follow-up was performed at the age of 31 years. During 1995-2003, the ORIOH was collaborating in planning, performing and reporting the 31-year follow-up study. The findings from the NFBC 1966 are useful in developing and targeting health promotion interventions for young people at school and for young workers at workplaces and at leisure.

### **Action Program: Work in the Cold (1997-2000)**

The ORIOH was leading the 'Cold Work Action Program' in 1997-2000, which continued as a standardization work and has resulted in a proposal 'Working practices in cold'.

### **Productivity**

The ORIOH has published annually between 13 and 31 scientific, mostly peer-reviewed papers during the period 1997-2003, corresponding to 1.0 to 2.7 papers per person-years in research. The mean impact ranged from 1.7 to 2.5. The papers have covered the main areas of expertise at the ORIOH. 'Other scientific articles and research reports' have numbered 31-47 annually, indicating active communication in the form of less formal publications. Compared with other institutes in the area of occupational and public health, the level of production is good. Compared with the evaluation in 1995, the numbers of papers have remained constant.

The productivity of expert services, highlighted under Activity (see above), has also been good, covering in 2003, for example, over 5,000 analyses in the work environment and over 1,300 analyses for research and quality control purposes.

### **Quality**

The published scientific work has come out in respectable professional journals. The apparent impact factors are high compared with the FIOH average, but they are available only for international journals and many ORIOH publications came out in Finnish journals. Many papers originating from the Northern Finland birth

cohort have started to emerge, which is probably a growing trend. Although the research on cold has produced scientific papers at regular intervals, a competitive international publication would give more visibility.

The work environment laboratory has composed its own peer-reviewed handbook for procedures and quality control. Measurements are carried out according to published standards. Published standards procedures are followed when available. The chemistry laboratory uses reference materials in analyses to confirm the validity of results. It also participates regularly in international proficiency testing schemes several times a year. The physiology laboratory follows the FIOH's general rules and procedures for scientific research.

## Relevance

### *Relevance to core processes*

Considering the core processes of the FIOH, the activities of the ORIOH have been highly relevant. Compared to the FIOH average, the ORIOH uses relatively more resources on information and training, which is understandable because of its geographical location. The ORIOH has found a natural specialization in expertise due to its environmental challenges.

Table 19 shows the distribution of person-years by core processes.

*Table 19. Person-years (%) by core processes in 1997, 2000 and 2003*

Core process	1997	2000	2003
Research	44	26	21
Information	2	9	8
Services	34	33	60
Training	21	33	10
Total	100	100	100
N	53	59	47

### *Relevance to mission and strategy*

The mission of the FIOH is to promote the work ability and functional capacity, general health and quality of life of Finnish people of working age. The overall strategy is to produce, compile and disseminate scientific information on the relationship between work and health and to promote its utilization. The ORIOH has specified these aims to be achieved in 2003 by research (21% of the total work input), expert services (60%), training and education (10%), and the dissemination of information (8%). There has been a rapid shift in favor of services in the past few years (34% in 1997 to 60% in 2003). This has taken place at the expense of research and training, and the main factor appears to be fluctuation in external research funding. The activity of the ORIOH is very relevant in terms of the set goals.

### *Relevance to future plans*

Several population-level changes influence the operational environment of the ORIOH: strong migrations, the influx into the Oulu area, the ageing of the population and unfavorable trends in the care relationship and changes in economic life, particularly the rise of the electronics industry. The ORIOH has pursued a proactive strategy in prioritizing northern and arctic research, the electronics industry, and project promoting work ability. The Northern Finland birth cohort of 1966 has been and will continue to be an important resource. The balance between research, service, training and dissemination of information has been maintained in spite of fluctuations in funding. One important challenge is to become involved in large-scale research programs, in addition to the research contract with the Finnish Defense Forces. The unique climatic laboratories including several climatic chambers, a wind tunnel and a ventilation laboratory are a resource which can accommodate new large-scale international projects.

### **Customer/Stakeholder relationships**

The steady and, in some areas, increasing level of requested services gives an indication of customer satisfaction. However, the IEG has no detailed information on whether client satisfaction surveys have been conducted or whether non-customers have been surveyed.

### **Impact**

Expert services have become an increasingly important function at the ORIOH, accounting for 60% of the person-years in year 2003. The analysis of metals and PAH in the expert area of mining and metallurgy have been important nationally. The decline in mining has been compensated by penetrating to the occupational health and safety problems in electronics industry, a growing branch both regionally and nationally. Research work in the cold has been nationally and internationally important, and it has been the basis of improvements and recommendations. In conclusion, the ORIOH has had a wide impact on its expert areas, and it has served regional needs according to the goals of the FIOH Regional Institutes.

### **Conclusions and recommendations**

#### *Conclusions*

The ORIOH has a special mandate in the areas relating to work in the cold, covering diverse aspects from physiology to garment design, and mining and metallurgy. Other activities include service and research on industrial hygiene, biomonitoring, occupational medical services, biological hazard assessment, ergonomic and physical exposures assessments. Biomonitoring services cover, among others, mercury, arsenic and polycyclic aromatic hydrocarbons. The ORIOH occupies modern research facilities and instrument park. The ORIOH has close relationships to departments at the University of Oulu, particularly to the Department of Public Health, the home of the Northern Finland birth cohort. The large annual fluctuations in funding between research and service are disturbing, but probably inevitable

under the current funding structure of the FIOH; a Regional Institute is too small to be able to absorb large changes. The problems of overstretching service activities and the large proportion of temporary staff are not unique to the ORIOH, but it has been adversely affected because of changing funding levels.

### *Recommendations*

The particularly strong areas need further emphasis:

74. Work in the cold has national and international importance, and the research, service and development work needs to continue and make full use of the unique resources that have been built up. A higher international profile would be beneficial, and it would be helped by a more visible publication policy in international journals.
75. The Northern Finland birth cohort will be a rich source of data on the whole life experience, relating to the increasingly important problems of psychosocial and physical health. Many new research programs focusing on health throughout the life span should make use of this unique source.

## **4.16 Tampere Regional Institute**

### **Brief description**

The Tampere Regional Institute of Occupational Health (TaRIOH) was established in 1974 and provides services to two provinces, Häme and Vaasa, in Central Finland. It functions as a service and development unit in the field of occupational safety and health. Its tasks are to use its expert services, training, research and information services to support the enterprises, occupational health services and labor protection authorities in the region.

In addition to its regional activities, the TaRIOH is responsible for training occupational safety personnel, improving occupational health care and occupational safety in the construction industry, and providing mobile clinic services on a national scale.

The TaRIOH is currently responsible for the Action Program 'Support for Occupational Safety and Health Activities' (2003-2005).

### **Influence of the 1995-1997 evaluations**

The TaRIOH has put more emphasis on combining its research, service, training and information services. Thereby, it has produced new approaches, action models and methods with which to support the work of occupational safety and health personnel at the workplace. These activities include:

- models and methods for risk assessment and management
- workplace surveys for construction occupations
- visualization methods
- practices for safety management
- comprehensive training for occupational safety and health personnel
- organizational development and consultation for organizational changes
- action models for diagnosing occupational diseases at the regional level.

### **Influence of Ministerial and FIOH strategic goals**

Activities at the TaRIOH are very much in line with the strategic goals of the Ministry and the FIOH. This applies in particular to improving the quality of work life, enhancing health and safety actions at the workplace and developing occupational health services. The TaRIOH has been very active in developing competence and methodology for risk assessment and management at the workplace level. Another important task related to the strategic goals is to develop occupational safety and health in the construction industry; this has been done at the national level. The TaRIOH also works towards these strategic goals by developing and providing national training of safety officers.

## **Management and resources**

43% of the TaRIOH funding comes from the state support and 57% from own income. Of the own income, 10% comes from research, 56% from services, 32% from training activities, and 2% from other sources. The TaRIOH is organized into units of training, laboratory, occupational hygiene, work organization psychology and occupational health.

The TaRIOH laboratory is well equipped for analyzing occupational hygiene air samples, material and product samples, and indoor air samples. Its equipment includes gas chromatographs, an ion chromatograph, a liquid chromatograph, an atomic absorption spectrometer, and a portable X-ray fluorescence analyzer for on-site measurement of metals in buildings and workspaces. The laboratory is accredited for measurements of volatile organic compounds, and quality control in the laboratory is based on the Finnish standard SFS-EN-ISO/IEC 17025. The most important clients are engineering firms, enterprises, occupational health services, and other Regional Institutes.

The TaRIOH has a unique facility in its mobile clinic. The objective of this facility is to provide infrastructures for field studies and supplementary services in occupational health care, such as radiographic examinations and health examinations in enterprises at distant locations. The clinic takes 1,000-3,000 radiographs annually and conducts about 2,000 health examinations.

## **Staff competence and renewal**

The staff at the TaRIOH cover a total of 60 person-years, 33% of which are involved in worker's health, 56% in work environment and 11% in work organizations. The staff spends 16% of its time on research, 7% on information, 54% on services and 23% on training.

To maintain and develop its expertise, the TaRIOH personnel have regularly participated both in the training provided by the FIOH for its employees, and in training offered elsewhere in Finland and abroad. During the evaluation period, three employees received their doctorate and two others obtained a university degree. Two of the staff currently have docent applications under review by a university, and four people are working towards their doctorate.

The age structure of the permanent staff at the TaRIOH leans towards the latter half of the career span. Some 52% of the staff belong to the 50-59 age group, and 8% are over 60 years of age. By 2010, it is estimated that 20 people will have retired. In order to prepare for this trend, the TaRIOH has begun to fill project positions with temporary employees who can work under the direction of their seniors in preparation for filling posts vacated by retiring experts.

## **Key activities**

20% of the TaRIOH staff are involved preventing occupational and work-related diseases, 23% in promoting health and safety in the work environment, and 26% in improving the quality and impact of occupational health. A further 3% are involved

in developing work organizations and well-being, five per cent in promoting work ability, and the final 24 per cent in other (unspecified) activities.

A key activity of the TaRIOH is to provide national training of safety officers. Since 1974, a four-week training course has been regularly held for safety officers in the private sector. In addition, since 1992, the TaRIOH has collaborated with the Association of Safety Officers in arranging three-day courses that provide basic information for safety officers. The Institute has developed a new pilot model for the education of specialists in occupational health care. One of the tasks of the TaRIOH at the national level is to develop safety and health in the construction industry. The TaRIOH has developed a method for workplace surveys specifically for the construction industry, and an action model for maintaining and promoting work ability. The TaRIOH has a mobile clinic to provide supplementary services in occupational health care, such as radiographic examinations. Further, the TaRIOH has formed virtual networks for developing techniques and knowledge for visualization methods. The TaRIOH has performed a number of occupational hygiene and risk assessments in the military. The institute has been involved in developing risk assessment and risk management tools for small and medium-sized enterprises. The TaRIOH is responsible for the occupational aspects of areas with polluted soil, as well as for the occupational hygiene aspects of building renovation.

## **Productivity**

The TaRIOH has produced on average 16-19 scientific, peer-reviewed articles and research reports annually during 1997-2003. This translates into 1.0-1.8 articles and reports per one person-year invested in research. The scientific papers have had a mean impact factor of 1.0-1.8 during the evaluation period. Further, the TaRIOH has published 19-26 other scientific articles and research reports per year, presented 10-13 abstracts in scientific meetings and produced 21-23 popularized articles per year.

With respect to service functions, the TaRIOH has been involved in 35-45 development and consultation projects in the area of psychology of work and organizational psychology during 1997-2003. Further, in the area of work ability and occupational health care, it has been involved in 17-27 projects during this period. In occupational medicine, the TaRIOH has increased its number of patients examined annually from 344 in 1997 to 606 in 2003.

In the area of industrial hygiene, toxicology and biomonitoring, the annual number of occupational hygiene and toxicological statements at workplaces has been stable throughout the period (239-265). Similarly, the number of analyses regarding work environment (3,085-2,849) has not changed much. In contrast, the number of specimens analyzed for research purposes, quality assurance and method development has doubled from 1997-2003 (548-1,116). The TaRIOH is also involved in projects related to occupational safety, as well as to ergonomics and physiology, and performs measurements of physical capacity.

The TaRIOH has been very active in training: TaRIOH has organized 40-55 courses annually, amounting to 3,593-4,993 trainee days per year during 1997-2003. The

TaRIOH had an average of 551-678 lectures at courses, meetings and seminars per year in 1997-2003.

## **Quality**

The TaRIOH has developed a model called 'Workplace surveys for construction occupations' (RATS). To date, surveys have been prepared for six construction occupations, covering about 60% of Finnish construction workers. By the end of 2004, 90% of construction workers will be covered by such surveys. The objective is for RATS to become an interactive medium for occupational health care, FIOH construction experts, and the occupational safety and health personnel of other enterprises. This will be a very valuable resource on the most important hazards in the construction jobs and their control. RATS web pages have been developed and they have been in much use. A questionnaire given to users showed that they considered RATS a useful tool.

The TaRIOH has been involved in a large-scale project sponsored by the European Social Fund on developing the reasoning behind risk assessment and risk management for small and medium-sized enterprises. The TaRIOH was responsible for training in this project. The project developed various tools for risk management, and they have become very popular.

According to the internal division of the FIOH, the TaRIOH is responsible for the occupational hygiene aspects of areas with polluted soil, as well as for the occupational hygiene aspects of building renovation. The expertise within the TaRIOH in these areas has been in much demand from engineering firms, the authorities and enterprises specializing in the clean-up of polluted soil.

## **Action Program: Support for Occupational and Health Activities (2003-2005)**

This Action Program is a joint development between the FIOH and the occupational safety and health (OSH) administrative bodies. The Program consists of six parts: 1) support for strategies and environmental analyses, 2) support for control, 3) training of OSH inspectors, 4) cooperation in the dissemination of information, 5) support for measures required by new legislation, and 6) evaluation of OSH work at workplaces. A number of goals have been developed for each of these parts, whereas the main objective of the Program is to use labor protection know-how through collaboration between the FIOH and the OSH units, in order to improve working conditions and to increase effectiveness at the workplace level. A general aim is to produce operating models and methods for such improvements.

The TaRIOH is responsible for the Program and collaborates with all the other Regional Institutes and several Departments of the Central Institute, as well as with safety and health inspectorates and the Ministry of Social Affairs and Health. The main funding comes from the Ministry. The Program has run for just over one year of the planned three-year period.

## Relevance

### *Relevance to core processes*

Table 20 shows the distribution of person-years by core processes.

*Table 20. Person-years (%) by core process in 1997, 2000 and 2003*

Core process	1997	2000	2003
Research	17	22	16
Information	5	8	7
Services	55	48	54
Training	23	22	23
Total	100	100	100
N	54	59	60

The main activities at the TaRIOH are related to services and training. It provides expert services in occupational hygiene for 200-300 enterprises annually. About half of the evaluations are associated with exposure and risk assessment. Requests for evaluations of indoor climate and moisture or mould damage have been increasing continually. The TaRIOH has systematically worked to develop occupational hygiene risk assessment and control for workplaces. The TaRIOH outpatient clinic is responsible for diagnosing work-related and occupational diseases in collaboration with the Tampere University Hospital. It also provides occupational health consultation for occupational health care units.

The objective of the TaRIOH training activities at the regional level is to increase the ability of individuals in occupational safety and health, labor protection, and management to carry out occupational safety and health activities. In addition, TaRIOH has arranged specialization courses in occupational health for occupational health physicians, occupational health nurses and physiotherapists.

Research and development projects in occupational hygiene have produced the information on chemical and physical risks to health and safety that is needed for risk assessment and control at the workplace level. Further, methods have been established for protective activities. In this, the TaRIOH has been very successful in developing visualization methods and strategies. Research activity supporting occupational medicine and occupational health has added to the knowledge of clients and produced data to guide occupational safety and health activities.

### *Relevance to strategy and mission*

TaRIOH's activities are directly connected to the mission and strategies of the FIOH, with 33-36% of the person-years devoted to workers' health, 50-56% to work environment, and 11-14% to work organizations. The TaRIOH focuses particularly on identifying and preventing occupational and work-related diseases, promoting health and safety in the work environment, and improving the quality and impact of health services and safety at work.

### *Relevance to future plans*

The TaRIOH will continue with the development of expertise and services that support the assessment and the prevention of working environment risks. Further, the TaRIOH will participate in the planning and product development carried out by enterprises. The TaRIOH will use its occupational health facilities to perform early diagnoses of work-related and occupational diseases and preventive intervention. It will also strengthen the collaboration with occupational health care professionals. Moreover, it foresees that the requests for expert services and special actions will become increasingly demanding. The TaRIOH will continue with leading the Action Program on support for occupational safety and health activities.

### **Customer/Stakeholder relationships**

According to a client satisfaction questionnaire covering all areas of TaRIOH activity that was distributed in 1999, 75-89% of the different client groups felt that the TaRIOH's activities corresponded well or moderately well with their needs. Altogether, 96% of the occupational health personnel and 85% the members of occupational safety organizations reported that the training offered suited their needs well or moderately well. At least 80% of the users of TaRIOH's expert services were satisfied with the various service groups.

### **Impact**

The services provided and the tools developed in the specialized areas of competence within the TaRIOH should meet many of the needs of working life in the region. Also, the institute contributes to important national functions such as the training of safety officers and promoting of occupational health and safety in the construction industry. It would be valuable to evaluate the impact of the workplace surveys in this industry. The TaRIOH's activities in risk assessment and risk management at the workplace level have also had important impacts, although they could be strengthened even more through enhanced collaboration with the risk assessment activities within the Central Institute.

### **Conclusions and recommendations**

#### *Conclusions*

The Tampere Regional Institute of Occupational Health is well suited, in terms of both competence and resources, to carrying out its regional functions. During the evaluation period it has strengthened its services and training activities in order to meet regional demand. The TaRIOH also provides important national functions.

The Action Program 'Support for Occupational and Health Activities' is now in its second year of operation, so it is too early to evaluate its accomplishments. The Program appears to have a clear focus and goals. The challenge will be to achieve real and broad collaboration between the FIOH and the OSH administrations, given their different cultures, organization and working procedures.

### *Recommendations*

76. The IEG recommends that an evaluation be undertaken on the use of information and knowledge established from the workplace surveys that have been conducted on the construction sector professions.

## **4.17 Turku Regional Institute**

### **Brief description**

The Turku Regional Institute of Occupational Health (TuRIOH) provides specialist services in occupational medicine, toxicology, occupational hygiene, ergonomics and work and organizational psychology for workplaces in the southwest of the country. The TuRIOH trains doctors, nurses, physio-therapists and psychologists working in occupational health in this region. It supplies the University Hospital with the medical consultations needed in the examination of patients with a disease the cause of which is suspected to be occupational. The TuRIOH also provides other parts of the country with services and training in developing occupational health care for entrepreneurs, evaluating the effects of psychosocial working conditions on sick-listing and early retirement, determining the chemical emission and acoustic properties of building materials, detecting allergenic substances in various products, and improving ventilation and reducing noise in factories. The TuRIOH has been given the responsibility of monitoring and actively studying working conditions and the health of employees working in seafaring and health care in the whole country. It has coordinated two Action Programs 'Working conditions, working capacity and well-being in the social and health care sector' (1999-2002) and 'Changing social and health care work' (2002-2005).

