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New Forms of Physical and Psychosocial Health Risks at Work

Study

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Contents

Executive summary

The following general drivers related to emerging OSH risks are important.

Globalization resulting in more competition, more restructuring and downsizing, more precarious work, and increased job insecurity, as well as increased intensification and increased time pressures at work, more self-employed workers without personnel, and small enterprises with poor compliance to OSH regulations;

Demographic changes leading to more older and migrant workers from decreases in the work force. According to statistics, migrants, illegal, deprived, and temporary workers have more accidents, (lethal) injuries, and occupational diseases. Work that entails considerable exposure to health and safety risks is not improved by employees because foreign and illegal workers often accept such jobs owing to economic constraints and a lack of knowledge about their labour rights. Demographic changes may lead to pressure on employees who may otherwise want to (partially) leave the work force early in order to continue working, such as women and the chronically ill;

Technical innovations leading to an employment shift towards services with no clear separation between working time and leisure time, possibly resulting in a poor work-life balance and, especially in the IT sector, in a greater complexity of working tasks that require lifelong learning to secure OSH. Additionally, the service economy with its growing number of offices leads to musculoskeletal disorders (MSD) from inactivity, static postures, or repetitive movements. Apart from this, the service industry creates more and new human/human interfaces, leading to increased psychosocial pressures such as violence and bullying. Additionally, technical innovations can lead to new risks caused by new environmental agents (chemical or physical) or new exposure characteristics;

New risk perception, deriving from the changed notion of tolerable risk as well as an awareness of combined exposure from different types of risk that result from new measurement possibilities. Combined exposure may be associated with a multiplication of the effects;

An increase in natural hazards affects the working conditions of workers who have contact with such hazards.

Emerging OSH areas affected by these drivers are:

1. Important emerging *physical risks,* such as: (1) inactivity and (2) combined exposure to a mixture of environmental stressors that multiply the risks of health problems;
2. Important emerging *psychosocial risks*, more specifically, (1) job insecurity, (2) work intensification and high demands at work, and (3) violence, harassment, and bullying, with high exposure rates in services and for (young) women. Additionally, work-life balance may be considered a risk that appears to be specific to working women, since in all EU countries women have, or feel they have the main responsibility for caring and household tasks at home;
3. Important emerging *dangerous substances* because of technological innovation, more specifically:
    - Exposure to nanoparticles;
    - Exposure to chemicals that interfere with the endocrine system (EDCs);
    - Increase in allergies caused by exposure to chemical and biological agents;

- Occupational risks related to global epidemics such as SARS;
- Exposure to electromagnetic fields;
- An increase in initiatives in the renewable energy sector leads to a need for more workers in these sectors and an increase of 'old' OSH risks (for example, working from heights) and 'new' ones (for example, exposure to engines using bio diesel as fuel).

On the basis of national and international statistics and the literature, most of the emerging OSH risks identified above can be evaluated for

1. number of workers exposed,
2. exposure duration,
3. effect and
4. probability that an effect will occur.

This evaluation by the authors is presented in table 1, below.

From table 1 it is apparent that little information is available on some risks. For multiple risk factors, only the number of workers exposed could be estimated. Problematic is the **large diversity of risk combinations**. It appears that the combination of psychosocial and physical stressors often occurs, the exposure duration is long, and may show a minor interactive effect. The effects are likely to be ill health, i.e. musculoskeletal and mental health problems, cardiovascular disease, and absenteeism. Dropping out of work is likely to include early disablement. Moreover, a combination of dangerous substances may have a strong interactive effect, with only limited time between exposure and effect. Examples of the latter are exposure to tobacco, smoke, and asbestos or radon.

Physical inactivity, work intensification, and work-life (im)balance are very prevalent emerging OSH risks. They often entail long exposure, but their effects are estimated to be of medium importance. In some specific target groups, such as the lower end of the labour market, the effects are of high importance to those exposed to many of these risks.

Several less frequent emerging OSH risks such as violence and harassment at work, allergies, and global epidemics have a significant impact on workers exposed to such risks. The latter types of emerging risks are known to expose workers in specific sectors and occupational groups.

Job insecurity is considered an emerging risk, but the number of exposed workers considered at risk varies among the different research groups. It appears that workers are hardly exposed to job insecurity in some European regions (particularly in the 'old' EU-15 member states), whereas very many workers are exposed to this risk in other European regions, particularly in the newer member states. When exposed to this risk, exposure occurs over time, particularly in regions where many workers are exposed.

EMF (electromagnetic field) is a specific emerging occupational risk, especially prevalent in specific sectors (certain sectors in manufacturing, healthcare, public administration, particularly waste management, and transport). Exposure is medium to high for workers in these sectors, and exposure duration is long. The impact of the exposure is relatively low, but when exposed, the probability of developing ill health is high.

An emerging risk not yet very prevalent and currently estimated to have an exposure duration and impact of medium to low importance is the use of sustainable energy sources. Nevertheless, this risk is really a future occupational risk: the number of workers exposed is rapidly increasing.

Table 1 An overview of risks, rated according to importance

Emerging risk	Long-term impact				Ranking
	Number of workers exposed	Exposure duration	Effect	Probability	
1. Physical inactivity	5	5	3-5	3-4	4-5
2. Multiple risk factors	5	nk (1-5)	nk (3-5)	nk (3-5)	5
3. Job insecurity	2-4	4	3-4	3-4	3
4. Work intensification	4	4-5	3-4	4	4
5. Violence and harass-ment	2	1-4	4-5	2-3	4
6. Work-life balance	4	4	2-3	3-4	3
7. Nanoparticles	1-4	2-3	nk	2	2-4
8. Endocrine disruptors	nk (1-4)	3-4	2-5	2-3	4
9. Increase in allergies	3-4	4-5	4	3	4
10. Global epidemics	1	2-4	5	2-4	3-4
11. Electromagenetic fields	3-5	4-5	2	1-4	4
12. Sustainable energy resources	1-2	2-3	1-2	1-2	1

5 = of high importance, 1 = of low importance, nk = not known.

Policy options

Below, a systematic overview of policy options and considerations is presented.

Broader policies that influence the emergence of new risks

Emerging OSH risks do not arise in a vacuum but are driven by technological, economic, demographic, or other social developments. We repeat this ‘conclusion’ in the introduction that elaborates on drivers of emerging OSH risks. The most proactive policy option for influencing emerging risks is to integrate OSH considerations in policies that influence technological, economic, demographic, or other social developments. Additionally, the emerging risks mentioned in this report are seldom solely OSH risks. Often they go hand in hand with public health or environmental risks. They are associated with economic issues within Europe, with differences among EU regions in the demand for labour, prices for labour, and social security regulations, resulting in a partly temporary migration of workers within the EU as well as across EU borders.