### **Influence of the 1995-1997 evaluations**

In the evaluation carried out in 1995 three recommendations were made for the TuRIOH. First, the size of the staff was considered barely sufficient to meet the demands, especially as regards the need for an additional engineer with ergonomics training and an additional occupational hygiene engineer for field services. Second, additional research on maritime studies, acoustical control studies and the longitudinal study of work stress among municipal employees would require additional staff. The TuRIOH has been able to raise its own income and strengthen its personnel in this way. For example, the research and monitoring of work stress among municipal employees has been partly financed by external resources and has become an important part of the TuRIOH's national tasks.

The third recommendation focused on the equipment in the toxicology/hygiene laboratories, which were considered old. Much progress has been achieved in this area, too. The ventilation laboratory is equipped for full-scale experiments, with instrumentation for air velocity, temperature and contaminant concentration measurements. It has a computer-controlled traversing and measurement system. The acoustic laboratory consists of two reverberation rooms and one anechoic

chamber. The measurement facilities cover building acoustics, occupational noise, building material testing and noise annoyance. It is accredited for testing the sound insulation of building elements.

The instruments used by the chemical laboratory comprise gas and liquid chromatographs equipped with various detectors. Special chambers with controlled temperature and humidity conditions are utilized for testing chemical emissions from building materials. An oven for simulating the thermal degradation of polymers in different working situations is also in use. The methodology used is focused on the determination of solvents, formaldehyde, ammonia and volatile organic compounds from air samples. Methods for analyzing aromatic, primary, secondary and tertiary amines as well as ethanolamines have been developed in the TuRIOH laboratory and analytical services are performed for all FIOH Departments. This is also the case with the determination of different isocyanates, hydrogen sulphide and mercaptans from air samples. Methods for acrylates and cyanoacrylates are also available.

### **Influence of ministerial and FIOH strategic goals**

TuRIOH's core task is to produce specialist services in occupational medicine, toxicology, occupational hygiene, ergonomics and work and organizational psychology. These services contribute to the strategic goals of the Ministry, especially longer work careers, the general functional capacity of the labor force, and the attraction of work and the promotion of well-being.

The Action Programs coordinated by the TuRIOH aim to monitor the changes taking place in social and health care work and their effects on the working conditions, health and well-being of the personnel. These programs contribute to the maintenance of the work ability of municipal health and social welfare employees, and in this way support the strategic goals of the Ministry and the FIOH at the national level.

### **Management and resources**

The total funding of the TuRIOH has increased from EUR 1.9 million in 1997 to EUR 2.4 million in 2003. This is because the TuRIOH has succeeded in increasing the share of its own income quite considerably. Research and services financed by external sources have increased. In 2003, state support covered 46% of the funding while own income covered 54%. It seems that the external funding is now close to optimal as regards the effective functioning of the teams and the overall performance of the TuRIOH. The number of person-years has increased from 34 to 41 between 1997 and 2003.

The TuRIOH's chemical laboratory is up-to-date for its present tasks. Methods for analyzing aromatic, primary, secondary and tertiary amines as well as ethanolamines have been developed in the TuRIOH laboratory, and analytical services are provided for all FIOH Departments. This is also true for some other analyses.

The ventilation laboratory is equipped for the measurement of air velocity, temperature and contaminant concentration. The acoustic laboratory consists of two reverberation rooms and one anechoic chamber. The measurement facilities

cover building acoustics, occupational noise, building-material testing and noise annoyance. It is accredited for testing the sound insulation of building elements.

### **Staff competence and renewal**

The educational level of the staff has improved. Seven employees have a doctoral degree and 22 have a master's degree.

Because of increased external funding, the TuRIOH has been able to recruit several young researchers for research projects covered by outside funding. Despite this regeneration, the age distribution of the personnel has become more skewed towards older age groups. Within ten years, the TuRIOH is going to experience a thorough generation change, even larger than the FIOH in general. Because of retirement, some of the key experts are going to leave the TuRIOH in the coming years. Adjusting to this shift should be started fairly soon.

Research projects have stabilized TuRIOH expertise and broadened its knowledge in the field of acoustics. The TuRIOH employs physicians, psychologists, nurses, physiotherapists, chemists, hygienists, laboratory technicians, engineers, physicists and some other experts. Social science competence is largely lacking, however, although the Action Programs of the TuRIOH have needed that kind of expertise. By networking with other actors and by developing the skills of its staff the TuRIOH has been able to acquire such expertise.

It seems that staff competence is adequate for the tasks of the TuRIOH. However, the management should be concerned with the quite big decrease in staff training during the period under review.

The work atmosphere study carried out at the FIOH in 2003 shows that the workload of TuRIOH's personnel is among the highest of the FIOH Departments. This should be a concern for the management. In other respects the work atmosphere is pretty close to the average at the FIOH. Perhaps one could note that the developmental aspects of work were better regarded at the TuRIOH than at the FIOH in general.

### **Key activities**

The TuRIOH uses over 40% of its person-years on the result area of 'workers' health', and an equal proportion of person-years is spent on the result area of 'work environment'. The latter has increased its share since 1997. Of FIOH's focus areas, 'promoting health and safety in the work environment' takes more than a third of the person-years, and 'promoting work ability' covers 20%.

The TuRIOH provides occupational various occupational health services in its area. This includes advice in questions related to workplace surveys, health examination programs, evaluation of biological, chemical and physical health risks at workplaces. TuRIOH also provides consultations in ergonomics, work physiology and work psychology.

Approximately 200 patients are examined annually at the occupational medicine policlinics at Turku University Hospital, where TuRIOH specialists act as senior

consultants. The main areas of the occupational hygiene service are indoor air quality, exposure to chemical hazards and testing building materials for chemical emissions.

Acoustic services cover measurements, consultation, research and product development. The workplace services are mainly regional, while laboratory testing of products is done at the national level. Ergonomics services consist of consultations and participative development projects aimed at improving working methods, processes, tools and working conditions to prevent musculoskeletal disorders and to promote the working capacity of ageing employees.

Services related to work and organizational psychology are primarily directed towards improving the performance and well-being of work organizations, development of leadership and management practices, and coping with crises and stress, as well as with bullying and violence at work. 40 to 50 service projects related to work and organizational psychology are carried out annually.

The TuRIOH cooperates with the Turku and Pori Occupational Safety and Health Inspectorate by introducing new inspectors to the objectives and tasks of the occupational health services and by training inspectors in the assessment of industrial hygiene, ergonomics and psychosocial risk factors at work.

The training activities of the TuRIOH are not a separate part of the overall activities, but often closely related to and at times integrated with both service and research projects. A considerable part of the training is given in the programs of other organizers. The training consists of courses planned by the staff, courses commissioned by and tailored for specific customers and lectures on desired topics.

Annually, 2-3 physicians are given 6 months training at the TuRIOH as an obligatory part of their specialization in occupational health. As the need for new specialists in occupational health has been growing steadily for many years, new training programs are currently being planned to enable the Regional Institute to train up to 5 new specialists a year in the future.

Started in the 1980s, the TuRIOH has given medical training to ships' officers, which has been legally demanded by national and international regulations since 2002. The total number of these courses in 1997-2003 is 27. The TuRIOH has specialized in maritime occupational health for more than 20 years, working with the maritime authorities, the Ministry of Social Affairs and Health, the shipping companies and the trade unions. It has a legal position as advisor to the Finnish Maritime Administration on the work ability of seafarers with chronic diseases and keeps the national archive of seafarers' medical certificates.

The TuRIOH has been responsible for monitoring the development of working conditions in the social and health care sector. It should be mentioned that intervention studies and service consultations in the health care sector show that it is possible to reduce both physical and the psychological strain at work.

Research on the psychosocial work environment has focused on the determination of the effects of structural changes in work organizations and staffing policies on working conditions and indicators of health such as perceived health, sickness absence, disability retirement and mortality. This research has extended our

understanding of the association between labor market status and health, the role of family and individual characteristics and lifestyle in the development of employee health, and clarified the relationship between health and sickness absence.

One of the national services of the TuRIOH is to focus on occupational health services for entrepreneurs. This is an important task, since less than 20% of entrepreneurs are covered by these services, as compared with nearly 90% of the employed. The TuRIOH has developed an early rehabilitation model for entrepreneurs, which is currently under review by the Finnish National Insurance Institute. The TuRIOH is also taking part in a quality development program for small and medium-sized enterprises called "Steps of Quality", introducing occupational health aspects into the quality processes. To ensure that entrepreneurs know what they may expect from the OHS, they are now more actively informed about the benefits, opportunities and restraints of different occupational health measures than before.

Other special competencies and services of the TuRIOH include polymer technology and welding. Its research and services regarding ventilation and noise control are impressive, partly due to well-equipped laboratories.

### **Action Programs: Working Conditions, Working Capacity and Well-Being in the Social and Health Care Sector (1999-2002), Changing Social and Health Care Work (2002-2005)**

The TuRIOH has coordinated two closely related Action Programs, 'Working conditions, working capacity and well-being in the social and health care sector' (1999-2002) and 'Changing social and health care work' (2002-2005). The objective is to monitor the changes taking place in social and health care work and their effects on the working conditions, health and the well-being of the personnel. Several other FIOH Departments participate in the latter program. The most important is the Department of Psychology, which has two large research projects under way. Both are concerned with the effects of organizational changes on the working conditions of hospital employees. At the TuRIOH one senior and one junior researcher are working full-time, following up the morbidity and mortality of employees in ten municipalities, more than half of whom are working in the social and health care sector. In addition, one researcher is working full-time, examining the physical work load in geriatric nursing, while a fourth researcher is studying nurses' intent on leaving their profession. At the Kuopio Regional Institute, one researcher is studying young physicians' working conditions and work motivation. Important research partners outside the FIOH are the National Research and Development Center for Welfare and Health, the Universities of Helsinki and Turku, and the labor market organizations.

The programs have given the FIOH an understanding of the causes of the changes taking place in social and health care, not only in Finland but in other European countries as well. The Ministry of Social Affairs and Health needs reliable information on the working conditions, health and well-being of social and health care workers. The FIOH should be able not only to provide up-to-date information

on the present situation and assess future trends, but also to make recommendations for government action when necessary. This is valuable because the question of how well the public social and health care system works is acute on the political agenda. All evidence-based recommendations as to how to implement future changes are very valuable, not only from the social and health care staff's point of view, but also to improve the functioning of the system.

FIOH aims to work closely with the National Research and Development Centre for Welfare and Health as well as with the labor market organizations. The national questionnaire carried out in the end of 1999 depicts developments during the 1990s. The next survey, which will be made at the end of 2004, will reveal the trend over the last 5 years. This time special emphasis will be placed on evaluating the social and health care personnel's experiences and opinions on the decision-making procedures in social and health care and the perceived meaningfulness of their work.

## **Productivity**

Increased resources for research have contributed to the increased number of scientific publications, but there also seems to be some productivity increase. The number of peer-reviewed scientific articles as well as other scientific articles has increased during the review period. In 2003, the number of scientific, peer-reviewed articles and research reports was 1.4 per person-year invested in research. The respective mean impact factor was 2.4.

The increase of service production is due to analyses for research purposes, quality assurance and method development. In other areas of service production, there are both increases and decreases, but the changes are less significant. These changes are due to variations in demand.

The use of TuRIOH experts in the courses organized by the FIOH has declined quite a lot, while training in other contexts has tripled during the review period. This is largely due to changes in demand: clients now ask for more tailored and short-term training within the framework of their own training programs, and less often for full training programs from the FIOH.

## **Quality**

The Acoustic Laboratory is accredited for testing the sound insulation of building elements. The accreditation will be extended to cover sound absorption and ventilation noise testing so that the testing repertoire will cover all important acoustic building products. The quality of the analytic procedures of laboratory work is secured by using detailed written instructions. In addition, quality is controlled by attending several international quality assurance programs.

As regards research, the TuRIOH's has some scientific peer-reviewed articles every year, which indicates that adequate quality is being maintained.

## Relevance

### *Relevance to core processes*

The distribution of person-years among core processes has changed during the review period (Table 21). The proportion of research and services has increased, while the proportion of training has declined. However, more training is now provided with research projects and services, so that the actual change has been smaller.

Table 21. Person-years (%) by core processes in 1997, 2000 and 2003

Core process	1997	2000	2003
Research	27	33	35
Information	9	10	8
Services	39	44	46
Training	24	13	11
Total	100	100	100
N	34	37	41

Maintaining a proper balance between services and research activities is a challenge. During the review period the impact of TuRIOH's activities has been shifted somewhat from the workplace level to system level. This is in itself desirable but should not lead to neglecting the acute problems of workplaces.

### *Relevance to strategy and mission*

The TuRIOH carries out the FIOH's strategy and mission in its region by providing specialist services in occupational medicine, toxicology, occupational hygiene, ergonomics and work psychology for the workplaces, by training the doctors, nurses, physiotherapists and psychologists working in occupational health, and by supplying the Turku University Hospital with medical consultations. It also has some national tasks, as agreed within the FIOH, such as developing occupational health care for entrepreneurs, evaluating the effects of psychosocial working conditions on sick-listing and early retirement, determining the chemical emission and acoustic properties of building materials, detecting allergenic substances in various products, and improving ventilation and reducing noise in factories. The TuRIOH has been given the responsibility of monitoring and actively studying working conditions and the health of employees at the national level are seafaring and health care, a task which has particular relevance for the strategies of the FIOH and the Ministry of Social Affairs and Health.

### *Relevance to future plans*

Keeping the present, experienced staff of the Regional Institute and success in recruiting replacements are crucial tasks during the next five years. It is very important to secure the transfer of experience and tacit knowledge from the third of the staff that will be retiring during this period. This includes the Director and two of the three Section Chiefs.

The training of the physicians and nurses entering the field of occupational health is an area where further developments are planned in cooperation with the university and the nursing colleges.

There will probably be a new building erected near the present location of the TuRIOH. If these plans come true, moving to new and more appropriate facilities will be considered.

To strengthen the present base of knowledge in areas where the Regional Institute may best serve the public interest, the TuRIOH aims to deepen and broaden its already good expertise in social and health care work as well as in questions related to acoustics and ventilation.

### **Customer/Stakeholder relationships**

The TuRIOH's networks seem to be appropriate. However, for many years the TuRIOH has not carried out client surveys measuring their satisfaction and expectations concerning the services provided by the TuRIOH. A survey could reach potential clients, i.e. those workplaces which for one reason or another could benefit but do not use TuRIOH's services.

### **Impact**

The TuRIOH makes significant contributions to the improvement of occupational health and safety in its region and also nationwide in its particular areas of responsibility. Its impact in the training, consulting and giving advice to the occupational health staff in its region is good. It works adequately in the detection of occupational diseases with other actors. Its main areas of the occupational hygiene service, indoor air quality, exposure to chemical hazards and the testing of building materials for chemical emissions are impressive. Also ventilation and acoustic services are important.

TuRIOH's Action Programs have provided important information for the national social and health policies, especially as regards the working conditions of the personnel in these services.

### **Conclusions and recommendations**

#### *Conclusions*

The Turku Regional Institute provides specialist services in occupational medicine, toxicology, occupational hygiene, ergonomics and work and organizational psychology in its region. During the review period the TuRIOH has continued to provide high-quality services and succeeded in expanding its research and services based on income sources other than the state support. This has contributed to the strengthening and improved manning of its teams, and laboratories have better facilities than before. The particular strengths of the TuRIOH are expertise in the development of OHS for entrepreneurs, in which area it has done pioneering work in Finland, and some of its laboratory activities, which serve the FIOH as a whole.

The Action Programs have improved the networking of the TuRIOH and increased its nationwide role. They have also contributed to our knowledge as regards the changes in the work of social and health services personnel.

*Recommendations*

77. The TuRIOH should carry out a client survey measuring client's satisfaction and expectations concerning its services. In order to obtain a comprehensive understanding of the need for FIOH's services, the possibility of expanding such a survey to target groups that are not clients should be explored.
78. The TuRIOH is going to experience an even greater generation shift than the FIOH in general during the next ten years. It should prepare a plan for managing this change. The FIOH as a whole should create the common framework for handling this generation shift.
79. The workload of the TuRIOH personnel is one of highest in the FIOH. This problem should be addressed by the management.
80. When the current Action Program ends, it is vital to secure the continuation of upholding and developing the expertise and knowledge in work health and health care personnel. This work has got nationwide significance, and the FIOH should consider giving this task to the TuRIOH, which is well suited to this task.

## **4.18 Uusimaa Regional Institute**

### **Brief description**

The Uusimaa Regional Institute (URIOH) serves the greater metropolitan area of Helsinki and Uusimaa. One quarter of the Finnish population lives in this region, which has Finland's highest density of workplaces. 660,000 people work at the region's 71,500 enterprises, 85% of which have less than 10 workers. The main goal of the URIOH is to provide specialist services and training for workplaces, occupational health care, and authorities. The aims of the research and development projects are to promote occupational safety and health and the functioning of work organization in the region's enterprises.

At the national level the URIOH specializes in indoor environment, small-scale workplaces, construction, which is a branch with a high prevalence of occupational diseases, and in the growing service sector. The URIOH provides services to develop work organizations, carries out ergonomic investigations, and evaluate the need for measures to maintain work ability.

The URIOH was in charge of the 'Indoor Air and Environment Action Program' (1994-1998) and of the 'Small Workplaces Action Program' (1995-2000).

### **Influence of the 1995-1997 evaluations**

As a result of the recommendations, the URIOH has increased its expertise and service work in the psychosocial field and has also responded actively to the recommendation to affiliate researchers to universities.

All patients from the region are referred to the Department of Occupational Medicine at the Central Institute. Also the previous evaluation noted this fact and had recommended that the FIOH explore the possibilities of increasing integration between the URIOH and the clinical activities within the Department of Occupational Medicine.

### **Influence of Ministerial and FIOH strategic goals**

The URIOH has contributed to all focal areas, predominantly to promotion of health and safety in the work environment (41% of person-years in 2003). The person-years have been allocated to improving the working environment (about 60%), workers' health (about 30%), and to work organizations (10%).

The URIOH has been deeply involved in assessing the impact of the Tobacco Acts on the number of people exposed to environmental tobacco smoke (ETS) at workplaces. To facilitate the assessment, new methods for assessment of exposure to environmental tobacco smoke were developed. The URIOH has close and productive cooperation with the local Occupational Safety and Health Inspectorate on topics such as small-scale workplaces and work organization.

## **Management and resources**

The URIOH is organized into four sections (number of employees):

- Occupational Environment. Chemistry and Indoor Air & Environment (11), Physics (5)
- Chemical and Microbiological Laboratory (13)
- Occupational Health, Work Organization and Ergonomics (10)
- Administration/Office (6)

Five medical doctors, two of whom mainly do research, take part in risk assessment, and provide consulting to the local Inspectorate, the occupational health service system, and workplaces. The URIOH has a strong focus on indoor environment and industrial hygiene. To get sufficient psychological expertise in e.g. crisis management activities, The URIOH cooperates with the Central Institute. The URIOH's own income has provided (50±5)% of the funding during the evaluation period. In 2003, services provided 48% of URIOH's own income.

The most important FIOH partners in research and service have been the Turku and Tampere Regional Institutes, and the Physics and Industrial Hygiene and Toxicology Departments at the Central Institute. The external, national clients and collaborators have been the Ministry of Social Affairs and Health, the Ministry of Labour and the Ministry of Education, the University of Helsinki, Helsinki University of Technology and the municipal offices of three major cities (Helsinki, Espoo and Vantaa) in the metropolitan area.