Emerging OSH risks should be seen as part of the broader topic of emerging risks in the related fields of OSH, public health, and environmental protection. As a consequence, policies on public health and environmental protection may envision similar needs that influence technological, economic, demographic, or other social developments. The consequences of, for instance, endocrine disruptors and nanotechnology are typical examples of emerging public health and environmental risks.

The social impacts of emerging OSH risks also include the costs of the risks identified. In many countries psychosocial risks are an important and rapidly increasing burden on public health and social security costs, but musculoskeletal risks are important as well. They often have secondary and sometimes primary social costs, depending on the particular country.

The developments associated with emerging OSH risk are very relevant not only for OSH policies, but also for policies on employment, economic development, equal opportunities, innovation and competitiveness, public health, social cohesion, and social security.

New legislative arrangements: development, adaptation, and enforcement of legislation

Occupational Safety and Health is already a highly regulated area. The policy question is: are existing regulatory requirements sufficient, should they be adapted, or is it mainly a matter of greater compliance and better enforcement? More legislative requirements may even hinder technological and social innovation. Reluctance to develop new legislative requirements by social partners is therefore expected. It is advisable to deal with discrepancies between partners in a balanced way.

The EU Framework directive is clearly also relevant for emerging risks. In itself it does not need adaptation. On the topic of EMF there appears to be an urgency to speed up the transition process regarding the amendment of 2004/40/EC on EMF.

The major policy challenge appears to be ensuring that existing requirements are implemented and applied to the various emerging risks. This is likely to require extra stimuli to foster compliance, including strengthening the abilities of enforcement agencies and other professional agencies to do this.

Economic incentives

An important policy option, in principle, is to develop economic incentives that help the invisible hands of market forces to reduce and control emerging risks. This would be in accordance with the ‘polluter pays principle’ (i.e. preventing shifting of consequences).

Tax arrangements could include dedicated charges for relevant items associated with social developments, or liabilities for future health and safety consequences of specific economic activities. Taxation, however, is mainly a national responsibility. Charges here may hinder innovation, as liabilities generally do not stimulate proactive policies. The most useful suggestion seems to be to impose (temporary) dedicated charges on some technologies, with the yields earmarked for research on potential negative impacts and to develop alternative technological options to reduce these impacts.

Research and development programmes

In several paragraphs on emerging risks there is not yet sufficient knowledge available to make reliable risk assessments. In some cases, especially with nano and endocrine disruptors, the problem is even more fundamental, since validated methods for measuring negative impacts are not yet available.

Research may also be needed on the solution side of emerging risks. When problems are measured and assessed, this is not in itself a guarantee that sufficient knowledge on potential solutions is available. It may require further research.

Development of European and national capabilities

Recognizing, assessing, reducing, and controlling emerging risks require new social capabilities that were hardly needed in the past. They cannot be directly influenced by the European Parliament (EP), but the EP may stimulate their development in several ways.

Specific attention is needed on capabilities in new member states, as these are generally less well developed. Important factors in national and European capabilities in this respect are:

- The availability of (validated and) practical methods and tools (including measurement or monitoring of risks);
- The availability of sufficient expertise in relevant sectors of industry in government organizations, consultancies, etc.;
- The availability of capabilities for research and development in universities and other knowledge organizations.

The development of validated, practical methods and tools (including measurement or monitoring of risks) can be stimulated by dedicated research and development efforts.

The availability of sufficient expertise can be encouraged by setting up European networks and conferences to stimulate exchange of know-how among experts of different member states. It can also be stimulated by dedicated activities for new member states.

Promoting the integration of emerging risk control in OSH management

EU legislation requires that companies systematically manage OSH risks. This is also true for emerging risks. Nevertheless, in everyday practice emerging risks are often ignored or neglected by OSH management.

Therefore, it may be very useful to start European and national initiatives to promote the integration of emerging risk control in OSH management. The aims should be to promote awareness, development of in-company expertise and expertise in OHS services to develop validated instruments and to change the culture of ignorance.

Promoting Corporate Social Responsibility with respect to emerging OSH risks

Companies and other organizations are increasingly adopting the concept of responsible business practices or Corporate Social Responsibility (CSR). This means integrating social and environmental concerns in business practices, and communicating them to stakeholders (EC 2001) on a voluntary basis (European Commission, 2001). It also implies taking ethical issues into consideration in business decisions. Safety and Health at Work is increasingly seen as an important dimension of CSR (Zwetsloot, G. and Starren, A., 2004).

Apart from mandatory requirements, emerging OSH risks certainly constitute an important area for Corporate Social Responsibility. Companies should therefore be encouraged to include this dimension in their responsible strategies, in dialogues with employees or their representatives, and also in dialogues with external stakeholders (e.g. social security agencies, insurers, public health institutions, governmental agencies - including labour inspection, etc).

1. Introduction

The changing labour market and innovations in technology will have an impact on the way work is organized and risks experienced at the workplace. In the report on *'Priorities for occupational safety and health research in the EU-25'* (European Agency for Safety and Health at Work, 2005 (a)), the Bilbao Agency identified five categories of emerging OSH risks.

Based on this report and four Delphi studies with about 200 OSH experts in Europe, the following emerging OSH risks were identified:

1. the psychosocial work environment,
2. musculoskeletal disorders,
3. dangerous substances,
4. OSH management, and
5. multifactor risks.

In parallel, the European Technology Platform Industrial Safety included seven topics in its first strategic research agenda (ETP Industrial Safety, 2006):

1. risk assessment and management,
2. advanced risk reduction technologies,
3. structural safety,
4. human and organizational factors,
5. emerging risks,
6. nanosafety, and
7. innovation for education and training.

Moreover, NEW OSH ERA (New and Emerging Risks in Occupational Safety and Health - anticipating and dealing with change in the workplace through coordination of OSH Risk Research) - began as a published FP6 ERA NET report on complementarities and gaps in national OSH research programmes on new and emerging risk factors in 2007 (NEW OSH ERA, 2007). This report revealed that the highest consensus for OSH research priorities among nations participating in NEW OSH ERA was on research concerning:

1. work environments that prevent the occurrence of psychosocial problems,
2. psychosocial risks associated with organizational changes and
3. combined exposure to multiple risk factors in the working environment, including physical, chemical, psychosocial, biological, and ergonomic issues,
4. changes in the world of work and employment conditions (forms of work), as well as
5. improving OSH management systems and safety culture.

In the next chapters we will provide an overview on the drivers related to emerging OSH risks and then expand on those emerging issues particularly relevant to study within the framework of health and safety at work. For specific emerging risks, the gaps in knowledge or practice and implementation are presented. Furthermore, a general framework on prevention is provided in a separate section. This report ends with conclusions as well as short and longer term policy recommendations.

2. Drivers related to emerging OSH risks

Looking at the major global trends of the past decades, we can identify the following general drivers that are related to emerging OSH risks:

1. Globalization;
2. Demography;
3. Technological innovation;
4. New risk perceptions;
5. Increase in natural hazards.

It is important to bear in mind that all these trends are interrelated and interact, and that there is an overlap in their effects on OSH.

2.1 Globalization

In the past decades significant changes have occurred in the world of work (European Agency for Safety and Health at Work, 1998; EFILW, 2002; NIOSH, 2002). Economic liberalization and the spread of free trade resulted in the onset of globalization. The need to compete with low-wage countries led many companies to restructure and downsize their workforce. Production plants moved to lower cost sites and companies made more use of non-traditional employment practices (outsourcing, temporary work, part-time work, or flexible work).

Moreover, they established new work methods such as lean production and just-in-time production (European Agency for Safety and Health at Work, 1998; EFILW, 2005(a); Boisard, P., et al., 2003). This led to an increase in self-employed workers without any personnel, small enterprises (fewer than 10 workers), and an almost inherent poor compliance with OSH regulations. Control of health and safety risks is difficult when subcontracting because, while co-operation among different enterprises and employers is obligatory, it is not always put in practice.

The above non-traditional employment practices are aimed at augmenting profits and reducing costs to ensure competitiveness. As in most companies, personnel costs are the main costs. Since the 1990s, increasing work intensification and greater numbers of precarious contracts have been observed in the EU and USA (Fuchs, T., 2006; Boisard, P., et al., 2003; Green, F., and McIntosh, S., 2001) when increased automation was not possible.

These developments entail increased job insecurity for employees and increased concerns for the future (Sverke, J., et al., 2006). Work intensification and time pressures may also increase the prevalence of musculoskeletal disorders (MSD) because of greater physical musculoskeletal strains and/or increased psychosocial risks for MSDs such as stress. In addition to these changes in the world of work, globalization leads to increased travel, which enhances the risk of global epidemics (LeBâcle, C., et al., 2005; Thiermann, A., 2004).

2.2 Demographics

In the coming decade strong demographic changes will become apparent in industrialized countries (see figure 2.1).

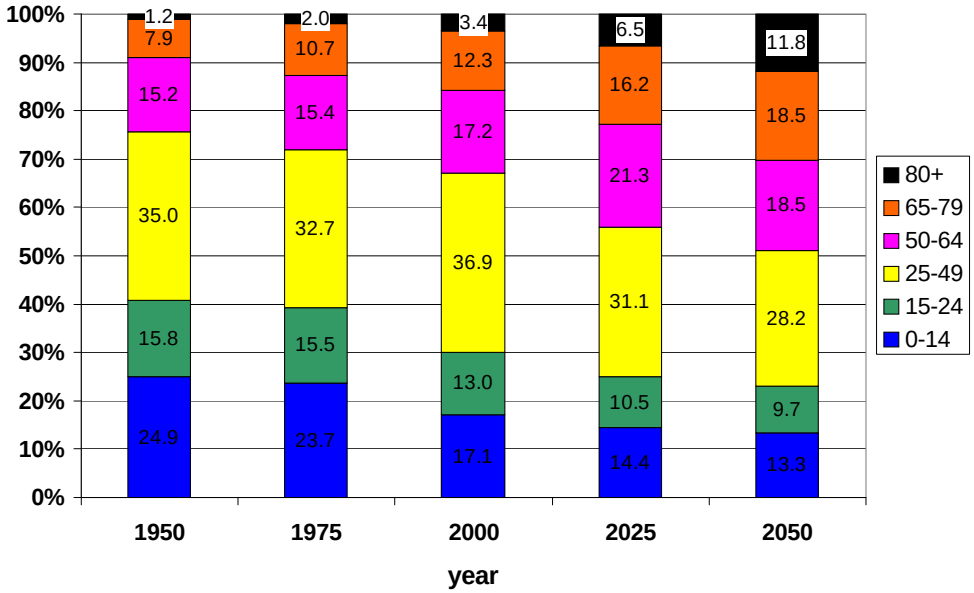

Figure 2.1 Trend of age group contribution to work force from 1950 to 2050 (in percentages). In 2050 half of all European citizens are expected to be 50+
Source: UN World Population Forecast 2002, Eurostat 2004 (EU-Nachrichten, 2006)

Decreasing fertility rates and higher life expectancy make the steady increase in the proportion of older people particularly important (Fahey, T., and Spéder, Z., 2006). In response to this phenomenon, some countries have raised the retirement age to stabilize social welfare systems. **Older workers** are often more vulnerable, especially to poor physical working conditions (see § 6.1). Physical and physiological performance from such factors as losses in hearing, vision, muscular strength, cardiovascular capacity, and the time needed to recover decrease with age.([1])

Moreover, slower response times and the experienced, accumulated strains during workers' work lives may cause them to have physical disabilities and occupational diseases more often, which also impacts on absenteeism and work performance (Commission of the European Communities, 2002; EFILW, 2005(b)). Therefore, the increasingly ageing workforce requires seeking more knowledge on how to prevent OSH problems for this target group.

Unfortunately, 'Societies, organizations, and employees still face difficulties in managing the consequences of the trend towards an ageing workforce in a satisfactory way.

Demographic changes can still be regarded as a challenge for occupational safety and health' (European Agency for Safety and Health at Work, 2007 (a)). These changes also lead to an increase in migrant workers with an impact on OSH for this group. Statistics show that migrants, illegal, deprived, and temporary workers have more accidents, (lethal) injuries, and occupational diseases (Ambrosini, M., and Barone, C., 2007). Workers in companies often do not understand many prevention instruments (training, instruction, procedures) because of language problems. Work that entails considerable exposure to health and safety risks is not improved by employers since foreign and illegal workers often accept such jobs because of economic constraints and a lack of knowledge about their labour rights (European Agency for Safety and Health at Work, 2007 (b)).