The laboratories and instrument facilities are excellent. The URIOH specializes in analyzing agents in indoor air, and has actively divided other analytical tasks with other FIOH units, taking into consideration the structure of working life in the region. URIOH also takes an active part in the FIOH units' sharing of the less frequently used field equipment.

## **Staff competence and renewal**

URIOH staff covers ergonomics, physical, chemical, and microbiological occupational hygiene, occupational medicine, and psychology, but not physiology, safety technology, toxicology, epidemiology, or sociology. There are two docents affiliated with universities. The percentage of staff having a doctoral degree is a rather low 8%. Forty per cent of the URIOH staff do not have permanent positions and the URIOH has expressed concern that at this level the Institute is vulnerable to time-gaps in funding and is exposed to the constant risk of losing specialist staff who tend to look for permanent positions elsewhere.

The URIOH stressed the need for having its own research in order to develop and maintain the skills of their experts, for method development, and for being able to keep qualified employees. The URIOH has an ongoing process for developing professional competence among its staff. The target competence profile is based on a detailed analysis of the Institute's mission, goals, and strategy. The same analysis also is used to define the competence of new personnel. A steady 2% of paid working time is spent on URIOH personnel training.

The age distribution is quite favorable, with 17% of staff being younger than 30 years. The URIOH has a clear strategy for recruiting replacements for people retiring within the next 10 years.

### **Key activities**

The URIOH provides services for occupational health care centers and for workplaces (e.g. offices, factories, hospitals, schools, day-care centers).

The URIOH has been in charge of two Action Programs. The 'Indoor Air and Environment Program' (1994-1998), which focused on the office-type environments, and the 'Small Workplaces Action Program' (1995-2000), which was implemented to improve disability prevention and to contribute to the maintenance of work ability (MWA) in order to help people continue to work longer, more effectively and productively.

Since the 'Indoor Air Program', the URIOH has become a leading indoor air specialist locally, providing services in this field to hundreds of workplaces, both private companies and municipal and government workplaces. URIOH's multidisciplinary team provides occupational health care centers and workplaces with services including questionnaire surveys, measurement of chemical and biological air contaminants, thermal and ventilation problems, technical building surveys, including moisture damage, and risk assessment.

Experienced occupational hygienists specializing in chemical and physical factors have acted as consultants to factories in traditional exposures such as solvents, dust, fibers, and metals and also in exposure to allergenic plastic compounds, carcinogens, and teratogens. They provide services regarding noise reduction, including acoustic modeling, vibration, non-ionizing radiation, and illumination. They are also responsible for exposure assessments related to patients referred to the Department of Occupational Medicine. The URIOH takes part in international standardization (ISO and CEN) and cooperates with developing countries.

The URIOH has investigated smoking habits and exposure to ETS and collected information about the implementation of the second reform of the Tobacco Act, with particular reference to restaurant workers.

The URIOH has studied causes of occupational diseases associated with exposure to microbes in water-damaged buildings, used microbial-derived volatile organic compounds and toxins to assess sources, and used immunological methods to determine farmers' exposure to specific micro-organisms.

The psychosocial dimension of indoor environment problems is a key competence of the URIOH. Their approach rests on a theoretical model based on studies that identified the typical characteristics of those companies, which were able to resolve their problems. Finally, the influence of indoor air problems on work organization and productivity has been investigated. Another specialty is their internet-based questionnaire that can be coupled in real time with measurement of physical-chemical exposures.

Other key activities in research have included diagnosing asbestos-related diseases and asbestos-exposure prevention, occupational health at small workplaces, including shoe repair shops, the construction industry, and veterinarians' occupational health and work environment.

The URIOH provides training in occupational health and medicine, occupational environment and safety, work organization, and ergonomics.

## **Productivity**

Scientific papers have consistently been published within all major activities of the URIOH. The number of peer-reviewed papers per person-year invested in research is in the lower half among the Regional Institutes.

Each year the URIOH specialists have consulted with over 1,000 workplaces. The number of occupational statements (final reports on analysis and interpretation of the working environment and health problems) has varied between 300-350 each year, which is the highest among all Regional Institutes. Each year the laboratory has carried out over 2,400 chemical and 1,000 microbiological analyses. Roughly one-third of all laboratory analyses performed were for research.

Each year URIOH arranges, on average, over 30 courses on occupational health and medicine, the occupational environment and safety, work organization, and ergonomics in part as tailor-made courses on special topics for companies. This number compares well with other Regional Institutes while the number of lectures at courses is lower than for the other Regional Institutes, and is declining.

## **Quality**

The services of the URIOH are in demand by customers, which documents their relevance and quality. Since 2003, the URIOH has had an accredited laboratory for analyses of VOC and ammonium. To handle and document the samples from the time of delivery at the front door to writing the report an integrated, computerized laboratory data management system is used. The number of analyses has increased since accreditation.

URIOH researchers have published papers in the leading occupational health journals and their impact factors are comparable to the mean of the top-ranking journals. The URIOH recently won an international award for its development project on improving chemical safety in small-scale industry.

## Relevance

### *Relevance to core processes*

From a low of 18% in 1997, research now receives over 30% of the person-years. As a consequence, the percentage of person-years used for information and for training in 2003 is only half of what it was in 1997 (Table 22).

Table 22. Person-years (%) by core processes in 1997, 2000 and 2003

Core process	1997	2000	2003
Research	18	38	32
Information	14	7	7
Services	42	33	48
Training	25	22	13
Total	100	100	100
N	48	52	53

Among URIOH's many scientific achievements are their papers on the role of psychosocial factors in the indoor environment and their Internet-based indoor environment quality questionnaire coupled to the on-line recording of markers for indoor air quality, temperature and air movements. The former has led to the development and practical use of an excellent loop-model for indoor environment problem identification and solving, which as one key feature has worker participation and follow-up. The latter is a unique facility that is now in practical use at customers and that offers wide scope for collecting information on indoor environment exposures and symptoms and speeds up survey processes.

The number of consultations in the URIOH specialty field of indoor environment is still increasing and there has been increasing interest in the services regarding organizational development. The URIOH's multidisciplinary teams offer services that are very attractive for occupational health care centers and for workplaces. Due to the special interest at the URIOH and local needs there has been a significant increase in consultation on problems dealing with small-scale industries. The URIOH estimates that the real need is probably much larger, but that the financial situation of small-scale industry limits the number of requests.

The URIOH has contributed with guidebooks, particularly on construction work. In cooperation with the TaRIOH, the hygienists have created information material on chemical and physical hazards for Internet data banks. The URIOH was aware, that the internet could be used to a greater extent.

### *Relevance to strategy and mission*

The URIOH contributes to mission and strategic aims through research and development in the promotion of occupational safety and health and the functioning of work organization in the region's enterprises and through provision of specialist

services and training for workplaces, occupational health care, and authorities. The URIOH has contributed to all the strategic aims of the FIOH. It serves the needs of the region, which has many office-like working places and small-scale enterprises. The person-years used for improving the working environment have been about 60%.

#### *Relevance to future plans*

The Action Program 'Small Workplaces' has identified several future challenges and the URIOH intends to enable the OHS to better serve the small industries. The URIOH also intends to establish a consortium consisting of a group of small enterprises having the same type of problem and apply for a research grant to be able to continue its research at small-scale workplaces.

In the region, a large number of new workplaces are created, employees without previous experience work in demanding jobs, and many workers come from foreign countries. The URIOH intends to direct research activities at these questions in collaboration with workplaces, local occupational health services and authorities.

The URIOH expects increasing difficulties in obtaining funding. To meet this challenge, the URIOH intends to widen its present network to be able to form research teams that have broad competence.

### **Customer/Stakeholder relationships**

The URIOH conducted three client satisfaction surveys. Unfortunately, their reliability was low due to the low response (30%). The URIOH found that one of the main strengths of the 'Small Workplaces' Action Program was the consensus and support of the various stakeholders: the Ministry of Social Affairs and Health, the FIOH, the Ministry of Labour, the Ministry of Trade and Industry, the Social Insurance Institution, the Federation of Accident Insurance and Employment Pension Institutions, and trade unions.

### **Impact**

URIOH's tiered approach to identifying and solving indoor environment problems ensures the cost-effectiveness of its service. One specialty of its approach is to include a follow-up. Thereby, monitoring the impact is an integral part of the service. This will improve the ability to assess and manage indoor environment problems.

The URIOH has shifted from single measurements towards the interpretation of the measurements and risk assessment, making its service more operational at the user level. Its use of noise prediction models is valuable as a tool for motivating enterprises to do proactive noise planning.

The Action Program 'Indoor Air and Environment' had a major impact within the FIOH and on workplaces, and it was very productive. It increased the multidisciplinary competence of the staff, and new methods and facilities were developed and implemented. Many more health care personnel are now involved and trained in this problem area.

## **Conclusions and recommendations**

### *Conclusions*

The URIOH serves the greater metropolitan area of Helsinki and Uusimaa, which has 71,500 enterprises. The URIOH specializes in indoor environment, small-scale workplaces, construction, and the service sector. The laboratories are of a high standard and well-equipped. The research is of good quality and their services are in high demand. The fact that all patients from the region are referred to the Department of Occupational Medicine and that URIOH occupational hygienists are responsible for exposure assessments of the patients creates some problems.

### *Recommendations*

81. The occupational physicians at the URIOH are an invaluable part of the multidisciplinary approach to hazard identification and risk assessment at the workplaces, but they have no opportunity of working in outpatient wards. It is recommended that this situation be evaluated during the evaluation recommended for the clinical services at the Department of Occupational Medicine. This is in agreement with the recommendations given in the previous evaluation.
82. In response to the previous evaluation, the URIOH has affiliated researchers to universities. The IEG recommends that the URIOH continue and strengthen this effort.
83. The information and training activities have been declining throughout the evaluation period. The IEG recommends that the URIOH increase these activities.

## 5 Comments to Questions from the Ministry of Social Affairs and Health

The International Evaluation Group appreciates the opportunity to learn about the strategies of the Ministry of Social Affairs and Health and to evaluate the responsiveness of the Finnish Institute of Occupational Health. Our replies to specific questions from the Ministry are provided here.

### 1. Society and customer results (mission effectiveness)

#### **a) Have strategies, division of resources and main activities of FIOH been in accordance with its legislative mandate and the relevant strategic objectives set by the Ministry of Social Affairs and Health?**

It is our understanding that in the strategic vision of the Ministry of Social Affairs and Health (Strategies for Social Protection 2010, published 2001) the following strategic objectives were set:

- “People stay on at work for 2-3 years longer than they do at present
- The general functional capacity of the population improves
- Work is more attractive and promotes well-being
- Social exclusion diminishes”

FIOH Departments and Regional Institutes and the Information Offices are attentive to legislative mandates and to the intentions and requests of the Ministry of Social Affairs and Health. FIOH’s strategies, assignment of resources, and activities flow from the legislative directives and the strategies of the Ministry. Substantial National Programs and Institute Programs have been developed and conducted in all years to advance the intentions of the Ministry. It is the view of the International Evaluation Group (IEG) that the work of the FIOH contributes significantly to the strategies of the Ministry of Social Affairs and Health. The IEG also observes that the FIOH contributes to the strategies of other ministries such as the Ministry of Labour, and other governmental agencies.

#### **b) Have the inputs for and the outputs of FIOH’s core processes (research, services training and information) been appropriate for achievement of the relevant objectives set by the Ministry of Social Affairs and Health?**

The inputs (resources, expertise of staff, design and conduct of staff activities) and the outputs by FIOH staff have been appropriate as the FIOH’s contribution toward meeting the objectives set by the Ministry of Social Affairs and Health. These outputs have included new knowledge from the high-quality research projects and preparation of practical guides and tools for use in service, training, and information dissemination.

The FIOH directs the work of the staff in the four core areas, all of which contribute directly to the four strategic objectives of the Ministry of Social Affairs and Health.

In the chapters of the evaluation report, the IEG provides suggestions to the FIOH regarding ways to strengthen coordination and collaboration internally and externally in order to further address the strategic objects, and to further clarify for stakeholders and customers the relationship of the FIOH programs and projects to the strategies of the Ministry.

Continuation of the high-quality FIOH research is essential, because it provides the knowledge necessary for success in the other three core processes. Transfer of research into practice at workplaces is of the utmost importance and can be strengthened and further focused. The IEG notes that additional emphasis on intervention effectiveness (evaluation) research will assist in identifying which are the successful workplace changes that advance the strategic goals of the Ministry. The IEG recommends that the FIOH strengthen staff expertise and undertake more intervention effectiveness research. Additionally, identification and evaluation of the effectiveness of key practical tools and information to effect change in workplaces is needed. Further, the FIOH should strive toward achieving full accessibility of all Finnish workplaces to these useful tools and information products.

The IEG understands that a key strategic objective of the Ministry is that ‘People stay on at work for 2-3 years longer than they do at present’, and that various Finnish institutions are working toward this same result. The IEG notes that strong societal and economic factors can control whether people stay at work longer, particularly the generation that has recently experienced the turbulence of the 1990s. Additionally, there is no current evidence in any country that addresses the question how much will a good working environment keep current generations nearing retirement at work substantially longer than those who are immediately preceding them. The IEG values the Finnish approach from within and outside the workplace. Finland is a leader in this type of effort. Therefore, a general comprehensive plan, including research, that would design, monitor, analyze and evaluate over time the successful societal interventions from the FIOH and other Finnish contributors to this objective, might be valuable. Contributors to such an effort would need to be from the FIOH and other relevant Finnish institutions.

The work of the FIOH to improve work ability and the work environment and to advance healthy and attractive working organizations is the key to understanding what aspects of work can succeed in keeping people at work longer. The FIOH is viewed globally as a leader in this area. The IEG also notes the importance of the FIOH work regarding young workers, because the effort to understand the factors that shape the choices of young and middle-aged workers will allow society to place emphasis on putting positive factors in place nationally. The IEG notes the potential value of the mobilization of all partners, including those at the workplaces, to carry out developmental and intervention programs in the workplaces and to evaluate their effectiveness.

The IEG also recognizes the importance of the innovation chain as developed by the FIOH. The practical activities of the FIOH in Finnish workplaces as well as the FIOH’s exploratory research brings in the knowledge of the actual problems. These provide stimuli for research, and fertilize training and information and also lead to new types of services. Such an innovation chain ensures that the core processes are kept in close contact with each other.

**c) How should the FIOH's resources, their internal allocation and main activities be developed for the achievement of the strategic objective to increase the average retirement age?**

The age at which people retire from work is a function of many different types of factors. It depends on the possibilities provided by the pension system, such as age limits, criteria for getting an early retirement pension, the amount of pension earned so far, etc. In the short term, these features of the pension system are strongly determinative for the retirement age. To what extent the possibilities created by the pension system are actually used by the employees, also depends on many factors. It depends on the work, how meaningful and rewarding is the work itself and how are social relations at work. To a certain degree it also depends on the health and work ability of the employee, and the fit of the work for the employee, as well as on work welfare.

It is here that focus areas of the FIOH's strategy can make a difference: preventing occupational and work-related diseases and injury, promoting health and safety in the work environment, promoting the development of human resources, developing work organizations, promoting work ability, promoting health and safety through useful information, promoting the occupational health of young people, and improving the quality and impact of occupational health services and safety at work.

We conclude that the FIOH's activities contribute to the Ministry objective, but we also make suggestions throughout the evaluation document on how FIOH can contribute even more. For example, the excellent service of the Regional Institutes can be strengthened to increase assistance to companies to implement and evaluate interventions in workplaces. Broadening the research partnerships with social partners, occupational health professionals, and academics will help to put in place broadly in Finnish workplaces those interventions found to be successful in research and demonstration projects. Broad implementation of change in workplaces will be advanced by the identification and evaluation of successful tools for use in workplaces and by making them available to all Finnish workplaces, small enterprises, entrepreneurs, and independent farmers.

**d) Are the outputs in FIOH's each priority area adequate and effective in view of the needs of Finnish work life?**

- i. Preventing occupational and work-related diseases**
- ii. Promoting health and safety in the work environment**
- iii. Developing work organizations and the well-being of personnel**
- iv. Promoting work ability**
- v. Improving the quality and impact of occupational health services and safety at work**
- vi. International and EU activities**

The IEG notes that these needs of Finnish work life constitute the six objectives of the the FIOH Strategy 2004–2007. We have provided some detailed assessments of the FIOH contributions to these areas in the chapters of this evaluation and in some specific recommendations. Here we provide a summary.

The FIOH is internationally recognized for high-quality research and leadership in occupational health in these priority areas. The service, training and information functions have assisted in bringing the knowledge in these priority areas into the workplace. Without neglecting the traditional work hazards found, for example, in construction and in work in the cold, the FIOH has been emphasizing the development of work organizations, the well-being of personnel, and the promotion of work ability in research, training, services, and information development. In order to hasten the recognition and implementation of beneficial interventions in workplaces, the IEG encourages the FIOH to undertake evaluation research to identify which interventions successfully advance health and safety, good work organization, the well-being of personnel, work ability and the quality and impact of occupational health services.

Collaborations of FIOH researchers in projects with colleagues from the Nordic countries and from the European Union are benefiting both Finland's workers and those in other countries. The FIOH should continue to encourage these opportunities. The FIOH is highly valued by both WHO and ILO for the work of FIOH staff on many levels needed by these organizations: research, technical assistance, advice, conferences, policy development, capacity building, and information dissemination. The IEG encourages the FIOH to continue its support of this international work.

## **2. Knowledge, competence and work ability**

**a) Are the knowledge and competence of the FIOH and its personnel adequate and sufficient for the current and forthcoming needs in respect to:**

- i. Comprehension, coverage and level of knowledge and competence**
- ii. Renewal/ensuring of knowledge and competence**
- iii. Role and tasks of the departments in sustaining knowledge and competence**
- iv. Internal and external co-operation and partnerships**

The quality and diversity of expertise is outstanding. Although there is some variability, FIOH researchers are very productive in generating scientific research publications, services and training, and the Institute has an information strategy that provides for levels of information to be delivered to various audiences. Many tools and good practice sheets are developed and made available. The IEG encourages the FIOH to enhance its understanding of and use of evaluation research to increase understanding of the useful characteristics of key tools, guides, information materials and training programs and of their impact in the workplace.

About one third of the FIOH staff will retire in the next ten years. Some departments and regional institutes are making good progress in developing young experts to ensure renewal, but such efforts should be enlarged and assisted by the FIOH leadership. Such a substantial retirement group presents some problems for the future coverage of priority areas. However, this also presents an opportunity to bring in new types of expertise and to shift emphasis to new areas, and particularly toward those areas key to increasing the average age of retirement. The IEG encourages the FIOH to assess current and anticipated priority areas and to develop permanent thematic areas with approaches modeled after the successful temporary

and collaborative Action Programs. This will channel expertise and resources more clearly to priority thematic areas and clarify the roles of the core processes to ensure progression from research to practice, utilizing services, training and information.

Internal and external co-operation is excellent in some areas but can be improved in others. Collaboration of the Departments and the Regional Institutes in Action Programs has been excellent and is highly valued by the staff. External cooperation has been of high quality and should be continued with social partners, companies, professional associations and scientific institutes in Finland. Cooperation in many EU activities has been at a very high level, ranging from country twinning, to research, to efforts of the European Commission and the European Agency for Safety and Health at Work. Nordic cooperation also continues at a high level.