([1]) http://ec.europa.eu/energy/res/setplan/index_en.htm.
http://www.erec-renewables.org/
http://www.erneuerbare-energien.de/files/pdfs/allgemein/application/pdf/ee_jobs_2006_kurz.pdf

2.3 Technological innovation

Technological innovation leads to changes in the 'world of work', creating new workplaces and reducing specific risks. On the other hand, technological developments may also lead to new risks and new risk groups.

Technical innovations in the past decades have created an employment shift towards services. Technological progress, leading to improved automation and new, growing fields of work (such as the information technology sector) have supported a shift from traditional manufacturing industries **to a new service oriented society**. At the same time, new types of work such as telecommuting or mobile IT devices for mobile workers result in unconventional working hours because employees can be reached anywhere and anytime (Janssen, D., and Nachreiner, F., 2004). Moreover, increased global networking favours a 24-hour society. The increasing lack of a clear separation between working time and leisure time may lead to poor work-life balance and moments of rest become scarce (Van Rijswijk, K., 2005).

The growth in new technologies, especially in the IT sector, leads to a greater complexity of work tasks which requires lifelong learning to secure OSH. IT developments appear to be quite different among the various EU countries and sectors, however (Joling, C., and Kraan, K., 2008) (see Annex 1), which may result in very different consequences and prevention strategies in these countries and country clusters.

More complex technology calls for better ergonomic design of the human/machine interface to ensure safe use of such technology. The service economy with its growing number of offices also leads to MSD from physical inactivity, static posture, or strong repetitive movements when using a computer and peripherals (Cramer, J., et al., 2001; Hoehne-Hückstädt, U., et al., 2007). Additionally, indoor air quality becomes more important for such workplaces (Nold, A., and Bochmann, F., 2006).

Besides, the service industry creates more and new human/human interfaces, leading to increased and new psychosocial pressures. When the demands of work are constantly high, workers' performance deteriorates. Particularly in situations where there are more human-to-human contacts; this may result in increased violence and harassment. Increased psychosocial OSH risks also tend to contribute to the occurrence of disorders such as MSDs (Halford, V., and Cohen, H.H., 2003).

Technological innovation such as the development of nanotechnology (Laigle, F., 2005), biotechnology (Advisory Committee on Dangerous Pathogens, 2005), new chemicals (Forum 10, 2003), and the introduction of new, sustainable energy resources may also lead to completely new hazards. New prevention approaches are required to cope with the consequences of such innovations, i.e. allergies caused by isocyanates or dermal exposure, infections due to antimicrobial-resistant pathogens (Livermore, D., et al., 2005; Canadian Centre for Occupational Health and Safety, 2003), and inflammatory responses due to endotoxins, work-related cancers, cardiovascular diseases, and reproductive health disorders caused by man-made dangerous substances.

2.4 New risk perception

The notion of a tolerable risk level has changed in modern societies. So, for instance, the focus on musculoskeletal disorders is not only caused by new risks, but also by a new type of risk perception. This is also true for the measurement of combined exposure, which was not widely discussed ten years ago (Hermanns, I., et al., 2007).

The combination of new measurement possibilities with new working conditions leads to new risk perceptions, which calls for new prevention measures. At the same time, the general public's knowledge and awareness of potential health hazards is increasing in our communication society so that well-targeted prevention is possible and necessary.

2.5 Increase in natural hazards

Increasing pollution causes climate changes to become visible, leading to floods, droughts, forest fires, and increased UV radiation due to a decrease in the ozone shield (NRPB, 2002). These phenomena are linked to the occurrence of diseases such as cancers. Moreover, natural disasters are affecting several industrial facilities simultaneously, including employees and critical utilities such as water and power supply as well as communication, which may not be available because of a lack of electricity or the destruction of infrastructure. Safety measures for industrial sites may not be sufficiently adapted to conditions following natural disasters, which could cause technological hazards. Likewise, people deployed in emergency aid are greatly affected by natural disasters, and their working conditions may lack OSH.

The above drivers are ubiquitous throughout Europe (Commission of the European Communities, 2002), the USA, and in many other developed countries (Quinlan, M., et al., 2001). Apart from some short-term positive effects, scientific research shows that these trends have harmful effects on workers' health and their work and employment conditions (NIOSH, 2002; EFILW, 2006 (a)).

3. Emerging OSH risks predominantly related to musculoskeletal disorders (MSDs), physical inactivity, and multifactor risks

3.1 Physical inactivity/lifestyle at work/obesity

Trends

The growing use of computers and automated systems causes an increase in sedentary work or prolonged standing at work, resulting in increased physical inactivity. In industry the emphasis on lean production leads to less walking (e.g. to fetch supplies) in order to maximize output. Growing computer use and productivity demands lead to increasing time spent in a fixed body posture.

Annex 1 shows the trends in the use of machines and computers from 1995 to 2005 by EU country clusters (Joling, C., and Kraan, K., 2008). A large increase in computer use took place in the Scandinavian countries and The Netherlands, as well as in southern Europe and other countries on the continent. While there was no increase in Ireland and the UK, there was a decrease in machine technology. In Eastern Europe, including Bulgaria and Romania, only an increase in machine related technology was observed.

Work commitments and other time demands are commonly cited reasons for physical inactivity, too (Sanderson, B., et al., 2002; Trost, S.G., et al., 2002). The increasing travel time to work and inactive leisure time also contribute to the overall increase in inactivity.

In The Netherlands the average time employees spend sitting during the day is 7 hours (Hildebrandt, V.H., et al., 2007). This sedentary behaviour varies among job types, from 5.5 hours (agrarian jobs) to 8 hours (management and administrative jobs). It is generally recommended that healthy adults have at least 30 minutes of moderate-intensity aerobic (endurance) physical activity for five days a week, or a minimum of 20 minutes of vigorous intensity physical activity for three days a week (ACSM, 2007; Haskell, W.L., et al., 2007). In 2005 43% of Dutch employees did not meet this guideline (ACSM, 2007; Haskell, W.L., et al., 2007). Two-thirds of the general population of Europe (over 15 years of age) does not meet this guideline, and the trend towards less physical activity is increasing (WHO, 2006 (A)).

In a study in the UK over 50% of respondents in small and medium sized enterprises reported they were physically inactive and had musculoskeletal problems (Fine, A., et al., 2004). Examples of sedentary or standing jobs are: crane operators, straddle-carrier drivers, truck drivers, workers in semiconductor factories, workers operating automated systems and machines, workers at visual display units (VDUs), and call centre agents (European Agency for Safety and Health at Work, 2005 (b)). This illustrates the need for targeted action to increase healthy activity among workers.

Impact of inactivity

Inactivity is associated with health risks such as coronary heart diseases, type II diabetes, and certain types of cancers (US Surgeon General, 1996; Zhang, M., et al., 2004). Another important risk of inactivity is obesity (Colditz, G.A., 1999). Obesity itself can lead to several adverse health effects, such as back pain (Wright, D., et al., 1995), high blood pressure, cardiovascular disorders, and diabetes (Rodrigues, J., 2001 (a); (b)).

Static muscle load leads to diminished blood circulation in the muscles (Cramer, J., et al., 2001). Employees who experience prolonged standing have an increased risk of oedema in the legs (Zander, J.E., et al., 2004), varicose veins, deep-vein thrombosis (Van Rijswijk, 2005; Tuchsen, F., et al., 2000; Beasley, R., et al., 2005), and back pain (Hoogendoorn, W.E., et al., 1999; Xu Xu, Y., et al., 1997). In addition, sedentary jobs are associated with increased prevalence of musculoskeletal complaints or disorders, e.g. neck and shoulder disorders (Chandrasakaran, A., et al., 2003; Burdorf, A., et al., 1993; Piazzi, A., et al., 1991; Korhonen, T., et al., 2003; Visser, B., 2004) and upper and lower back disorders Chen, Y., et al., 2006). Such disorders may lead to sick leave and work disability (Cramer, J., et al., 2001).

Interventions

Appropriate and selected interventions are needed to reduce the health risks of inactivity at work. Current policy promotes ergonomic measures, thus improving working postures. Such measures do not address the lack of activity at the workplace, however. In fact, they may even have an adverse effect. After all, placing all needed materials and tools within close reach further reduces physical activity.

Therefore, the risks of inactivity should cause a concerted effort to optimize the physical load and organization of the workplace by everyone involved, i.e. employers and employees, policy makers, OSH officers and ergonomic experts.

Recommendations

Several initiatives may contribute to reach this goal:

• Develop guidelines for a healthy amount of activity at work and include these in existing guidelines and standards for musculoskeletal load. Apart from regular physical activity (the recommendation mentioned earlier), regular work breaks are recommended and have already been mentioned in several Council Directives (Council Directive 90/270/EEC, Council Directive 98/37/EC, Council Directive 93/104/EC), although the amount and duration of breaks are not specified. In **the Netherlands** an initiative has been taken to develop recommendations for the amount of physical activity and for recovery time of static muscle load (Commissaris, D., and Douwes, M., 2007). More **scientific evidence** is needed to provide a basis for these recommendations and prove their effects.

The effort should include:

• Developing objective methods to assess the amount of physical activity of employees;

• Performing studies on the health effects of promoting healthy activity at work.

• Adding breaks, this has been shown to be associated with reduced discomfort and fatigue in the neck and shoulder muscles (De Looze, M.P., et al., 2005; Balci, R., and Aghazadeh, F., 2003; Boucsein, W., and Thum, M., 1997).

• Integrating exercise programmes in the daily work routines of employees, which can have a positive effect on cumulative trauma disorders and mood states (Pronk, S.J., et al., 1995; Taylor, W.C., 2005).

• Raising awareness can reduce the incidence of lower back pain (Lyons, J., 2002).

• Engaging in sports for at least one hour a week during at least 10 months a year is associated with reduced neck and shoulder symptoms, sickness absence, and long-term sick leave due to neck and upper limb symptoms (Van den Heuvel, S.G., et al., 2005 (a));

• Developing new interventions and effective intervention strategies, such as office furniture or technologies that enable dynamic computer and other static work tasks, e.g. dynamic chairs, sitting-standing tables, mobile computer systems, meeting facilities, etc.;

• Performing cost-benefit studies on promoting healthy activity at work. Increased physical activity and other healthy practices (reduced smoking or alcohol consumption) are associated with lower healthcare costs. Investments in effective interventions to encourage healthy behaviour can be justified to employers and managers if financial benefits can be shown (Edington, D.W., et al., 1997; Martinsson, B.C., et al., 2003).

3.2 Combined exposure to multiple risk factors

Trends

It is well established that workers are exposed to a diverse and dynamic mix of environmental stressors as a routine part of their work. Differential exposure to various environmental stressors, including biological, chemical, physical, and psychosocial ones, can contribute to increased health and safety risks in human populations. Stressors can include any ergonomic or other physical risk factor (e.g. heat, noise, radiation), biological (e.g. staphylococcus aureus, penicillium funiculosum), chemical (e.g. benzene, lead, dichlorodiphenyltrichloroethane), or psychosocial one (e.g. high work demands, low control, work or family conflict, unemployment, neighbourhood crime), which may, either by its presence or absence, cause deleterious effects in an organism, community, or population (U.S. EPA, 2003).

Impact of combined exposure is multiplicative rather than additive

There is clear evidence that **toxicity can be modified by simultaneous or sequential exposure to multiple environmental stressors** (Carpenter, D.O., et al., 2002; Hertzberg, R.C., and Teuschler, L.K., 2002). For example, exposure to tobacco smoke and asbestos (Erren, T.C., et al., 1999) or radon (Morrison, H.I., et al., 1998) multiplies the risk of lung cancer. It has a much greater effect than what would be expected from simple adding up the effects of the individual stressors. The study concludes that one-third of cancer cases among smokers exposed to asbestos can be attributed to the synergistic behaviour of the two carcinogens (U.S. EPA, 2003).

A statistically significant relationship was noted between radon-progeny exposure and risk of lung cancer mortality. A multiplicative relationship between radon-progeny exposure and current smoking and the risk of lung cancer has consistently been shown. The study also showed that with equal total exposure, a high exposure rate (of short duration) is less harmful than a low exposure rate (of long duration) (Carpenter, D.O., et al., 2002).

Similarly, exposure to aflatoxin-contaminated food and hepatitis B infection greatly increases the risk of hepatocellular carcinoma (Kuper, H., et al., 2001). Exposure to noise and toluene results in higher risk of hearing loss than from either stressor alone (Franks, J. and Morata, T.C., 1996).