**b) Are employees rewarded; is their work appreciated; is their work ability promoted?**

The 1995-1997 evaluations pointed out the problem of overload of the FIOH staff. The IEG believes that the generally hard working and committed staff continues to struggle with balancing the demands of service requests against ongoing research, training and information obligations. The IEG recommends that the FIOH leadership undertake an analysis and develop and evaluate some pilot solutions to help the staff achieve a better workload balance.

There was a recent salary reorganization which has not been well-received by some staff. Also, it seems that there has been a loss of young professionals because FIOH salaries are not competitive, and that the salaries of the senior professionals also are not competitive, although few have departed from the FIOH. This is a difficult area, and the IEG understands that the FIOH leadership will continue to seek appropriate solutions regarding salaries.

**3. Operational efficiency and quality**

**a) FIOH's core processes are research, dissemination of information, training and services:**

- i. Are the core processes organized and managed efficiently?**
- ii. Assess the quality and productivity of the core processes**
- iii. Is the quality of the core processes managed adequately?**

The FIOH is extraordinarily productive in the generation of research, provision of training and services and dissemination of information, and the quality of the work is generally of a high quality. Detailed assessments are provided in the chapters of this evaluation report.

The management of the core processes in some parts of the Institute can be improved. For example, the management of research could be improved to ensure cross-Institute collaboration. Management by objectives is viewed by some FIOH staff to reward production of high numbers of publications, products and services by individual departments and regional institutes, thus deterring broad collaboration. The 1995–1997 evaluations also noted that the management by objectives system works against collaboration at the Institute. The addition of the Balanced Scorecard approach

does not seem to have changed the situation yet, but the Action Programs are widely valued for bringing about genuine collaboration. The IEG recommends the leadership of the FIOH to assess the situation and to consider the incorporation of approaches that would continue to assure high-quality products, but which would also encourage collaborations more strongly and enhance the work ability of the staff. It is the view of the IEG that genuine cross-Institute coordination in major topical areas will require that indicators of success, and managerial and staff performance evaluations, address the strength and effectiveness of collaborative and coordinated efforts.

#### **4. Resources and financing**

##### **a) Are the FIOH's resources adequate for its mission and are they adequately allocated within the Institute?**

Although additional funds would always be welcome, the resources are adequate. FIOH has an obligation to provide services and training, for which it charges in order to cover the legally determined 20% of the state-approved budget. On top of that, the FIOH has found it necessary to collect more income to finance many relevant activities which otherwise could not have been done at all. It is the view of the IEG that this income has considerably improved the FIOH's total impact on Finnish working life.

The Action Programs provide models for resource allocation to bring appropriate partners from within and outside of the Institute together to focus on important themes. The Action Programs are highly praised for generating new collaborations that enhance the focus and impact of the program, develop new projects, and generally provide a plan to bring research into practice in the workplace and into OHS expert practice. Action Programs that include partners from various levels in society, as in the program on Youth and Work, for example, have great potential to foster mutual exchange of ideas, topics and expertise between science and practice. However, it is widely viewed that the startup and termination of the temporary Action Programs have been difficult, in part due to the need to seek outside funds for startup and to terminate the funds at the end, even when components of the Action Program should be incorporated into the department or regional institute. The IEG suggests that the FIOH leadership set up a working group to evaluate and modify resources, timetables, and processes.

##### **b) Is FIOH's technical infrastructure (instrumentation and equipment, information and communication technology, work spaces) optimal for current and future needs?**

The FIOH has a good infrastructure, including work spaces and laboratories, and the addition of the new building, a new department of occupational health services and a training centre. These seem optimal for current and future needs.

## 6 Appendices

### ***Appendix 1. Customer and Stakeholder Input to the 2004 Evaluation***

In 2004, FIOH carried out a customer survey to assess the satisfaction of its clients. The survey of used the same format of the 1999 survey, so that many results could be compared. The IEG received a preliminary report of the findings, which indicated that generally the clients are very satisfied. Currently, the results are undergoing a thorough analysis, and then a working group will be created by FIOH to discuss and outline the actions needed and suggested by the analysis. Following broad discussion in FIOH, conclusions and recommendations will be presented to the board of directors. The IEG concurs that this is a good way to utilize such research. It would be valuable for FIOH to consider carrying out a survey targeted to reach non-clients. This could be a way to evaluate the particular types of clients with need for FIOH's services, and to achieve information why those in need do not use its services.

The IEG met with the following customers and stakeholders of FIOH. During the meetings, the IEG inquired of each group what they consider particularly valuable in the work of FIOH and what they might like to see enhanced. A summary of this information is provided in the text of the Overview of the Finnish Institute.

The evaluation group interviewed the following representatives:

#### *FIOH Board of Directors*

Prof. Mats Brommels, Chair

See also the list below:

\* Member of the FIOH Board of Directors

\*\* Deputy member of the FIOH Board of Directors

#### *Ministry of Social Affairs and Health*

Mr. Markku Lehto, Permanent Secretary

Mr. Kimmo Leppo\*\*, Director-General, Health Department

Mr. Mikko Hurmalainen\*, Director-General, Department of Occupational Safety and Health

Dr. Matti Lamberg, Medical Counsellor

#### *Ministry of Labour*

Mr. Matti Salmenperä\*, Director

Ms. Raila Kangasperko\*\*, Governmental Counsellor

#### *Finnish Confederation of Salaried Employees (STTK)*

Mr. Erkki Auvinen\*, Advisor for Working Environment

#### *Central Organisation of Finnish Trade Unions (SAK)*

Ms. Kirsti Palanko-Laaka\*, Director

Ms. Raili Perimäki, Secretary for Working Environment

*Confederation of Finnish Industry and Employers (TT)*

Dr. Kari Kaukinen\*, Expert Physician

*Employers' Confederation of Service Industries (PT)*

Mr. Antti Mähönen\*\*, Senior Adviser

Ms. Riitta Wärn, Senior Adviser

*Central Union of Agricultural Producers and Forest Owners (MTK)*

Ms. Kaarina Knuuti\*, Director

Mr. Ilpo Mattila\*\*, Head of Section

*Finnish Association of Occupational Physicians*

Mr. Mikko Nykänen, Chair

Mr. Teppo Toponen\*, Member of the board

*Finnish Association of Occupational Health Nurses*

Ms. Taina Tuhkanen\*, Member of the board

Mr. Tuomo Nenonen, Organization Secretary

## **Appendix 2. Plan for Scientific and Functional Evaluation of the Finnish Institute of Occupational Health**

*Sent to International Evaluation Group on 12 November 2003*

### **International evaluation of the Finnish Institute of Occupational Health**

#### **Background**

In 1994 The Finnish Ministry of Social Affairs and Health decided to evaluate the Finnish Institute of Occupational Health (FIOH). The evaluation was carried out by an international evaluation group, and the group submitted its report in June 1995. In 1997 the same group examined the effects of the evaluation in a follow-up meeting. The evaluation proved to be a useful tool for developing the functions of the Institute. It was recommended in the follow-up report that the evaluation is repeated in the next 5 to 10 years.

Since the mid-1990s evaluations have become an established method of quality management and development work in organisations, intervention programs and even in single projects. The Ministry of Social Affairs and Health uses evaluation for auditing and developing the institutions in its sector. In the evaluation of research and development (R&D) activities, assessment of effects and impacts has become a major issue.

A high quality of work life as a basis of social welfare and economic competitiveness is one of the cornerstones of Finnish society. In the strategic vision of the Ministry of Social Affairs and Health (Strategies for Social Protection 2010, published 2001), the following strategic objectives were set:

- people stay on at work for 2-3 years longer than they do at present
- the general functional capacity of the population improves
- work is more attractive and promotes well-being
- social exclusion diminishes.

#### **The mission and organisation of FIOH**

The Finnish Institute of Occupational Health produces, collects and disseminates evidence-based information on the interaction between work and health, and promotes its utilization. FIOH also provides expert services, and trains occupational health and safety specialists. In this way FIOH contributes to improving the work ability, health and well-being of the working-aged population of Finland.

FIOH consists of the Central Institute located in Helsinki and of six Regional Institutes located in all main regions of the country, i.e. the metropolitan area, Turku, Lappeenranta, Tampere, Kuopio and Oulu. The Central Institute comprises eight research departments, as well as the Training Centre, the Editorial Office for the periodical 'Work Health Safety', the Information Service Centre, and the Administrative and General Service Departments. FIOH is governed by the Ministry of Social Affairs and Health and its highest administrative organ is the Board of Directors, where, in addition to the Ministry of Social Affairs and Health, the Ministry of Labour, and the labour market organisations are represented. The organisational chart of the Institute is given on pages 8-9 of the Annual Report 2002 (enclosed).

In 2003 the total annual budget of FIOH is approximately 60 million euros. About 60% of the total budget (35 million euros) is covered by government funding. 40% (25 million euros) of the budget is financed by FIOH's own income cumulated as fees for services, training courses, publications and external grant funding for research projects. The average number of permanent personnel is about 600; additionally, around 230 persons are employed in the projects or in other functions on external funding.

## Scope and purpose of the evaluation in 2004

The task of the international evaluation group is to assess how FIOH succeeds in implementing its mission in modern work life. The evaluation should be future-oriented, and should make recommendations for the further development of FIOH's activities. The evaluation concerns FIOH both as an institute and its main units (departments and regional institutes).

The evaluation will address the effectiveness of FIOH and its prerequisites. The following four perspectives make the framework of the evaluation:

1. society and customer results ('mission effectiveness')
2. knowledge, competence and work ability
3. operational efficiency and quality
4. resources and financing.

(The framework is based on the Balanced Scorecard model, and it is, with slight modifications, applied widely in strategic planning in the administrative sector of the Ministry of Social Affairs and Health, also in FIOH).

The time period of the evaluation covers the years 1997-2003, and the future perspective extends until 2010.

## Objects of the evaluation

The evaluation should focus on the following issues, but the evaluation group may choose to evaluate also other topics relevant to the purpose of the evaluation.

### *1. Societal and customer results*

a) Have the strategies, division of resources and main activities of FIOH been in accordance with its legislative mandate and the relevant strategic objectives set by the Ministry of Social Affairs and Health?

b) Have the inputs for and the outputs of FIOH's core functions (research, services, training and information) been appropriate for achievement of the relevant objectives set by the Ministry of Social Affairs and Health?

c) There has not been much progress in the strategic objective concerning retirement age. How should FIOH's resources, their internal allocation and main activities be developed for better achievement of this objective?

d) Are the outputs in FIOH's each priority area adequate and effective in view of the needs of Finnish work life?

- prevention of occupational and work-related diseases
- promotion of health and safety in the work environment
- developing the functionality of work organisations and in promoting the well-being of the personnel
- promotion and maintenance of work ability
- improving the quality and impact of occupational health services and safety at work
- national and international activities.

### *2. Knowledge, competence and work ability*

a) Are the knowledge and competence of FIOH and its personnel adequate and sufficient for the current and forthcoming needs in respect to:

- comprehension, coverage and level of knowledge and competence
- renewal/ensuring of knowledge and competence
- role and tasks of the departments in sustaining knowledge and competence
- internal and external co-operation and partnerships.

b) Are employees rewarded; is their work appreciated; is their work ability promoted?

### *3. Operational efficiency and quality*

FIOH's core processes are research, dissemination of information, training, and services.

a) Are the core processes organised and managed efficiently?

b) Assess the quality and productivity of the core processes.

c) Is the quality of the core processes managed adequately?

#### *4. Resources and financing*

- a) Are the FIOH's resources adequate for its mission, and are they adequately allocated within the Institute?
- b) Is FIOH's technical infrastructure (instrumentation and equipment, information and communication technology, work spaces) optimal for current and future needs?

## The evaluation report

The evaluation group is expected to produce a report representing a consensus view of the evaluators. The evaluators are encouraged to take an independent, critical approach by using, if possible, corresponding institutes in other countries as references. Evaluation of any other questions and aspects, which may be found appropriate by the group, are welcomed.

The evaluation report should include proposals for future development of FIOH's activities, its tasks and priority setting and resources.

## Material

Prior to the work of the independent group of external evaluators, FIOH will produce a self-evaluation report, which will address each of the four perspectives of the framework suggested for the evaluation. The time span of the material to be used is 1997-2003.

The evaluation group is encouraged to ask for any additional information from the Institute which may be needed for the assessment of FIOH activities.

## The international evaluation group

The following experts will be contacted for the evaluation of the activities of the Finnish Institute of Occupational Health:

Dr Marilyn Fingerhut, US National Institute of Occupational Safety and Health, USA (Chairperson of the group)

Professor Frank van Dijk, University of Amsterdam (occupational health services, evaluation activities)

Professor Erik Dybing, Norwegian Institute of Public Health, Norway (toxicology, risk assessment)

Professor Kari Hemminki, German Cancer Research Center (DKFZ), Germany, and Karolinska Institutet, Sweden (molecular and genetic epidemiology, cancer research, biomarker research)

Professor Lars Hagmar, University of Lund, Sweden (occupational medicine, epidemiology)

Dr Joachim Lambert, Commission for Occupational Health and Safety and Standardization (KAN), Germany (physical factors, safety, prevention technology)

Dr Thomas Schneider, National Institute of Occupational Health, Denmark (occupational hygiene, exposure assessment, prevention technology)

Professor Hannu Uusitalo, the Finnish Centre for Pensions, Finland (working life research, sociology at work)

Professor Gunnela Westlander, University of Linköping, Sweden (organisational and work psychology)

## **Tentative time schedule**

The evaluation report is due on 31 May 2004.

Acceptance of the assignment by the evaluators	October 2003
Background material	End of 2003
Self-evaluation material	2 February 2004
First meeting of the evaluators in Helsinki seminars with the Institute staff members, outlining the report	23 - 28 February 2004 (6 days)
Compiling the report	March-April 2004
Second meeting of the evaluators in Helsinki seminar on preliminary results, interviews of the clients of the Institute, revising the report	21 - 23 April (3 days)
Final report	End of May 2004
Third meeting of the evaluators in Helsinki seminar on evaluation at FIOH, hand-over of the report	10 June 2004 (1 day)
Publishing the evaluation book	August 2004

## **Administrative questions**

The evaluators will receive honoraria corresponding to the Scandinavian practices. The costs of travelling, accommodation and daily allowances of the evaluators will be covered by the Finnish Ministry of Social Affairs and Health. The Institute management and staff are expected to make all efforts to facilitate the work of the evaluators, e.g. by providing additional information and, if needed, secretarial help, organizing meetings with clients and interest groups, etc.

## **Appendix 3. Activities of the FIOH in 1997 2003: Executive Summary**

*Sent by FIOH to the International Evaluation Group in March 2004*

### **FIOH: mission, organisation, and strategy**

#### ***Mission***

The Finnish Institute of Occupational Health, FIOH, is a research and specialist organisation in the field of occupational health and safety. The Finnish Institute of Occupational Health promotes the work ability and functional capacity, general health and quality of life of Finnish people of working age. To this end, the Institute produces, compiles and disseminates scientific information on the relationship between work and health and promotes its utilisation.

#### ***Organisation***

FIOH consists of the Central Institute located in Helsinki, and of six Regional Institutes located in all main regions of the country: Uusimaa, Turku, Lappeenranta, Tampere, Kuopio and Oulu. The Central Institute's eight departments represent different disciplines in occupational health and safety. The Central Institute comprises also the Training Centre, the Editorial Office of the periodical 'Work Health Safety', the Information Service Centre, and the Administrative and General Departments. The departments and their main tasks are described in Appendix 1.

FIOH is governed by the Ministry of Social Affairs and Health and its highest administrative organ is the Board of Directors, where, in addition to the Ministry of Social Affairs and Health, the Ministry of Labour, and the labour market organisations are represented.

The Executive Committee supports the Director General in leading the FIOH. The members are directors of departments, and they represent the strategic areas and core processes of FIOH. The current Executive Committee was nominated in November 2003. In order to improve the communication between departments and the Committee, each member represents a group of departments.

Since 1997 there have been two major changes in the organisational structure of the FIOH. The Department of Research and Development in Occupational Health Services was founded in 2001 in order to strengthen the Institute's support for the occupational health service system in Finland. The second major change was the founding of the Training Centre in 2002 as a response to the challenge arising from the generation change-over and legislative reforms in occupational health and safety.

FIOH's *action programmes* are tools for solving major current and emerging problems in Finnish work life. The action programmes are carried out in multidisciplinary collaboration, and they put all the core processes of FIOH

(research, services, training, and dissemination of information) to use. FIOH often carries out the programmes with collaborative partners. They extend the scope of expertise, and bring the end-user's perspective to the programme. FIOH's action programmes in the period of 1997-2003 were the following:

- Allergy and Work (1992-1997)
- Indoor Air and Environment (1994-1998)
- Good Industrial Air (1998-2001)
- Workplace 2000 (1994-2000)
- Small Workplaces (1995-2000)
- Work in the Cold (1997-2000)
- Prevention of Health Risks from Exposure to Non-Ionizing Radiation (1998-2003)
- Working Environment 2005 (2001-2006)
- Wood-dust - Exposure Assessment and Health Effects (2002-2006)
- Promoting Health, Safety and Work Ability in Security Occupations (1999-2003)
- Support for Occupational Safety and Health Activities (2003-2005)
- Learning organizations (1997-2001)
- Human Resources for Work (1997-2000)
- Decent Work - A Sound Life (2001-2002)
- Human Aspects of Work in the Information Society (2000-2004)
- Changes, flexible solutions, and well-being at work (2003-2007)
- Working Conditions, Work Capacity and Well-Being in the Social and Health Care Sector (1999-2002)
- Changing Social and Health Care Work (2002-2005)
- Youth and Work (2002-2007)

Professor Jorma Rantanen had a long career as Director General of FIOH, from 1974 to 2003. After his retirement professor Harri Vainio was nominated as the Director General in November 2003.

### ***Strategy and management***

FIOH has continuously readjusted its strategic plans. The time span in the strategy documents has been five years, but the strategy has been revised every two or three years. The work ability model has been the cornerstone of FIOH's strategies. In 1997, the model had the form of a triangle: in order to promote work ability, it is necessary to take care of the workers' health, the work environment and the work organisation. In 2001, the work ability model was reshaped to a tetrahedron: occupational and working life skills were added as the fourth dimension to the model, indicating the importance of competence and skills in modern work life. The strategic aims are structured by focus areas. The focus areas either reflect the dimensions of the work ability model (focus areas 1–3 in Figure 1), or form a synthesis of the dimensions (focus areas 4–6 in Figure 1).



# OCCUPATIONAL HEALTH AND SAFETY IN FINLAND

## *Finland, 1997-2003*

The average age of the Finnish population is slightly below that of the European Union, but the Finnish labour force is retiring earlier and faster than in most other EU countries. The total number of the labour force (both employed and unemployed) was 2.6 million in 2002 (Figure 2). In Finland women participate very actively in work life; the women's share of the labour force is 48%.

The large post-war age cohort is approaching the age of 60 years, and more than a quarter of the employed labour force are at least 50 years old, whereas in 1994 their share was only 19%. The average retirement age is about 59 years. The changes in the age structure will begin to lead to difficulties in the second half of the present decade, both as lowered supply of domestic labour force, and a greater need for the provision and funding of social welfare in Finland. This has been a major concern in the policy programmes of the recent Finnish governments, and therefore, e.g. a goal has been set to raise the average retirement age by 2-3 years.