Poor psychosocial factors at work can generate work-related MSD. A great deal of research is currently being carried out in this field (European Agency for Safety and Health at Work, 2005 (b)). Workers exposed to a great many biomechanical and psychosocial workplace risk factors are more likely to report symptoms of musculoskeletal disorders than workers exposed to one or another of such factors (Devereux, J.J., et al., 2002; Bongers, P.M., et al., 2006). This is illustrated in Annex 2. Psychosocial risk factors at work have a greater effect on the prevalence of musculoskeletal complaints when exposure to physical risk factors at work is high than when it is low.

Work organization characteristics such as low job control (European Agency for Safety and Health at Work, 2005 (b); Norman, K., et al., 2004), high job demands, poor management support, as well as little support from colleagues (Bongers, P.M., et al., 1993) and lack of solidarity (Gunnarsdottir, H.K., et al., 2003) have been shown to be associated with an increased risk of musculoskeletal injuries. Thus, physical as well as psychosocial factors need to be studied and addressed to prevent musculoskeletal disorders (Van den Heuvel, S.G., et al., 2005 (b)). Additionally, psychosocial risk factors can cause a physiological reaction which, when prolonged, results in diverse pathologies, ranging from cardiovascular morbidity and mortality to illnesses related to malfunctioning of the immune system (see § 4.1 and § 4.2).

In a population of computer workers productivity loss was involved most often in cases reporting both neck/shoulder and arm/hand symptoms (36%). Productivity loss involved sickness absence in 11% of the arm/hand cases, 32% of the neck/shoulder cases, and 43% of the cases reporting both symptoms (Van den Heuvel, S.G., et al., 2007).

Prevention and recommendations

In spite of the fact that there are usually multiple risks in all jobs, **risk assessment methods and preventive measures are often one-dimensional**. Although there is evidence that stress can induce or reveal a latent effect from certain toxic agents or that it can alter basal levels of biological functioning and shift toxicity thresholds, methods and techniques for assessing levels of stress and their potential contributions to cumulative risk are in their infancy (DeFur, P.L., et al., 2007). An exception is computer work, where a multi-risk approach is being increasingly applied.

In most cases there is a lack of proper tools to adequately evaluate interactions among risk factors (European Agency for Safety and Health at Work, 2005 (b); Menzie, C.A., et al., 2007). Quantitative tools are needed for assessing the biological response to cumulative environmental risk factor exposure as well as to assess single factor exposure.

Effects of long lasting exposure to various risk factors is particularly difficult to assess since, in the last 15 years, there has been a significant increase in outsourcing as well as subcontracting, also increasing the combined exposure in certain risk groups, yet the effects of long lasting exposure to risk factors cannot be traced (e.g. see Chapter 6).

The fundamental, interrelated questions that must be addressed as part of the cumulative risk assessment process are: Which environmental mixtures are most important to address from a public or occupational health perspective? What are the nature and magnitude of cumulative exposure to populations of interest? What is the mechanism and consequence of combined effects on the exposed population? Which interventions can be taken to counter this process in an effective and practical way?

From a public health perspective the following mixtures are most important:

- The population size exposed to the mixture of risk factors for a large magnitude of the exposure;
- The volume, duration, frequency, and/or timing of exposure to the mixture of risk factors;
- The known or suspected adverse outcomes of exposure;
- Probability of interactions among risk factors.

Recommendations for interventions aimed at reducing the consequences of the combined effect of risk factors on the exposed population:

- Develop prospective studies, which would provide data on exposure to multiple environmental risk factors and on the health effect of such exposure;

- Establish environmental health monitoring systems that provide for the systematic collection, integration, analysis, interpretation, and dissemination of information about environmental risk factors, including sources, exposures, doses, and potentially related health effects;
- Provide availability for specific and sensitive biological, chemical, radiation markers of exposure and appropriate methods for risk assessment;
- Develop computer models to simulate longitudinal exposures to multiple risk factors and effects of interventions;
- Take into account the range of non-occupational exposures in the assessment process;
- Develop methods which provide in-depth understanding of exposure-related events that occur from worker contact with environmental risk factors for discomfort, dysfunction, disability, and disease.

4. Emerging OSH risks predominantly related to psychosocial issues

4.1 Job insecurity related to unstable labour markets and precarious contracts

Trends

The proportion of precarious contracts has significantly increased in the past two decades (Fuchs, T., 2006). The **definition of precarious contracts** should include the fact that they only offer short-term employment, little social protection, low levels of income, poor control over work, and high job vulnerability (De Witte, H, 1999; EFILW, 2005 (a)). Such precarious work forms include: temporary agency work, short-term contracts, part-time work, home-based work, on-call work, and day hire work. In times of unstable labour markets, such work forms appeared to politicians as promising means to avoid unemployment, as they provide more flexibility in the labour market (Quinlan, M., et al., 2001; EFILW, 2006 (a)).

Working under flexible employment contracts is usually accompanied by decreased access to occupational safety and health and increased exposure to more dangerous or hazardous working conditions than for employees who work under standard contracts (Benach, J., et al., 2000). Only in rare cases are such flexible work forms beneficial. It is expected that people who work at home will generally have more freedom to choose their own pace of work, have more autonomy and flexibility than their office based colleagues, or are more able to improve their work-life balance. Several national studies contradict this assumption, however.

Home-based workers or workers who work outside the employer's premises for a considerable amount of their working time often lack social support and social contact (particularly lower skilled workers), are often confronted with higher demands, spend more time in sedentary postures, and are less likely to take regular breaks from (computer) work than do their office based colleagues. In addition, they often lack technical and ergonomic support and receive less training. Particularly in the non-sedentary jobs, there is evidence that more accidents take place away from the workplace, and there is a higher prevalence of MSDs. In addition, working conditions for subcontractors are not as advantageous as for employees of the contracting company (EFILW, 2007 (a)).

Job insecurity is a major stressor and is often high in employees working under precarious contracts (EFILW, 2005 (a)). The definition of job insecurity often relates to an overall concern about the continued future existence of the job, but may also be related to such aspects of the job as income or position in the company (De Witte, H., 1999). Researchers highlight an employee's powerlessness and inability to control the situation as characteristics of job insecurity (EFILW, 2007 (a)). In addition to organizational conditions (e.g. plans for restructuring), perceptions of job insecurity may also be associated with such worker characteristics as socioeconomic status, age, and gender, as well as with personality traits such as optimism (versus pessimism).