Rapid economic growth, globalisation, and structural changes in the economy as well as in companies characterised Finnish work life towards the end of the 1990s and at the beginning of the 21st century. However, this growth did not affect all the sectors, and the unemployment rate stabilised at around 9-10%. Regional differences in employment are significant; unemployment is three times as common in the eastern and northern parts of the country as in the metropolitan area.

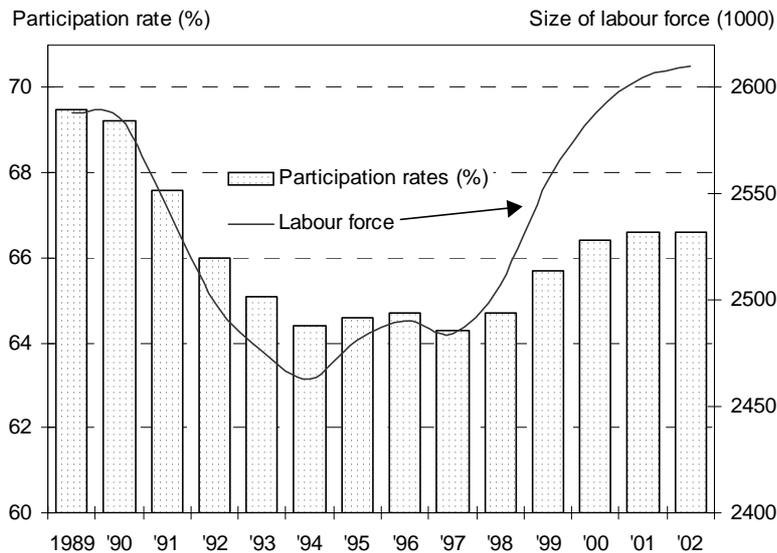


Figure 2. Labour force and labour force participation rates among the 15-74-year-aged population. Source: Finnish Labour Review 4/2003.

The employed labour force can be grouped into three nearly equal-sized occupational branches: production work (31%), service work (34%) and information work (34%). During the years 1994-2002, the share of production work diminished by four percentage points, and the other branches grew correspondingly. The increase in the number of old people is also reflected in the rapid growth of social welfare services, which is one of the branches that have grown the most. The leading branches in the Finnish manufacturing industry are the metal and engineering industry, information technology, and the wood and paper industry.

The private sector employs 73% of the labour force. There were nearly 225 000 enterprises in 2001, but only one out of a hundred companies employed more than 50 persons, and only one out of a thousand employed more than 500 persons. However, the 250 or so companies with more than 500 persons employed almost one fifth of the labour force. 9% of the employees worked in companies with less than five persons.

The number of foreigners living in Finland has increased evenly in the past few years but is still small. At the end of the year 2002, 2% of the population were citizens of other countries.

Finland became a member of the EU in 1995 and entered the Economic and Monetary Union (EMU) in 1999. The membership led to a process of amending the legislation and shaping the roles of political institutions to correspond with EU legislation. The basic integration has now been accomplished, but the depth of future political integration is an issue in Finnish political life.

## ***Trends in health, safety and work life<sup>1</sup>***

### ***Exposure to chemical, biological and physical factors***

According to the Work and Health in Finland Surveys, half of the employed people are exposed to chemical agents. The level and extent of exposure have not changed substantially during the past seven years. The most common agents at work are various dusts, detergents and solvents. In 2003, 35% of the employed reported harmful dusts, 15% harmful detergents, and 10% harmful solvents at work. A moldy smell, which often appears in water-damaged buildings, was reported by 13%. Exposure to environmental tobacco smoke was reported by 7%.

Seven percent of the employed persons are exposed to high noise levels (>85 dB), this share has not changed significantly in the first years of the 21st century (estimates from the FINJEM job exposure matrix), but the total noise dose of the population during leisure time is increasing. Four to five percent of the employed persons are exposed to hand vibration and to whole body vibration. Exposure to non-ionizing radiation has increased with the growing use of mobile phones, the increasing number of their base transceiver stations, and antitheft alarm systems.

The physical load of work has not changed much since 1997. In 2003, every fourth employee found his/her work to be physically somewhat or very heavy.

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<sup>1</sup> Unless mentioned otherwise, the data in this chapter are based on the reports 'Työ ja terveys Suomessa' (Work and Health in Finland, FIOH 1997, 2000, and 2003).

**Psychosocial factors**

Job satisfaction has remained at the same good level from year to year: over 80% of the employed are satisfied with their jobs. The perceived psychological work load and time pressure have decreased since 1997. Mental work load is most common in the social and health care sector and in education, where half of the employed consider their work mentally straining.

The quality of social interaction at work has slightly improved. Bullying and mental violence has decreased, and in 2003 it was experienced by 3% of the employed. There has also been slight improvement in balancing work and family life. In 2003, 15% of the employed reported that their family life suffered rather or very often because of their work.

Also violence or the threat of violence has decreased during the past few years, after a steady increase during the previous 20 years. In 2003, less than 4 % of the employed considered violence a threat in their work. The threat of violence has been most commonly experienced by hotel and restaurant workers and social and health care workers, and it is among them that the threat has also decreased the most.

Men and women had somewhat different opinions about gender equality: 21% of the men and 40% the of women had witnessed unequal treatment of men and women at their place of work. Every fourth respondent had noted inequality between different age groups, and 4% reported discrimination against minority groups.

**Accidents at work**

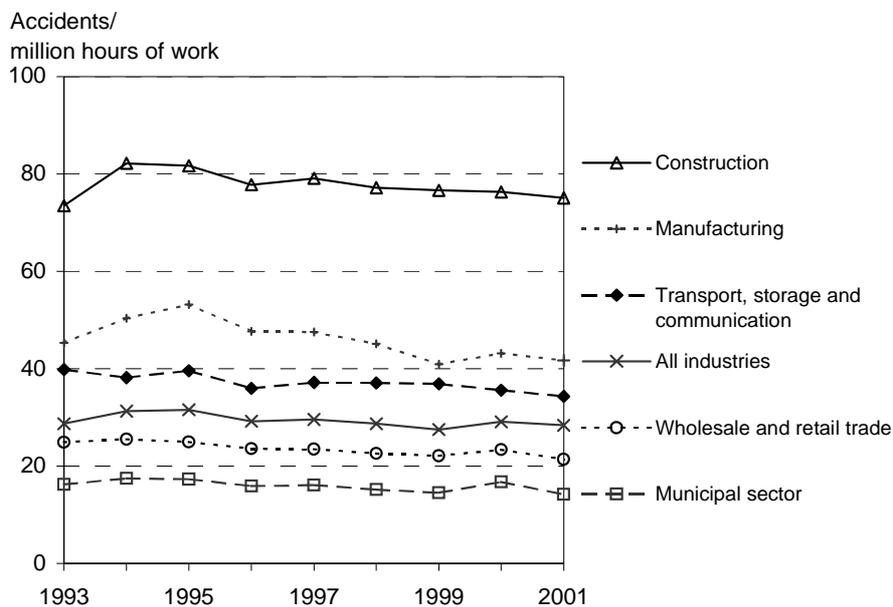


Figure 3. Accidents at work and commuting accidents between home and workplace per million hours of work in 1993-2001. (Source: The Federation of Accident Insurance Institutions)

Altogether 125 000 occupational accidents took place in Finland in 2001, and they caused the death of one hundred employees (*Statistics Finland*.) The risk of accidents is greatest in construction and in manufacturing (Figure 3).

The incidence of occupational accidents has not changed significantly during the past seven years. 12% of the men and 9% of the women had been involved in an accident at work or during commuting in the past 12 months. Young workers are the most accident-prone, and they also seem to underestimate the risks at work. Every tenth employee considered his/her accident risk at work to be extremely or fairly high. Typical risk factors were haste at work, slipperiness, physically heavy work, and inconvenient work postures.

### ***Occupational diseases***

In 1997-2002, the number of occupational diseases reported to FIOH has varied around 5000 new cases per year (two cases per 1000 employed persons). The most common occupational diseases have been repetitive strain injuries, which have accounted for 26-30% of all occupational diseases. Skin diseases have accounted for 20% of all occupational diseases (Figure 4). The highest incidence of new occupational diseases is found in the food-processing industry. Other branches with a high incidence of occupational diseases are the manufacture of transport equipment, construction, agriculture, and the manufacture of metal and mineral products. In the chemical industry, the number of occupational diseases has decreased clearly.

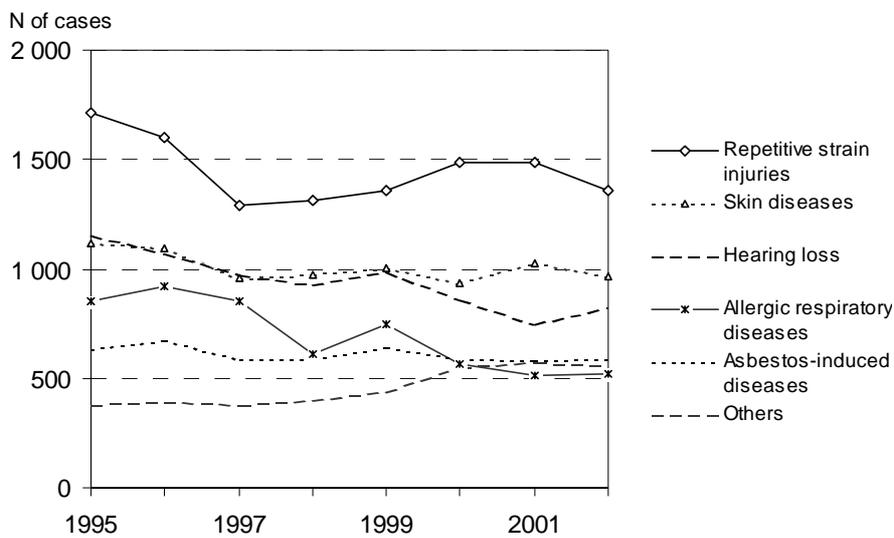


Figure 4. Occupational diseases in 1995-2002. (Source: *The Finnish Register of Occupational Diseases, FIOH*)

### ***Sick leaves***

The number of sick leave days has risen from 1997 (7.5 days per employed person) to 2002 (8.4 days). Previously, the number of sick leave days had been on the decline. In 2002, women had more sick leave days (9.4 days) than men (7.4). The manufacturing industry and construction have the highest rates (11.1 days). They are followed by the social and health care sector and services. The lowest rates of sick leave are found in administration, education and the commercial sector.

### ***Work ability***

At the end of 2002, nearly 151 000 people aged 16-64 years, i.e. 4.5% of the entire age group, were on disability pension or individual early retirement pension (early retirement pension is granted to people aged 60-64 years on grounds of diminished work ability). The most common medical causes for these pensions were mental disorders (40%) and musculoskeletal diseases (26%).

In the Work and Health in Finland surveys, nearly half of the employed population rated their own work ability as very good. This self-rated work ability has not changed in the period 1997-2003. A third of the employed estimate that they are able to continue in their present work until retirement age, as far as their health is concerned.

### ***Causes of death***

Life expectancy at birth was 74.6 years for Finnish boys and 81.5 years for Finnish girls born in 2001. The life expectancy at birth has increased by one year since 1997. The most common causes of death in 2001 were cardiovascular diseases (43% of all deaths), tumours (22%), accidents and violence (9%), respiratory diseases (8%) and gastrointestinal diseases (4%). (*Statistics Finland.*)

In a study published in 2001, FIOH estimated that 3.7% of all deaths in Finland in 1996 were at least partly work-related (6% for men, 1% for women). Thus, the yearly number of deaths due to work-related causes is 1800.

## SOCIETAL AND CUSTOMER RESULTS

### ***FIOH's contribution to the national strategies and programmes on occupational safety and health***

#### ***Government Programmes***

During the evaluation period, the Government and various ministries have launched a high number of various policy programmes for work ability, well-being at work, development of health and social services, development of productivity and quality of work life, etc. Most of the FIOH responses to the objectives of the government programmes have taken place through the Institute's participation in the national programmes, launched by the Government or by the Ministries.

FIOH has participated in the following Government- or Ministry-coordinated policy programmes:

- National Information Society Strategy (Prime Minister's Office)
- National Programme for Ageing Workers 199842002 (Ministry of Social Affairs and Health)
- National Productivity Programme 199342003 (Ministry of Labour)
- The Finnish Workplace Development Programme 199342003 (Ministry of Labour)
- Well-being at Work Programme 200042003 (Ministry of Labour)
- National Labour Accident Prevention Programme 200142005 (Ministry of Social Affairs and Health)
- National Programme for Strengthening the Prevention of Home and Leisure Time Accidents 2003 (Ministry of Social Affairs and Health)
- Government Tobacco Control Policies 199742003 (Ministry of Social Affairs and Health)
- The VETO Programme 2003-2007 (promoting the attractiveness of working life, Ministry of Social Affairs and Health).

FIOH's responses to the programme of the current, Prime Minister Vanhanen's Government will mainly take the following forms:

- Participation in the implementation of the VETO Programme
- Participation in the new Workplace Development Programme (2004 , Ministry of Labour)
- Development of competence, practices and methods for implementation of new legislation on occupational health services and occupational safety and health
- Continuing the development and implementation of PMWA activities (PMWA = promotion and maintenance of work ability).

### ***Strategies of the Ministry of Social Affairs and Health***

In the strategy of the Ministry of Social Affairs and Health for the years 2001-2010 four main strategic lines were chosen. In *strategic line 1 for the promotion of health and functional capacity* of people, particular emphasis was given to the promotion of the health and functional capacity of the working-aged population. The objective was set to postpone the present average age of 59 at retirement by 2-3 years by the year 2010. *Strategic line 2 for improving the attraction of work life* was planned to be achieved by improving the quality of work life, enhancing health and safety actions at the workplace, developing occupational health services, ensuring equality at work and activating social security. *Strategic line 3, preventing social exclusion* was planned to be combated by, e.g. reducing long-term unemployment and lowering the threshold for employment. *Strategic line 4, providing efficient services and income security* is relevant to FIOH from two points of view: ensuring the availability of workforce for the health and social sector through the development of working conditions and competence, and constructing a versatile and seamless service system through the networking of various types of services, i.e. public, private and others (including occupational health services).

Virtually all FIOH activities in some way support the achievement of the objectives of the national strategies, as the national strategy objectives, government programmes, ministry strategies and national programmes are all taken into consideration in drafting FIOH institutional strategies and programmes.

### ***Identifying and preventing occupational and work-related diseases***

#### ***A threat to the health of today's workforce: Allergies and hypersensitivities of the respiratory system and skin***

##### ***Occupational asthma***

In a register linkage study the population attributable fraction of work in asthma was shown to be higher than previously estimated. Also a large number of occupations with a high risk of asthma, unidentified previously, were detected. In isocyanate asthma, research has provided better understanding of the mechanisms, risks, clinical diagnostics and follow-up of the patients. Collaboration with work safety personnel and administration, and training and informing the occupational health professionals have contributed to an essential decrease in di-isocyanate asthma in Finland. Another focus of interest has been the asthma risk involved in the increasing use of enzymes in several industries, such as bakeries and flour mills. In the detergent industry a high risk of sensitisation and also new agents were found; continuous surveillance was thus started. Problems due to moisture damage grew fast in Finnish buildings in the 1990s. The scientific basis was reviewed and criteria for mould-induced asthma/rhinitis were agreed on in the "Majvik Recommendations". New methods were developed to improve the reliability of the diagnostics, and the importance of water-damage microbes in the development of asthma was confirmed in a population-based study.

### *Occupational skin diseases (OSD)*

Nordic Occupational Skin Questionnaire for surveys on work-related skin disease was developed. It is the first validated questionnaire of its kind in the world. The relative risk of OSD in different occupations was established from the data of the Finnish Register of Occupational Diseases. Dentists and dental nurses had especially high risks of allergic contact dermatitis. Therefore, an extensive worker education program was carried out to prevent OSD in dental work. In 1997-2003 FIOH has updated and standardised all major patch test series in Finland, giving recommendations for testing through the Finnish Dermatology Society. A unique database for allergens in skin care and personal care products has been developed in Finland to help patients who have become allergic.

### *Prevention and detection of asbestos-induced diseases*

In 1997, an international group of experts formulated criteria for the diagnosis of asbestos-related diseases and their attribution to asbestos. The Helsinki Criteria have met widespread acceptance and thereby improved compensation practices in Finland and several other countries. A guideline document was produced on diagnostics and surveillance of asbestos-induced disease. Worldwide use of asbestos and the incidence of mesothelioma were reviewed to support international preventive actions. In 2001, a landmark verdict by the Appellate Body of the World Trade Organization (WTO) validated the rights of Member States to prohibit the import, manufacture and use of asbestos-containing products. FIOH contributed to this process by providing extensive research evidence, reports and policy advice to the EU Legal Office.

### *Epidemiological estimates of the proportion of fatalities related to occupational factors and work life expectancies*

New methodology was developed and applied in estimating the proportion of fatalities related to occupational factors and work life expectancies. These considerations provide information on the need for preventive programs directed at work life to ensure a sufficient and healthy labour force also in the future. According to this risk assessment, especially the impact of circulatory diseases was greater than anticipated. Work life expectancy indicators were developed for the estimation of the expected duration of work life. The work ability of aging workers starts to deteriorate already long before the general statutory retirement age. The indicators of work life expectancy allow one to examine the development of work ability at early ages, when it is still possible to intervene.

### *Brain, sensory organs and work*

An experimental laboratory (Brain@Work) was founded to study systematically, in the context of applied cognitive neuroscience, how modern work affects the functions of the human brain and senses. The laboratory has developed, e.g., a computerized multitask test that enables research on the effects of work load, age, sleep deprivation and stress on attention, working memory, auditory and visual vigilance and task performance strategy. Also computerized tests for studying visual search at the

human-computer interface have been developed, as well as tools for analyzing sleep quality and sufficiency. The latter have been used in predicting the risk for a permanent disorder in sleep rhythm that can lead to lowered work ability. The research has contributed to the development of International Railway Medicine Guidelines for evaluating work ability.

***Immunotoxicological studies of occupational allergies and inflammatory diseases***

Several natural rubber latex (NRL) allergens were characterized. Based on the information about relevant NRL allergens, a novel immunological assay to measure allergen levels in NRL products and in occupational hygiene samples was developed and commercialised. This progress has already led governmental authorities in Finland to inform the consumers on the allergen levels of glove brands on the market. State-of-the-art knowledge, techniques and a unique murine model of allergen-induced skin inflammation have been applied to examine the role of different cells, cytokines and chemokines and their receptors in the pathogenesis of allergic dermatitis. These studies improve understanding of the mechanisms of allergic dermatitis, and open new avenues for the development of selective therapies for inflammatory skin diseases.

***Evidence for primary and secondary prevention of work-related musculoskeletal disorders***

Longitudinal studies have contributed to the evidence of the importance of both physical and psychosocial factors at work, and of leisure as well as individual factors. In a register-based study of back disorders leading to hospitalisation, high rates were obtained for several physically strenuous occupations, indicating a need for preventive action. A genetic-epidemiological study on disc degeneration and low back pain demonstrated relationships between the carriage of certain functional polymorphisms and lumbar disc degeneration in MRI, and low back pain. Several intervention studies have confirmed the effectiveness of preventive measures directed at exposures (e.g. workplace layout and equipment in computer work, improved ergonomics and work enlargement at a paper machine) and at the capacity of the worker (neck muscle exercises, rehabilitation courses). A standardised examination protocol was developed for low back, neck and shoulder disorders, in collaboration with occupational health professionals. Evidence-based good practice guidelines for the treatment of neck and back disorders were produced within the framework of the Cochrane collaboration.

## ***Promoting health and safety in the work environment***

### ***Developing new tools for exposure assessment***

FIOH has developed several methods for more accurate exposure monitoring of individual workers and various work environments. These include, e.g.

- method for assessing personal exposure to toluene diisocyanate (TDI, in polyurethane production or arising from thermal degradation of polyurethanes) by measuring blood protein adducts (albumin and/or globin).
- measurement of DNA adducts in lymphocytes obtained from blood samples as indication of exposure to, and health effects of, polycyclic aromatic hydrocarbons (PAH)

### ***Surveillance of exposure to occupational hazards***

FIOH has established a systematic surveillance programme that utilises national registers, questionnaire-based interview surveys, observational company surveys and expert judgment. The information is interpreted and summarized annually, and every three years in a book written by about 60 experts of FIOH. Every third year FIOH carries out interview surveys (Work and Health, Work Ability Barometer, Occupational Health Services) to update the information. The state and trends of occupational health and safety (OH&S) are followed, e.g., by indicators, and the main findings are reported in the media. The most important surveillance publications are freely available at the FIOH website.

FIOH has actively participated in international projects on exposure modelling (e.g., RISKOFDERM, EUROPOEM, validation of EASE). FIOH has designed exposure information systems (e.g., FINJEM, CAREX) which contain documented information on the prevalence and level of exposure by occupation and industry for a wide range of factors. These databases are being used in international risk assessment projects (WHO, EU, IARC), as models to develop national hazard surveillance systems (Canada, Central America, Japan, New Zealand) and as exposure assessment tools in epidemiologic studies.

### ***Modelling and prevention of hearing loss***

A database and expert programme (NoiseScan) for the evaluation of total exposure to noise, and the risk for hearing loss has been created. Exposure to noise explains about 25% of the variation in hearing loss. Other risk factors that can deteriorate hearing separately, or in combination with noise, are environmental factors (impulse noise, ototoxic substances, vibration, smoking), individual factors (elevated blood pressure, cholesterol, pain killers) and hereditary factors. When all other risk factors are included, about 50% of the variation in hearing loss can be explained by the NoiseScan model. NoiseScan is aimed to respond to the requirements of the new noise Directive (2003/10/EEC).

Techniques for acoustic modelling of work premises and sound insulation elements have been developed. The models can be applied to the planning and renovation of work environments.

### ***Control technology, model solutions and good practices***

A number of methods have been developed at the Institute to promote understanding of technologies when preventing exposure to gases, solvents, or particles. The developed methods include the tracer gas method for evaluating air distribution and capture efficiency, emissions from machines by the test bench method, FFIR (Fast Fourier Infrared) method for the distribution of contaminants in industrial premises. Control solutions have been developed, for example for wood dust, for contaminants in foundries, for sanding and metal grinding, for tobacco smoke in restaurants, and for cold air curtains in large doorways in industrial halls. A quantitative link between the work environment and labour productivity was assessed in terms of intervention case studies conducted in office and industrial environments. 'Good Practices' web pages have been prepared for the European Agency for Safety and Health at work.

### ***Indoor air: Environmental tobacco smoke, moulds and moisture***

FIOH has provided expertise for preparing the legislation on tobacco control in workplaces, and investigated the impacts of the amended legislation. Smoking has been restricted in workplaces since 1977, but restaurants were excluded from the restrictions. The current legislation from 2000 limits smoking also in restaurants. The legislation defined environmental tobacco smoke (ETS) as a human carcinogen. Subsequently, since 2001, action has also been taken to include all workers exposed to ETS in a national Registry of Employees Exposed to Carcinogens (ASA) kept by FIOH.

Moisture-problem buildings and exposure to moulds have become a marked health problem in Finland, as almost 50% of Finnish buildings suffer from moisture damages. FIOH has played a key role in identifying exposure to moulds in workplaces and other buildings as an emerging occupational health risk. This new health hazard merits immediate attention in order to protect the workers and to develop effective means for preventing exposure to these microbes. *In vivo* and *in vitro* studies have been useful in defining the mechanisms by which fungi and moulds induce their effects.

### ***Risk assessment and risk management in the occupational setting***

FIOH has actively conducted and developed the risk assessment of chemicals at work places in co-operation with the authorities, and the chemical safety and medical health care personnel at workplaces within the frame of the current legislation. This activity has covered the expertise of exposure assessment, knowledge of the existing toxicological and safety data on chemicals, including the existing preventive tools, practical guidance and risk reduction measures. This has led to the development of guidelines (books, questionnaires, checklists, computer-based programmes, etc.) for workplaces to carry out the stipulated chemical risk assessment(s), by applying the corresponding standards and the frame set by the authorities.

FIOH has carried out several risk assessments of chemicals through scientifically based evaluations of individual substances at EU level, jointly with Finnish competent authorities, and internationally associated with activities of the World Health Organization (e.g. International Programme for Chemical Safety). FIOH's

scientific experts have participated in many technical and scientific committees and working groups within EU, OECD and UN/WHO.

Studies on mobile phones have demonstrated that there is no association between hypersensitivity symptoms and radio frequency fields emitted by the mobile phones. These and other studies have allowed the Institute to contribute to international collaboration in the management of potential risks in the use of mobile phones, and practical risk assessment and management at workplaces. These activities have had also system effects in the development and implementation of European standards, directives, and national practices.

FIOH has promoted the zero-accident vision during the past five years. Even though some international corporations have adopted it a long time ago, it was new in Finland. FIOH's innovation was to present 'zero accidents' as a vision rather than as a direct goal. The response of the public has been positive, and several trade unions have officially adopted it as the guideline of their policy.

## ***Developing work organisations and well-being of personnel***

### ***Impact of psychosocial work environment on the health of employees***

According to the leading models in occupational health research, job strain (indicated by high demands and low job control) and an effort-reward imbalance present significant psychosocial health risks at work. FIOH has found the predictive value of these models in relation to mortality due to cardiovascular disease, and medically certified sickness absenteeism.

New psychosocial determinants of health have been identified. The findings imply that fair decision-making procedures and fair interpersonal treatment by supervisors may significantly decrease the risk of ill health among employees. Importantly, this protective effect seems to be independent of the traditional psychosocial factors, such as job strain and effort-reward balance.

### ***From work organization research to organizational intervention services***

The methodological basis and competence for FIOH's current organisational services for workplaces were created in action programs and in research and intervention projects. The "healthy work organization" model was developed, and several tools were constructed and validated, e.g. the *General Nordic Questionnaire for Psychological and Social Factors at Work* and the *Healthy Organization Questionnaire*. Practices that support innovativeness at work were evaluated in interventions studies. FIOH's good organization intervention practices have been published, e.g. in the *Organizational Innovation book for Occupational Health Service (OHS) personnel and other experts responsible for organisation development interventions*.

### ***Recognition and prevention of workplace bullying***

FIOH has conducted several studies on bullying, e.g. in the municipal sector, in prisons, and in hospitals. Information about bullying has been disseminated via lectures, journal articles, and TV and radio programs. Training has been given to people in work units to help them understand what bullying is, and to supervisors to help them handle bullying situations. These activities have had significant effects on Finnish work life. Nowadays, bullying is acknowledged as a serious health and safety hazard that has to be addressed. The new Occupational Safety and Health Act includes a paragraph on harassment and inappropriate treatment at work that obligates the employer in a bullying situation to take measures to remedy the situation. Anti-bullying instructions have been prepared in numerous organizations.

### ***New theoretical and methodological tools for recognizing and preventing burnout***

FIOH has conducted numerous cross-sectional and longitudinal studies on the prevalence and severity of stress and burnout at work. Both nation-wide and occupation-oriented studies have revealed that burnout can no longer be seen only as an individual phenomenon. It has accumulated in economic sectors where major structural changes have taken place. Alternative theories about different dimensions of burnout and the sequential process of the three dimensions of burnout (i.e. exhaustion, cynicism and professional efficacy) have been tested. FIOH participated in the international validation of the general version of the Maslach Burnout Inventory (MBI-GS) and Utrecht Work Engagement Scale. The concept of work engagement stresses the importance of job resources and the meaningfulness of work. The dissemination of information about burnout has been extensive via lectures, articles, booklets, guidebooks, and TV and radio programs.

### ***Gender mainstreaming into research, development and occupational safety and health practice***

FIOH has participated actively in the international dialogue on gender differences in working conditions and in health outcomes. FIOH has, e.g. produced reports on this issue to OECD and EU organs. A schema on gender mainstreaming was created in EU collaboration: gender issues can be integrated into OH&S research, development and practice, so that people's diverse working conditions and rapidly changing circumstances can be taken into account, instead of trying to provide "mass solutions" with gender neutrality for everybody. In Finland, the new Safety and Health Act (2003) was gender-mainstreamed after gender impact analyses were carried out.

### ***Work career management and prevention of exclusion from working life***

FIOH has developed preventive group methods for supporting the management of people's work career. The *Back to Work (Työhön) group method* aims at facilitating the re-employment of unemployed workers. The *From School to Work group method* is designed for graduates of vocational schools. The methods are used throughout the country by labour offices, institutions of adult and vocational education, and

private firms. New applications of the model are under development. A framework of innovation cycles has been applied in the development work: (1) definition of problems and risk factors related to critical transitions during the study and work career, (2) design of group models and group contents aimed at decreasing problems, and the role of risk factors, (3) effectiveness studies of the developed innovative group model prototype in a real life context with host organizations, (4) adaptation of the preventive model for publication, and wide dissemination in host organizations.

### ***Flexible organization of work***

Due to structural changes in the labour market, resulting from globalisation and economic fluctuations during the 1990s, companies and work places have had to implement new flexibility strategies. FIOH has analysed the effects of flexibility strategies, such as working time arrangements and eWork, as well as work contracts, and has also conducted case studies of innovative working time arrangements. Many of the studies were planned together with employers' and employees' organizations, and some of the main issues have been included in collective labour agreements, e.g., the so-called 'bank of work hours' in the agreement of the commercial sector in 2003.

### ***Management of structural and functional changes in organizations, taking into account well-being and health: Research findings***

Restructuring, downsizing and mergers started to increase after the mid-1990s, and were a challenge for research. In the municipal sector, FIOH's research results showed that the money saved by downsizing was lost due to increased sickness absenteeism among those who were retained. Other studies showed that the transition to a new organization tends to fail when the change is carried out too technically, without taking into account the organizational culture of the unit.

## ***Promotion and maintenance of work ability (PMWA)***

### ***Comprehensive concept of work ability and the PMWA***

The development of the content of the PMWA was originally based on the FIOH's follow-up studies of municipal employees over 45 years of age. In this study a new, positive framework from work disability to work ability was created. In 1991, the PMWA concept was included in the Finnish Occupational Health Service Act and as the employer's obligation.

During 1997-2003 FIOH developed the conceptual model of the PMWA to include a more comprehensive view of the determinants influencing work ability and employees' health. The interactions between the human resources (health, competence, values, attitudes) and work dimensions (work environment, work content and demands, work community and organisation as well as management and leadership) are the building blocks of work ability. Ideally, the PMWA processes become an integral part of organisational strategy planning and management and human resource development. Furthermore, work ability, in this comprehensive sense, creates the basis for employability. The PMWA can be seen as the basic process to guarantee the employability of people.

### ***The social innovation of the PMWA***

During 1997 - 2003 many case reports, guidebooks and booklets, handbooks and review articles have been compiled, edited, and published by FIOH. More than 10 manuals and guidelines have been published e.g. "Good Work Ability", "Good Practice - Cases", "Methods and tools for PMWA". The topics cover all elements of the PMWA, as well as and issues such as aging, SMEs, and certain industrial branches. FIOH has organised or contributed to hundreds of training courses, development processes in industries and seminars during the past ten years regarding various research results, methods and practices in the domain of the MWA. FIOH has put a lot of emphasis on supporting the prerequisites and educational resources of the OHS personnel regarding PMWA.

The social innovation of the PMWA has reached wide political acceptance, and has been given the status of a steering factor in the occupational health policy of Finland. According to the national Barometer of Maintenance of Work Ability (MWA barometer), more than 80% of Finnish employees work in enterprises which apply the PMWA strategy. About 80% of the management believe that investments in the PMWA are profitable and they are also willing to continue and increase the investments.

### ***The PMWA has developed into one of the core functions of Occupational Health Services***

The PMWA has been adopted as one of the core functions of OHS. It has widened the role of OHS to a supporter, adviser and evaluator in workplace health promotion and other PMWA activities carried out in an organisation.

### ***Ageing and work ability in focus***

FIOH tradition in the research on ageing workers has produced evidence-based concepts and good experiences in enterprises, and this has been recognised also in the European Union. Therefore, the experts of FIOH have access to a large network in the research on aging and work, and they participate in the planning of the age strategies for the European Union.

### ***Finnish National Programme on Ageing Workers***

FIOH expertise was widely utilised in the Finnish National Programme on Ageing Workers (FNPAW) from 1998-2002, established by the government. The aim of the FNPAW was to improve the status and the work life of ageing workers, as well as to re-employ older, unemployed people. The role of FIOH was to coordinate the research and developmental projects, to establish a barometer to evaluate the PMWA-activities, to establish a network of experts to support the processes in enterprises, to develop the Age Management concept for supervisors, and to offer training and education for them. One of the key actions needed was the improvement of supervisory work. About 800 managers, supervisors and foremen participated in the Age Management training courses.

## ***Improving the quality and impact of occupational health services and safety at work***

### ***The new Act on Occupational Health Services and its implementation***

FIOH's experts participated in the preparation of renewing the Act on Occupational Health Services (OHS), amended in 2002. Already in 2001, the Ministry of Social Affairs and Health started a massive country-wide information campaign which FIOH organized. About 1600 providers of OHS from all Finnish health care units providing OHS participated in this one-day training session, organized in the largest cities of Finland.

The Department of R & D in OHS was established in 2001 to serve as a source of expertise for the Ministry of Social Affairs and Health, and to develop and evaluate practices for OHS. In 2002 FIOH established the Training Centre, one of the main tasks of which is to improve the knowledge and skills of the OHS personnel. The surveillance database from FIOH's triennial surveys (OHS in Finland, Work and Health, Maintenance of Work Ability Barometer) have made it possible to monitor the needs, input, processes and outputs of OHS activities, competence of the personnel, etc., for rational decision making concerning e.g. training and interventions to improve the performance of OHS.

FIOH has conducted several development and evaluation projects in order to find feasible solutions to improve the coverage of occupational health services, and to ensure their existence in today's increasingly fragmented work life (incl. OHS for small workplaces and self-employed persons, farmers, and the construction industry).

### ***Generating expert services for the occupational safety and health authorities, increasing the knowledge base in occupational safety, and promoting cooperation in occupational safety***

FIOH has developed models and tools for occupational safety and health inspectors to help them assess work environments and work loading. Tools have been prepared, e.g. for the general work environment (Elmeri), for construction work (TR-mittari), for repetitive work, and for work with visual display units.

FIOH has produced methods and tools for workplaces to assist them in hazard identification and risk assessment of, e.g. chemical agents and physical factors in the environment.

The ongoing action programme Support for Occupational Safety and Health Activities (2003-2005) is a joint development project between FIOH and OH&S authorities. The objective is to use OH&S know-how as effectively as possible for improving working conditions and for increasing effectiveness at workplace level.

The Institute's experts have taken part in the preparation of many EU Directives (vibration and noise, completed; electromagnetic radiation and personal protectors) under a general Directive regulating working conditions, and the compilation of application instructions. The expertise of FIOH is being used in over 30 international standardisation groups.

The Institute's Department of Physics has acted as the notified body in the area defined by the directive on personal protectors, and FIOH has several units which offer their clients accredited testing, certification and analysis services.

### ***Training in occupational health services and occupational safety***

FIOH arranges continuation and supplementary education for those working in the field of occupational health and safety in Finland. Basic training in occupational health services is arranged in the form of traditional courses and as distance-learning, all lasting seven study weeks. A four-week course for safety managers forms the core of occupational safety training.

The Training Centre was founded in 2002 to strengthen the competence of OHS personnel and other experts in tackling problems in work life and finding solutions to them. To achieve this, FIOH has started to increase cooperation with the universities, polytechnic institutes and other adult education institutes, as well as inside the FIOH. The aim is to guarantee a sufficient number of occupational safety and health experts also in the coming years, when many of the currently employed professionals retire.

### ***Regional activities***

The Regional Institutes of the FIOH have been founded to improve work environments, to promote and to maintain work ability, to develop work organizations, and to prevent work-related diseases and develop their diagnosing in their respective regions. The Regional Institutes form a network with the local occupational healthcare centres and the Occupational Safety and Health Inspectorates. They also collaborate with the local universities and research institutions, and co-operate with the workplaces in their region.

On the national level, each of the six Regional Institutes is specialized in a particular industrial sector. Kuopio specializes in agriculture and forestry, Lappeenranta in the wood-processing industry, Oulu in metallurgy and mining as well as work in the cold, and Tampere in training in occupational health and safety in construction work. Turku specializes in seafaring, shipbuilding, stevedores' work and working conditions, work ability and well-being in the social and health care sector, and Uusimaa in indoor air and the environment, small-scale enterprises, construction work and the service sector.

### ***Services***

The expert services of the Regional Institutes form the basis for FIOH's connections to workplaces. They are the channels through which FIOH disseminates its expertise and knowledge to workplaces but also through which FIOH gathers information on the problematic issues at workplaces. The main clients of these services are mostly big companies and municipalities.

### ***Training***

With the aid of training and counseling, the Regional Institutes support occupational health and safety professionals to develop working conditions and organizations, to apply good practices in occupational health service, to maintain the employees' work ability, and to recognize musculoskeletal disorders and mental stress. In addition, the Tampere Regional Institute offers courses on occupational safety for safety delegates.

## ***EU and international activities***

### ***EU collaboration***

In the EU collaboration, FIOH has represented Finland in the official bodies of the EU, participated in the standardization work and the risk assessment tasks of the EC, participated in the Framework Programmes of research and the networks of the EU, and carried out joint projects with both the Dublin Foundation and the Bilbao Agency for Safety and Health at Work.

On the policy level, FIOH has contributed to the work of the EU in building the European Information Society for All. This contribution was channelled through the work of the High-level Expert Group on Information Society. Before and during the EU Presidency of Finland, FIOH, together with the Ministry of Social Affairs and Health and some other national organizations, organized three symposia, one on safety and two on occupational health services.

FIOH is represented in various EU standardization and other groups as follows: Preparatory Groups in Finland (3), EC Advisory Committees (1), EC Expert Groups (6), EC Scientific Committees (2), EU Networks (7), and Standardization Groups (69).

From 1998 on, FIOH has participated in the Topic Centre activity of the Bilbao Agency (coordinator in Dangerous Substances, partner in Musculoskeletal Disorders, Stress, and Research in OH&S). Currently (2002–2004) the FIOH is coordinating an extensive Topic Centre on Good Practice, Systems and Programmes.