In the EU-27 almost 14% of the workers regard it as probable that they will lose their job in the coming 6 months (EWCS, 2005). This percentage is lower in the old member states (about 11%) and higher in the new member states (about 25%) (EFILW, 2006 (a)). The greatest percentage of employees suffering from job insecurity can be found in the hotel and restaurant sector (20.2%), the construction sector (17.7%), the manufacturing sector (16.4%), and in retail (15.1%). A comparable picture is true of temporary contracts (EFILW, 2006 (a)).

Impact of job insecurity, unstable labour markets, and precarious contracts

Working under precarious contracts is indirectly linked to poor health outcomes, and job insecurity is an important stressor which results in reduced well being (psychological distress, anxiety, depression, and burnout), reduced job satisfaction (e.g. withdrawal from the job and the organization), and increased psychosomatic complaints as well as physical strains (Piazzi, A., et al., 1991; Decker, S.W.A., and Schaufeli, W.B., 1995), and often has an unfavourable impact on personal growth, recognition, and participation in social life (De Witte, H., 1998; Decker, S.W.A., and Schaufeli, W.B., 1995). Moreover, employees' poor health and reduced job satisfaction negatively affect the effectiveness of the organization.

There is evidence from a **Belgian study** that temporary and permanent workers respond differently to job insecurity (De Cuyper, N., 2008). This implies that temporary workers cannot be evaluated against the same standard as permanent workers. The results of the study show that temporary workers can have favourable work outcomes. This may be due to the sometimes precarious position of permanent workers (e.g. permanent workers can be influenced by whether there are a large number of temporary workers in their company) or if the results mirror rationalized positive responses (temporary workers have lower expectations and consequently no unfavourable outcomes).

In general, many scientific studies assume that the extent to which the termination of an employment contract may be anticipated, making job insecurity persistent, is more stressful than the certainty of being made redundant (Kinnunnen, U., et al., 2000).

Prevention and intervention

According to the report on psychosocial emerging OSH risks of the Bilbao Agency (European Agency for Safety and Health at Work, 2007 (a)), only a few attempts have so far been undertaken to protect workers in precarious contracts. One possible intervention is to implement policies which oblige employers to provide workers under fixed-term contracts and temporary agency work with instructions and training for carrying out their work in a safe way *before* they start working as well as at regular intervals thereafter. Realistic hazard assessment should be used.

Workers appear to be better able to deal with job insecurity if they are informed about planned restructuring as soon as possible. Then they can better anticipate and prepare to act to minimize the consequences. Researchers recommend realistic and honest communication during restructuring processes as well as using restorative strategies to reassure survivors of reorganization processes (Kinnunnen, U., et al., 2000). This is in line with the findings that job insecurity is perceived as more stressful than certainty about a professional future.

For those who are already experiencing significant job insecurity, it is very important to provide them with social support, since support buffers the negative effects of job insecurity on health, for example, by counselling employees (European Agency for Safety and Health at Work, 2007 (a)).

More research in the form of longitudinal studies is needed. Furthermore, more attention should be paid to moderating variables such as social support, organizational support, worker participation, and the role of trade unions (European Agency for Safety and Health at Work, 2007 (a)).

The need for security of employment to balance flexibility in the labour market is reflected in the European social dialogue.([2]) For example, the Framework Agreement on part-time work (concluded 6 June 1997) and the Framework Agreement on fixed-term work (concluded 18 March 1999) both refer to 'flexibility in/of working time and security for workers'. Employment security is a particular concern with respect to fixed-term work.

By the end of 2007 the **European Parliament** endorsed a resolution entitled the Common Principles of Flexicurity on 29 November.([2]) The Parliament's position is a response to the Commission Communication Towards Common Principles of Flexicurity (European Commission, 2007). This report states that flexicurity policies can be implemented across four policy components:

- Flexible and reliable contractual arrangements;
- Comprehensive lifelong learning;
- Effective active labour market policies;
- Modern social security systems.

In February 2008 the **Commission** stressed its commitment to flexicurity by setting up the Mission for Flexicurity, which consisted of members representing the Commission, ETUC, BusinessEurope, and the French government (French presidency of the Council from July 2008). The Mission's role is to visit four or five member states and discuss in depth the state of play with respect to development and implementation of the national pathways based on the Common Flexicurity Principles. In December 2008 the Commission will present the Mission report to the employment ministers, outlining ways in which the principles can best be implemented, taking into account the specific circumstances of each member state.

Recommendations

- European level
  Further disseminate pathways and good practices in policies directed towards contractual arrangements that offer a careful balance between flexibility and security, lifelong learning, effective labour market policies, and modern social security systems.
- Member state level
  Member states can study the pathways and good practices for better combinations of flexibility and security, taking into account their own particular situation.
- Active involvement of social partners is recommended to ensure that flexicurity delivers benefits for all. A national dialogue could be set up with representatives of employers, workers, government, and other parties, with the task of formulating a series of policy approaches or a package of measures (European Commission, 2007).
- Subsidiary organizations and companies within the member states can make use of the European Social Fund (ESF) and European Regional Fund. Actions that may be funded are training at the company level and active labour market measures (e.g. job-finding assistance, lifelong learning, and promotion of self-employment). Member states can stimulate subsidiary organizations and individual companies to use these funds.

([2]) http://www.eurofound.europa.eu/areas/industrialrelations/dictionary/definitions/FLEXICURITY.htm

4.2 Work intensification and high demands at work

Trends

Redundancies, restructuring, budgetary constraints, as well as new forms of work organization and employment contracts have brought about increasing intensification of work in Europe and the USA since the 1990s (Boisard, P., et al., 2003; Green, F., and McInthos, S., 2001). Also, according to the European Foundation for the Improvement of Living and Working Conditions, **work intensification** is undoubtedly one of the most significant recent trends (EFILW, 2006 (a)). Askenazy (Askenazy, 2005) highlights three main causes of work intensification:

1. Changes and innovations in organizations (in structure, technologies, procedures, aims, etc.),
2. Weakened impact of trade unions, and
3. Increase in job insecurity combined with fear of unemployment.

The increasing demands workers are exposed to are quantitative (high speed, no time to finish work in regular working hours), qualitative (increased complexity), emotional (need of employees to be friendly in their contact with customers), and sometimes physical as well (often associated with performing the task quickly).

The **widespread use of ICT** in almost all EU countries and sectors (Joling, C., and Kraan, K., 2008) may contribute to the phenomenon of work intensification. Some risk factors for OSH due to ICT work discussed in a Commission's Staff working paper (SEC(2002) 372) were:

- Stress symptoms due to excessive working hours, workload, and increasing complexity of tasks;
- Information overload;
- Stress of having to constantly upgrade skills;
- Human relationships replaced by virtual contacts; and
- Repetitive strain injuries and other musculoskeletal disorders due to equipment that has not been adapted and/or forced postures.