FIOH has succeeded in getting funding from the EU Framework Programmes of Research. Over 90 projects have been funded by EU in 1997–2003. In the 5th Framework Programme, FIOH received funding for 19 projects, in four of which it acted as a coordinator. Also, large programmes such as the Finnish Small Workplace Programme, were partly funded by the European Social Fund. In the 6th Framework Programme, the structure of funding is different, and occupational health and safety has not been a spelled-out priority. Despite this, FIOH has received some funding for its projects from various sub-programmes of the 6th Framework Programme.

### ***WHO and ILO collaboration***

One of the main priorities of the FIOH international activities has for the past three decades been the collaboration with the International Organizations, WHO and ILO. This support has been channelled in 1997–2003 through FIOH contributions

to the Global Network of the WHO Collaborating Centres in Occupational Health in the implementation of the Global Strategy on Occupational Health for All.

In the collaboration with ILO and WHO/EURO, FIOH has developed indicators and country profiles to support the national and local level policies in OHS by means of benchmarking. Though it has become clear that it is not possible to directly compare the countries on the basis of these indicators due to cultural differences, the indicators and profiles nevertheless provide a basis for self-development, further discussion and planning.

FIOH has edited and published the African and Asian-Pacific Newsletters on Occupational Health and Safety. The Newsletters have been integral elements in the Regional Programmes of ILO in South-East Asia, and of WHO/ILO joint efforts in Africa.

#### ***Nordic and Baltic collaboration***

FIOH takes part in Nordic collaboration both within the Nordic Council of Ministers and directly with the sister institutions. Within this collaboration, FIOH organized in its turn the Nordic Work Environment Meeting, which in 2003 attracted 130 researchers to Finland. The Finnish Institute has also contributed to the work of the Nordic Institute for Advanced Training in Occupational Health and Safety, NIVA, which is located on the FIOH premises.

FIOH collaboration with its neighbouring areas was further strengthened from 1995 on, as FIOH, at the request of the WHO/EURO Consultation, started the establishing of the Baltic Sea Network on Occupational Health and Safety. In addition to the network of occupational health and safety experts in the Region, also an Internet network was created.

In 1998, EU PHARE launched the so-called Twinning Programme and funding for accession countries. Estonia applied for funding to develop its occupational health and safety infrastructure. FIOH made a tender, and won the competition. The first Estonian-Finnish Twinning Project on Occupational Health was carried out in 2000–2002; the outputs of the project include the establishment of the Occupational Health Center, development of the occupational health service system, and training of Estonian experts. This collaboration has continued in Twinning Project II which started in May 2003 and will continue until May 2004.

## Knowledge, competence and work ability

*Table 1. The funding of the personnel's salaries in 1997, 2000 and 2003.*

	Person-years containing governmental funding	Person-years funded entirely by external income	total	external funding %
1997	585	152	737	21
2000	575	221	796	28
2003	586	215	801	27

Two thirds of the personnel are women. In 2003, 40% of the personnel were over the age of 50. FIOH faces a major generation change-over within 5 to 10 years.

FIOH's personnel training is based on the yearly evaluation of training needs. The number of trainee days per year and per employee has been 5.6 on average. A new leadership training programme began in 2003, and it is compulsory for the supervisory staff of the FIOH at all levels. The programme consists mainly of human resource management and skills, and it can be taken in half a year. The total attrition in 2004–2010, according to the estimate, is about 30–50 persons per year.

In 2003, the sick leaves amounted to 22.4 person-work-years, which was 2.8% of the paid working time. This number of sick leaves is low compared to the sick leaves in the public and private sectors. FIOH provides occupational health services for the employees in order to maintain and promote their work ability and functional capacity, and to prevent and treat work-related illnesses and diseases to which the population is generally prone.

FIOH has a new salary system, which is based on the competence demands of the work, and on the level of performance. The part of the system based on competence demands has now been taken into use. The part of the system based on performance level will be taken into use in 2004.

Surveys on work climate show that commitment to work is at a high level. The situation is also good in regard to job satisfaction and possibilities to influence matters at work. The results have not been quite so good in regard to leadership practices and the work climate.

Department	Physiology	Ergonomics	Safety Technology	Occupational hygiene, physical	Occupational hygiene, chemical	Occupational hygiene, biological	Toxicology	Occupational medicine	Epidemiology	Psychology of work	Sociology of work	Other disciplines
Dept. of Epid. and Biostatistics		○			●				●		○	●
Dept. of Physiology	●	●							○	●		○
Dept. of Psychology										●	○	
Dept. of Occup. Safety			●							○		
Dept. of Physics	○		○	●								○
Dept. of Occup. Medicine	○	○						●				●
Dept. of Ind. Hyg. & Toxicology					●	○	●					○
Dept. of R&D in OHS		○			○			●		○	○	○
Training Centre						○		○		○		○
Information Service Centre												
Periodical Työ Terveys Turvallisuus												
Kuopio RIOH		●	○	○	●	●	○	●		○		
Lappeenranta RIOH				○	○			○				
Oulu RIOH	●	○	○	○	○	○		○	○	○		○
Turku RIOH		○		●	●	○		○	○	○		
Tampere RIOH	○	○	○	○	○			○		○	○	○
Uusimaa RIOH		○		○	○	○		○		○		

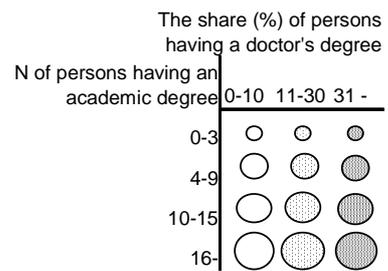


Figure 5. The competence profiles of the Departments.

## Operational efficiency and quality

### **Research, services, training and information: An innovation system**

The core processes of the FIOH are research, the dissemination of information, expert services, and training.

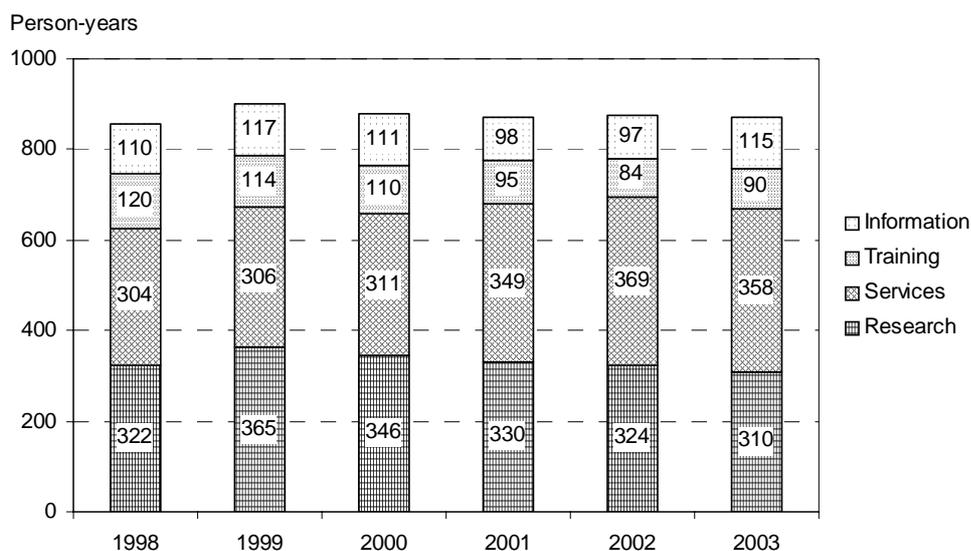


Figure 6. Working time (person-years) by core processes in 1998 2003.

*Research* creates a strong competence and expertise based on scientific evidence in order to achieve impact on the health of the work force. *Services* include surveying and developing work environments and work organisations, diagnosing occupational diseases, and providing expert services for the authorities. Dissemination of *information* provides reliable information for the improvement of working conditions for professionals and experts, but also for the general public. FIOH provides *training* for professionals and experts in the development of work environments, work communities, and occupational health care. These core processes form an innovation system, in which research generates new knowledge and expertise. The other core processes transfer the knowledge and expertise for use by our clients.

## Research

The scientific quality of the research has remained the predominant criterion of research assessment. However, in the domain of FIOH, more and more attention is now being paid to the social dimensions of the scientific work and knowledge. Most impacts of research are of an indirect nature, they take a long time to filter through, and they are difficult to operationalise and measure.

*Table 2. The funding of research*

	1997	1998	1999	2000	2001	2002	2003
Total expenditure, million €	15.9	18.1	20.7	21.8	20.6	21.3	21.0
External funding, million €	4.5	6.5	7.5	7.9	6.0	6.2	6.3
External funding, %	28	36	36	36	29	29	30

*Table 3. Scientific publications in 1998-2003*

	1998	1999	2000*	2001	2002	2003
<b>All scientific publications</b>	<b>586</b>	<b>591</b>	<b>805</b>	<b>684</b>	<b>673</b>	<b>608</b>
number/one-year full-time equivalent	2.8	2.5	3.4	3.0	3.0	2.8
<b>Peer-reviewed scientific articles</b>	<b>297</b>	<b>276</b>	<b>409</b>	<b>348</b>	<b>366</b>	<b>334</b>
% of all scientific publications	51	47	51	51	54	55
number/one-year full-time equivalent	1.4	1.1	1.7	1.5	1.6	1.5
<b>Peer-reviewed articles in international journals</b>	<b>213</b>	<b>207</b>	<b>289</b>	<b>263</b>	<b>257</b>	<b>249</b>
Scientific (oral) presentations	360	297	314	300	257	399

\* The year 2000 was an exceptional one because of some big international conferences with proceedings publications, several handbooks and final reports of large projects.

Prioritisation is important in the current situation, as the Institute can no longer grow. Growth can be sought mainly by networking with researchers nationally and internationally. Networking is important also in other respects, especially at the European level in order to get funding from the European research programmes. Collaboration within the European OS&H research community is also needed in order to influence the priority setting of the future EU research framework programmes. The FIOH already participates in the activities of collaborative groups, such as PEROSH (Partnership for European Research in Occupational Safety and Health) and the Sheffield Group.

## Services

The services of FIOH are meant to promote health, safety and work ability, to improve work environments and products, to develop work organizations, and to prevent work-related diseases. FIOH provides services in occupational medicine, occupational hygiene and biomonitoring, occupational psychology, occupational safety, testing and certification, ergonomics, and in the development of occupational health services.

FIOH's customers are workplaces, manufacturers, health care units, designers, labour market organizations, insurance companies and authorities. In addition to services, FIOH develops analyses and methods, modeling and software products to support the activities carried out at workplaces, as well as the activities of the occupational health services and authorities.

*Table 4. Services in 1997, 2000 and 2003.*

	1997	2000	2003
<b>Psychology of work, organizational psychology</b>			
Development and consultation projects	141	158	211
Selection assessments (number of persons assessed)	3188	4233	1035
<b>Occupational medicine</b>			
Patients examined	3966	3011	2654
Statements of a person's work ability	576	467	398
<b>Work ability and occupational health care</b>			
Development and consultation projects	28	70	152
<b>Industrial hygiene, toxicology and biomonitoring</b>			
Occupational hygiene and toxicological statements to workplaces	1168	1353	1508
Analyses regarding work environment (number of specimens analyzed)	50668	43852	44152
<b>Occupational safety</b>			
Development and consultation projects (n)	36	70	60
EC type certifications of personal protective equipment	277	211	260
<b>Ergonomics and physiology</b>			
Development and consultation projects	64	97	64
Measurements of physical capacity (number of persons examined)	1149	322	3000

\*Includes patients from the asbestos screening project.

## Training

Table 5. Training courses and lectures in 1997-2003

	1997	1998	1999	2000	2001	2002	2003
Courses organized by FIOH	267	293	311	248	291	225	296
- Participants	8984	8752	8483	6993	8965	8075	8941
- Trainee days	21634	22601	20630	18489	21230	20509	20779
Lectures at courses organized by others	3644	7660	3492	4074	3143	3470	3112

During the evaluation period, training has been essential in the implementation of the new OHS and safety legislation and good practices of OHS, in the promotion and maintenance of work ability, in the management of the health hazards of poor indoor air, and in the development better of psychosocial work conditions.

The training offered by FIOH attracts mainly OHS personnel, safety managers and delegates, and people working in production, sales, services, maintenance and other technical professions.

In 2002, the Training Centre was founded to strengthen the competence of OHS personnel and other experts in tackling problems in work life and in finding solutions to them. The most important challenge concerns the number of qualified and competent professionals in the field of OH&S, and thus the response to the needs of future work life. In future, other key groups than traditional OH&S professionals will be the target of the training. Human Resource and Organisation Development specialists, line managers, and work, equipment and work place designers, are examples of future trainees. Emphasis will be placed on multidisciplinary and multiprofessional training.

Physicians specializing in occupational health have been trained at the Department of Occupational Medicine of the Central Institute, and also in the FIOH Regional Institutes. Since 1997 some 180 physicians with an OHS specialist's degree are trained, and at present an additional 556 physicians have registered as trainees in specialization on OHS.

Table 6. Participants in the training of the FIOH, 1997 2003 (%)

	1997	1998	1999	2000	2001	2002	2003
Nurses	21	26	23	21	26	21	29
Physicians	10	12	11	11	13	11	16
Physiotherapists	8	8	8	8	6	8	5
Safety managers	10	9	9	10	9	10	8
Safety delegates	9	8	8	8	7	9	8
Administrative personnel	10	5	7	9	8	6	3
Production, sales and technical staff	9	7	8	7	7	8	7
Laboratory staff	2	2	3	2	1	4	4
Ship staff	3	2	3	3	3	1	1
Office staff	2	2	2	2	2	2	1
OHS receptionists	1	2	2	2	2	2	2
FIOH personnel	3	4	6	6	5	5	6
Others	12	13	10	11	11	13	10
Total	100	100	100	100	100	100	100

## Information

The four specific information units at FIOH are the Office of Information and International Affairs, the Editorial Office of the periodical Work Health Safety, the Publication Office, and the Information Service Centre. One of the goals of FIOH information dissemination is to foster and promote the use of information at workplaces. For this purpose, training, advisory services and intervention studies of FIOH are needed, and they are powerful collaborators in achieving this goal.

In the FIOH activities, the following channels are used – to a varying extent – for information dissemination: media, including the radio and TV, PR activities, journals, magazines and newsletters, books and other publications, web services, as well as library and information services.

The FIOH website was opened in 1995, the second generation in 1998, and the whole new service in June 2003. FIOH has a www Centre, created in 2001. It is a virtual unit, i.e. the experts in the Office of Information and International Affairs and the Information Management Unit of the General Department work closely together to guide and develop the work being done in the whole Institute in web services.

Table 7. Popularized articles and press releases in 1997–2003

	1997	1998	1999	2000	2001	2002	2003
Popularized articles and publications	431	450	564	389	518	545	421
Press releases	40	41	41	43	35	39	37
Press conferences (incl. in releases)	10	5	14	9	14	17	10

### Cooperation and networking

FIOH’s strategy encourages the organisation to seek knowledge, competence and operational efficiency through internal and external co-operation. FIOH has an extensive co-operation network at organisation, project and expert level, both in Finland and internationally.

FIOH has for a long time collaborated with international organisations, such as WHO and ILO. In the EU activities, FIOH has concentrated a large part of its activities on standardisation work, as this work has a direct impact on the health and safety of work life. FIOH participates in and contributes to seven EU networks.

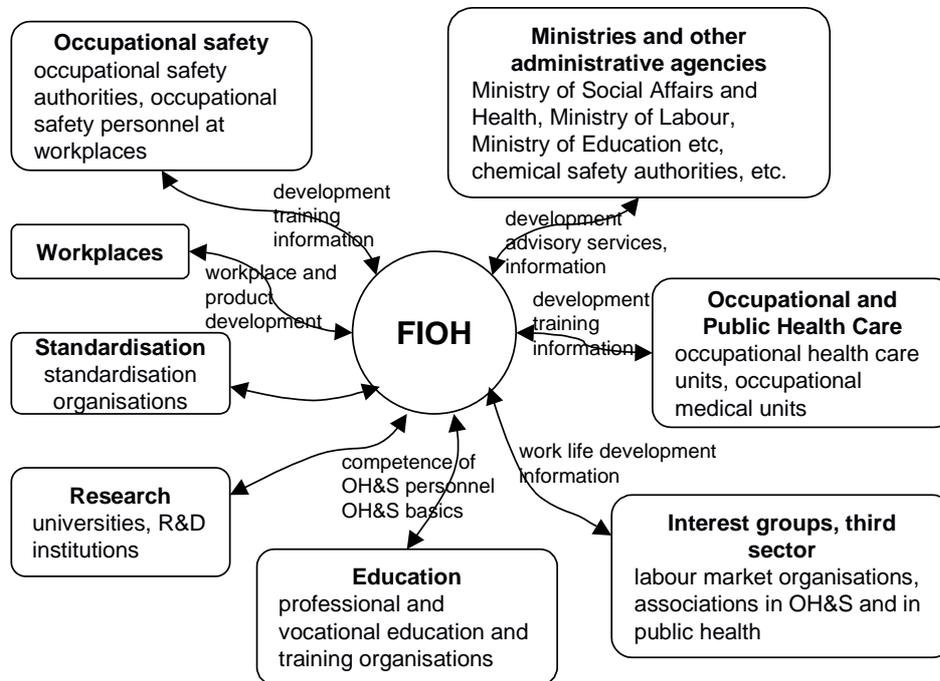


Figure 7. FIOH’s co-operation network in Finland.

## Resources and funding

### *Finances*

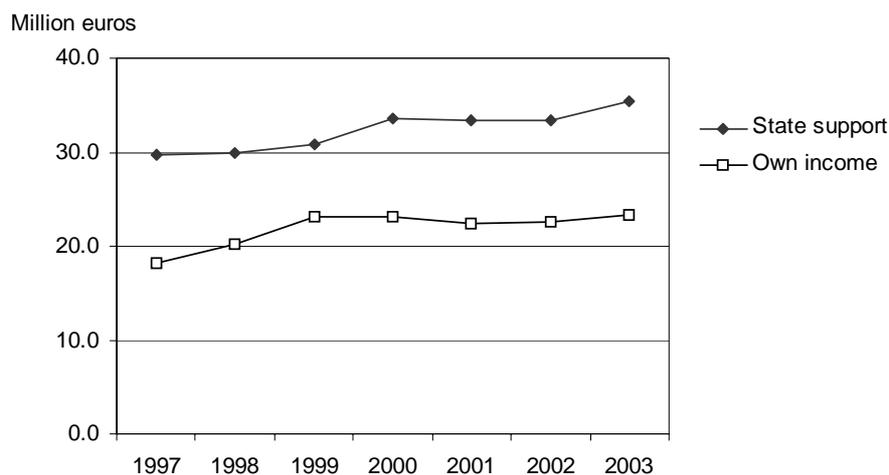


Figure 8. The overall funding of FIOH (EUR million).

According to the Act on the Operation and Financing of FIOH, 80% of FIOH's budget costs, as approved by the Ministry of Social Affairs and Health, are paid as government subsidy (state support) in accordance with the scope of operations approved in the annual State Budget. FIOH must submit an annual proposal for its following year's budget to the Ministry of Social Affairs and Health. The remaining 20% of the costs FIOH finances through its own income. In addition, FIOH can perform other activities and finance them entirely through its own income. On the whole, state support constitutes about 60% of FIOH's funding, and FIOH's own income covers the remaining 40%. The main strength of FIOH finances is this combination of funding.

State support can, however, also be a weakness because major changes (sudden cuts) can be made by political decisions, as has happened in some other countries. In any case, the amount of state support is always known for at least the following 1.5 years, giving a chance to plan for the future. At least one third of FIOH's own income comes from well-established long-time customers; this also brings stability to the planning, e.g. in maintaining jobs.

The temporary rise in research income in 1998-2000 resulted from some big EU-funded projects. The country's economic situation has an impact on the services and on training (especially in the public sector).

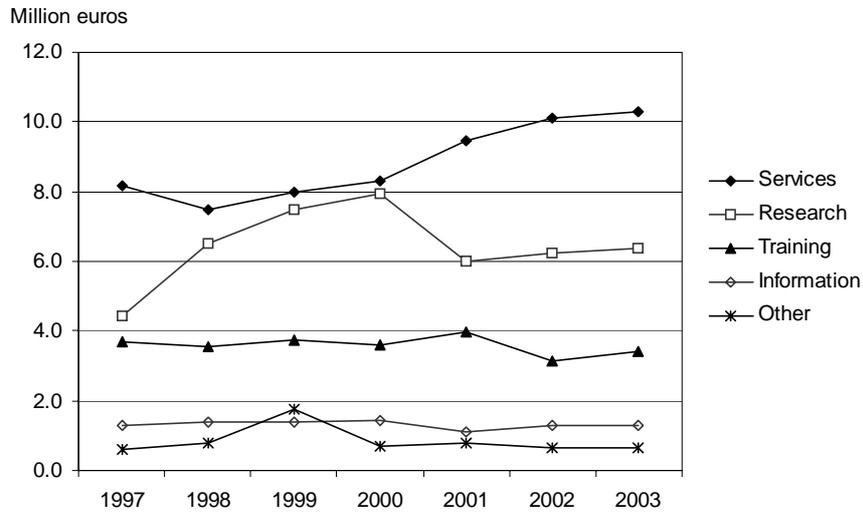


Figure 9. Distribution of own income (EUR million)

### Instrumentation and equipment

The annual investments amount to EUR 4-5 million, which is 6-10% of FIOH's total expenses. On the average, hygiene and toxicology account for 30%, physiology, ergonomics and medicine 10%, information technology 35%, and office technology plus other general infrastructure 25% of the total volume. In the past few years, general infrastructure has been given extra weight due to acquisitions related to the implementation of new premises. In the future, core activities will again gain a higher priority.

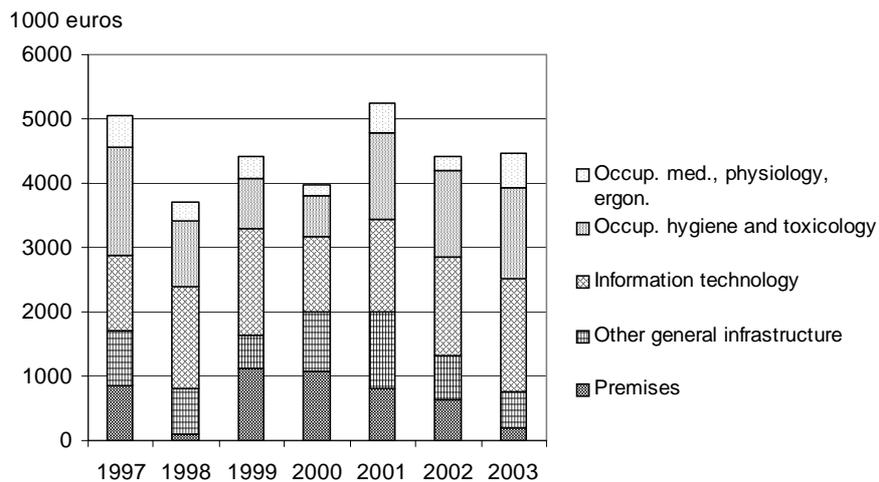


Figure 10. Investment volume and profile in 1997 2003 (1000 euros)

## ***Work spaces***

Since 1997 the Central Institute's premises have undergone considerable changes. About 40 % of the Central Institute's work spaces have been taken into use after the year 2000, and about 25 % have been totally renovated after the year 1995. Especially the new laboratory building with its modern and flexible laboratories offers excellent opportunities for high-level research and good working conditions for the personnel. All of the Central Institute's premises are now situated in a compact area on the Meilahti Hospital Campus. Compared to the previous decentralisation, this is a great improvement, enabling better collaboration between individual researchers as well as the different departments.

The Training Centre started the year 2004 in a new building with good facilities for arranging training, workshops and meetings.

## Appendix. Departments and Regional Institutes

The **Department of Epidemiology and Biostatistics** conducts epidemiologic research on work-related diseases to determine the occurrence and risk factors of diseases and possibilities for their prevention. Priority areas: epidemiology of musculoskeletal diseases, respiratory diseases, reproductive health and cancer, and social research. The Department coordinates FIOH's occupational health and hazard surveillance, the aim being to produce topical information about the state of the work life of Finns', and keeps the Register of Occupational Diseases and the Register of Employees Exposed to Carcinogens (ASA). The Department provides expert services to assure the appropriate use of epidemiological biostatistical methods in research at the FIOH.

The **Department of Physiology** produces a scientific base for considering human psychophysiological potential and limitations in work life. The purpose is to reduce the unhealthy features of work and to improve health by developing the work content, the work organization, the work environment, and individual resources. The Department uses a comprehensive and multidisciplinary approach to promote human work ability. Special emphasis is given to improving the work ability of people between the ages of 45 and 68 years. Fields of expertise: work physiology, chronophysiology, musculoskeletal research and work activity research.

The **Department of Psychology** carries out research and provides services to improve work, organizations, and workers' resources, so that the conditions for well-being, competence and productive work will be promoted. The main competence areas: developing work organizations, managing technological and other change processes, promoting psychological well-being at work, promoting gender equality and diversity, work career management, psychological assessment and testing of work competencies and work ability, developing methods for measuring and improving psychosocial factors and well-being at work.

The **Department of Occupational Safety** conducts research, and provides training and services designed to advance employee safety. The Department studies accidents in order to understand how and why they happen, develops methods and solutions for identifying, eliminating and managing workplace risks, and offers solutions and materials to help workplaces promote safety in novel ways. Fields of expertise: accident risks and workplace design, safety management and information systems, work processes and logistics.

The **Department of Physics** investigates physical hazards and provides services to prevent health risks. Research activities include identification, risk assessment and prevention of physical hazards, and optimization of physical factors at workplaces. Fields of expertise: non-ionizing radiation, noise and vibration, personal protective equipment (PPE) and clothing, postural stability, slips and falls, thermal environment (comfort, stress and strain), air quality and contaminant control. The Department is a Notified Body (PPE and Marine Equipment Directives) and an accredited testing laboratory (ISO 17025).

The **Department of Occupational Medicine** is responsible for the diagnostics and treatment of occupational diseases, and serves as the outpatient ward for occupational diseases at Helsinki University Central Hospital. The Department develops

the diagnostics of occupational diseases, and in this capacity serves as the reference institute for hospitals, insurance companies and official establishments and institutions. The Department also conducts multidisciplinary assessments of working capacity, carries out research on the aetiology, mechanisms, diagnostics, treatment and prevention of occupational diseases, and studies human brain function in information work. The Department trains physicians specializing in occupational health services and occupational medicine in the university curriculum.

The **Department of Industrial Hygiene and Toxicology** carries out research on exposure to chemical and selected biological agents, explores the magnitude of the exposure in occupational environments, delineates the deleterious effects of these exposures, and studies the mechanisms by which these exposures cause health effects in exposed workers. The Department develops methods for exposure assessment, and identifies new chemical and biological hazards. Areas of expertise also include chemical risk assessment, risk communication and risk prediction. Prevention of exposure-related health effects, and education and dissemination of safety information related to these issues are also important.

The **Department of Research and Development in Occupational Health Services** studies, develops, and assesses OHS and the OHS system. In cooperation with OHS personnel and workplaces, the Department also develops the content, processes and effectiveness of measures taken to promote work ability. The Department provides training for occupational health care professionals and experts. We provide services for experts in the fields of occupational health, occupational safety, and work ability. The Department houses the National Centre for Agricultural Health and the Computer-Assisted Telephone Interview Unit.

The **Regional Institutes** act as regional expert service and development units in occupational health and safety issues. Their primary task is to support workplaces, occupational health service units, regional authorities, and the regional labour market organizations in their efforts to develop working conditions and to promote the health of workers. Each Regional Institute also specializes in the problems of a particular branch of the economy, coordinating research and development activities in that particular specialty.

The **Kuopio Regional Institute of Occupational Health** specializes in forestry and agriculture, bioaerosols, aging, and disabled workers, as well as methods for the exposure assessment of workers.

The **Lappeenranta Regional Institute of Occupational Health** specializes in the forest industry, including pulp and paper production and the wood product industries. Other fields of research and development are working conditions in the hotel and restaurant sector, the road and transport sector, indoor air quality and the control of hazards, and exposure assessment of carcinogens.

The **Oulu Regional Institute of Occupational Health** specializes in the promotion of health and work capacity in cold working conditions and in a cold climate. Mining, metallurgy and the electronics industry are also important research targets. The northern Finland birth cohort of 1966, and soldiers' health, performance and cold protection are other objects of research.

**The Tampere Regional Institute of Occupational Health** specializes in the training of occupational safety personnel, in improving occupational health care and occupational safety in the construction industry, and in providing mobile clinic services on a national scale.

The **Turku Regional Institute of Occupational Health** specializes in the working conditions and occupational health of seafarers and health care workers. It offers special services and training in developing occupational health care for entrepreneurs, evaluating the effects of psychosocial working conditions on sickleaves and early retirement, determining the chemical emissions and acoustic properties of building materials, detecting allergenic substances in various products, and improving ventilation and reducing noise in factories.

**Uusimaa Regional Institute of Occupational Health** specializes in the topics regarding indoor air and environment, small-scale workplaces, construction, and the service sector. It provides services to identify, measure and prevent chemical, physical, and biological hazards, to develop work organizations and workplace ergonomics, and to evaluate the need for measures to maintain work ability.

The **Training Centre** offers high-level expertise meeting the needs of Finnish work life. It follows and evaluates the training needs of occupational health and safety professionals, evaluates the implementation of this training, develops the contents of qualifications and training to acquire qualifications (together with universities and other educational institutions), and organizes advanced and supplementary training services. The Centre also coordinates and develops FIOH's training activities.

**The Information Service Centre** acquires and maintains electronic publications and printed collections and databases. It responds to occupational health and safety information needs of internal, national and international customers with its library and information services. It promotes the use of its collections, databases, and reference management programmes by training and advising the users, by developing new user-friendly products and tools, and by providing access to the resources via numerous channels such as the Internet and the intranet.

'**Työ Terveys Turvallisuus**' (**Work Health Safety**) is a nationwide magazine, which disseminates information about the work environment, work organizations and the interaction between work and health. It keeps occupational health and safety experts and other interested parties up to date on recent developments and events in the field by providing reliable and practical information that helps to prevent and eliminate occupational health and safety problems.

**The Administrative Department** houses the following functions: the Director General's Office; the Administration Office; the Finance Office; the Publication Office; and the Office of Information and International Affairs. The **General Department** supports the acquisition, development and maintenance of information technology infrastructure and centralized information systems, as well as general acquisitions, real estate, and safety services.

## **Appendix 4. The 2004 International Evaluation Group**

**Marilyn A. Fingerhut, Ph.D** (Chairperson) currently serves as International Coordinator for the National Institute for Occupational Safety and Health (NIOSH) in the United States. She recently completed a two year assignment at the World Health Organization in Geneva, Switzerland, where she was Coordinator of the WHO Occupational and Environmental Health Unit. She returned to NIOSH in 2003 where she continues to do some work for WHO, serving as the Coordinator of the 70 WHO Collaborating Centers in Occupational Health.

She has held several positions at NIOSH. She was the NIOSH Chief of Staff from 1995 to 2001, Chief of the Industry-wide Studies Branch of NIOSH from 1988 to 1994, and a NIOSH research scientist from 1981 to 1987. The areas of interest in her epidemiologic research are global risk assessment, dioxin, carcinogens, and issues of women workers.

**Frank van Dijk, MD, PhD** is since 1987 professor in Occupational and Environmental Health and head of the Coronel Institute in the Academic Medical Center of the University of Amsterdam, The Netherlands. In the institute research and education are focused on occupational health issues. He is vice dean of the Netherlands School of Public and Occupational Health (NSPOH). This school offers among others postgraduate courses for occupational physicians. He is member of the Board of the Netherlands Center of Occupational Diseases, member of the steering committee of the Dutch research program on Mental Fatigue at Work, member of the Program Committee on Cooperation between occupational health care and health care in general. He is chairman of a program for improvement of the knowledge infrastructure for the Dutch occupational health care and member of the Editorial Board of Occupational and Environmental Medicine (London).

Current special interests are the development of evidence-based occupational medicine, the evaluation of quality and effectiveness of occupational health care, fitness for work issues related to employees with a chronic disease, and mental health at work.

The Coronel Institute is a Collaborating Center in Occupational Health of the WHO, the institute is active in various scientific committees of the ICOH.

**Erik Dybing, MD, PhD** is Director of the Division of Environmental Medicine (DEM), Norwegian Institute of Public Health (NIPH) in Oslo, Norway. The DEM is a research and advisory facility serving central and local health, environment and food authorities. He has for many years held adjunct professorships in toxicology and environmental health at the Medical Faculty of the University of Oslo.

He has participated in numerous national and international expert committees related to toxicology and environmental health, including IPCS, IARC, EC, WHO/EURO and OECD. He is currently a member of the European Commission Scientific Committee on Toxicity, Ecotoxicity and the Environment (CSTEE) and is chair of the WHO Study Group on Tobacco Product Regulation.

He has participated in the two previous evaluations of FIOH.

**Kari Hemminki** was born 1947 in Finland. MD University of Helsinki 1973, Ph.D in medical chemistry in 1973 and docent medical chemistry in 1975, University of Helsinki. Postdoctoral fellow, Johns Hopkins University, USA 1976-8, scientist 1978-87, research professor 1987-92 and temporary chief physician 1993-95, Institute of Occupational Health, Helsinki, Finland. Visiting scientist at Frederick Cancer Research Facility, USA 1984-5, Massachusetts Institute of Technology, USA 1987, Institute of Public Health, University of Cambridge, UK 1999.

Currently, he is Professor in epidemiology with a special reference to chemical health risks (molecular epidemiology) at Department of Biosciences, Karolinska Institute, Huddinge, Sweden (1989 present, 20%), and professor of molecular genetic epidemiology, German Cancer Research Center (DKFZ) and the University of Heidelberg, Germany (2002 present). He is also Chairman of research area C, Cancer Risk Factors and Prevention, DKFZ-

He has published over 600 scientific papers, of which about 500 original works. About 400 papers deal with toxicological and molecular aspects of cancer; 200 papers deal with reproductive and cancer epidemiology, with current emphasis on familial risk factors in cancer based on the Swedish Family-Cancer Database, created by him.

Activities: On expert panels on toxicology and reproductive hazards and on carcinogens, Chemical Inspectorate, Sweden 1999-, and Scientific Council, IARC 1999-2003. Editorial boards of 6 scientific journals, co-editor of 5 international books.

**Lars Hagmar, MD, PhD** is currently Professor and Senior Consultant in Environmental Medicine, at Lund University Hospital, and Chairman of the Institute for Laboratory Medicine, Lund University. He has previously (2000-2002) served as Vice-Dean for the Medical Faculty at Lund University.

He has served as both member and chairman for a number of national research granting committees, and also been member of WHO and IARC expert groups. He has previously coordinated a EU-funded collaborative research project and is presently participating in four such projects. Besides the EU fundings, he has grants from several national Swedish research councils. He is co-editor for Scand J Work Environ Health, member of the Editorial Board for Mutation Research Reviews, and regular referee for about 10 other scientific journals.

His scientific publications concern mainly epidemiological studies of occupational and environmental health, often applying biomarkers of exposure, susceptibility or effect. The current publication list contains 127 published original peer-reviewed papers, 12 review papers published in peer-reviewed international journals, 16 book chapters, 24 full length published abstracts, 173 other abstracts, and 40 reports.

**Joachim Lambert, Dr.-Ing.** has his background in mechanical engineering and engineering of nuclear power plants, Technical University of Aachen, (Dipl.-Ing. 1971). Research fellow in the field of Biomedical Fluidmechanics, Aeronautical Department, Technical University of Aachen, (1971 1976). Postdoctoral fellow, Physiological Flow Studies Unit, Imperial College of Science and Technology, London, (1976 1978). Scientific Manager for the German Federal Minister for Research and Technology (BMFT), responsible for the Preparation and supervision

of research projects in the field “biomedical engineering”, (1978 – 1982). Associate lecturer at Technical University Aachen in the field “Fluid mechanical aspects in Medicine” (1980 – 1998).

Institute for occupational safety and health (BIA), Sankt Augustin, Germany, Coordinator for research and testing, Head of Central Department, Head of Certification, Head of Quality Assurance, (1982 – 2000). Since 2000, he has been Director of KAN-Secretariat (Commission for Occupational Health and Safety and Standardization (KAN). KAN protects the German OSH interests in national, European and international standardization.

**Thomas Schneider, MSc.** served as Director of the Occupational Hygiene Department, National Institute of Occupational Health in Copenhagen from 1980 to 1997 and of the Indoor Environment Department from 1997 until 2001 when he stepped back to work as Senior Scientist at the institute.

He has contributed to exposure modelling, development of measurement instruments and approaches, exposure assessment for epidemiology, and source control. He is Co-editor, Scandinavian Journal Work, Environment and Health, has managed several national and international research projects and participated in international expert committees, including IPCS and IARC.

He has participated in the 1984 evaluation of the Swedish National Institute of Occupational Health.

**Hannu Uusitalo, Ph.D** is currently Director of Research, Statistics and Planning, Finnish Centre for Pensions. Before that he was deputy director general of STAKES, National Research and Development Centre for Welfare and Health (Finland), a kind of “sister organization” of FIOH. He has also been a member of Member of the Research Council for Culture and Society, The Academy of Finland altogether six years. He left Helsinki Economic University in 1991 after working there as professor of sociology ten years. He has been an evaluator or a member of an evaluation group of several Finnish institutes and one Nordic institution.

**Gunnela Westlander, PhD, D. Eng. H.c., Professor emeritus:** Formerly professor and head of the Division of Social and Organizational Psychology, Swedish National Institute of Occupational Health 1986-1995.

After retirement, she holds since 1995 expert appointments at the Division of Industrial Ergonomics, Linköping University and the Royal Institute of Technology, Stockholm, providing doctoral instruction, dissertation guidance and supervision in current research projects.

Current positions:

- Norwegian Research Council. Member of program board for Work and Health 1999
- National Agency of Higher Education. Expert evaluator of sociology and social psychology education at Swedish universities 2003-2004
- The Swedish Agency for Innovation Systems. Member of Program Board “VINNOVA competence centres” 2004

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