European statistics show that in 2005 more than half the European employees worked for three-quarters or more of their working time to tight deadlines (61.8% in EU27: 67.7% for male employees and 54.4% for female employees) and at very high speed (59.6% of EU27: 62.4% for male employees and 56.1% for female employees) (EFILW, 2006 (a)). This rise in work intensification is also confirmed by national working conditions surveys in most member states (EFILW, 2007 (b)).

An extreme illustration of work intensification caused by restructuring and expansion of the organization in combination with poor management is 'the Lidl case' in the **German Schwarz Group**. It is described in a black book (Hamann, A., and Giese, G., 2006). The Schwarz Group operates Lidl and Kaufland stores in 23 countries in Europe, and the number of these stores increased rapidly in 2005. This expansion was not without problems. From reports of employees to management it is clear that Lidl has a company culture of high work pressure, permanent shortage of staff, low wages, enormous general pressure, and unfair checks. For example, in Poland inspectors of the state labour authorities registered numerous legal deficiencies i.e. violations of compulsory rest periods. One Kaufland worker reported a 25.5-hour non-stop work shift.

Extra hours were hardly ever paid and working time was poorly noted. Management style included intimidation of employees to force even higher productivity. Workers were afraid to stand up for their rights because of high unemployment rates.

Impact of work intensification

Work intensification is causally related to the development of stress, burnout, fatigue, and depression, as well as to musculoskeletal disorders and cardiovascular mortality, and it may result in increased injuries and accidents from the more rapid work pace and work intensification (EFILW, 2007 (b); Hoogendoorn, W.E., et al., 2000; Ariëns, G.A.M., et al., 2001; Belkic, K., et al., 2004; Boisard, P., et al., 2003). In addition, work intensification is also associated with violence and bullying at work because of enhanced time pressure (Boisard, P., et al., 2003), particularly with respect to inter-individual contacts.

An increase in job demands combined with a decrease in job control, as has been observed in the EU over the past decade or more (EFILW, 2006 (a)), not only poses an additional health risk, but adversely affects skills development as well (Karasek, R., and Theorell, T., 1990). Regarding trends in the use of skills (see Annex 1), we see a very divergent pattern across EU countries, a pattern that is closely associated with computer use (Joling, C., and Kraan, K., 2008). In Scandinavia and The Netherlands we see a reduction of monotonous, short, repetitive work and an increase in non-monotonous work, whereas in the southern and East European countries, as well as in Bulgaria and Romania, a clear reduction in non-monotonous work can be seen.

With respect to extended or unusual working hours in response to work intensification, the European Foundation for the Improvement of Living and Working Conditions indicates that establishments which require at least 20% of their staff to work unusual and changing hours are confronted with more difficulties than others. These include: more health problems, sickness absence, motivational problems, and staff turnover (Kimmerling, A., and Lehndorff, S., 2007).

On the other hand, work intensification can also offer exciting challenges, and under conditions of high demand combined with a great deal of decision latitude and high social support, it can be a source of job satisfaction and enhanced personal investment (Périlleux, T., 2006). Such conditions are very unusual, however, and are often only true for managerial and highly skilled or specialized workers.

Prevention

Preventive measures are often based on well-established stress models, such as the models by Karasek or Siegrist. Karasek states that great psychological demands combined with low decision latitude results in health impairments and inhibits learning. Lack of social support at work is shown to result in work-related stress, particularly in cases of high demand and low control. Siegrist acts on the assumption that an imbalance between effort and reward at work is perceived as stressful. In fact, several good practices to prevent work-related stress from work intensification and high demand at work have been identified Europe-wide (EFILW, 2007 (b)).

Recommendations

Recommendations for immediate actions:

- Create and promote the dissemination of more examples of interventions that feature restructuring of changes indicating increases in the demands of work (e.g. work intensification can be reduced by better work design after analyzing the amount of workload);

- Create and promote dissemination of more information about crucial factors and conditions motivating interventions at work to protect workers' safety and health. An example is how the introduction of Fatigue Management Safety Regimes in organizations effectively communicate about (near) accidents that happened to colleagues and consequently resulted in increased safety;
- Develop a comprehensive policy aimed at systematically introducing flexible working hours for employees who regularly have unusual working hours, and promote a renewed interest among actors at the national, sector, and company levels for new approaches to compensation for unusual working time arrangements;
- Develop (better) training programmes for health and safety issues, e.g. in the use of ICT, contact with clients, ergonomic training, etc. Training, however, should be an additional rather than a standalone intervention, since it does not tackle the problem at its source.

Recommendations for longer term actions:

- Assessment of the impact of measures regarding work organization such as:
  - More control over work (if additionally desired by the employees);
  - Decentralization of supportive tasks and maintenance;
  - Job enlargement, job rotation, and interdepartmental job rotation;
  - Knowledge management, occupational safety, and health management;
  - Telecommuting;
  - Teamwork;
  - Virtual networks;
  - Participation;
- Promote stronger commitment from public health, employers, and politicians concerning understanding and preventing safety and health risks posed by work intensification and increased demands at work;
- Improvement of models which explain the equilibrium among factors influencing the psychosocial environment (e.g. social support, decision latitude) and demands at work.

4.3 Violence and harassment at work

Trends

The successive European Working Conditions Surveys (EWCS), together with several national surveys (i.e. Germany, Finland, The Netherlands, and Sweden), have highlighted a trend towards the increasing incidence of workplace bullying, harassment, and violence as the basis for work related health problems (EFILW, 2002). The low percentages reported for these issues, however, reveal they are exceptional rather than frequent. It should be noted that there may have been some selection bias, which leads to underreporting. Particularly workers subjected to serious instances of abuse (physical or psychological) or discrimination may no longer be employed.

The 4th EWCS (2005) indicates that there was an increase in the level of physical violence in the period 1995-2005 from 4% to 6% (EFILW, 2006 (a)). The survey reveals that 2% of all workers are subjected to physical violence from fellow workers, 4% from people outside the workplace, and 6% report being subjected to threats of physical violence.

Additionally, 5% of workers report having been subjected to bullying and harassment in the workplace. Female workers (6%) are more at risk than male workers (4%), and younger women are at greatest risk. The greatest exposure rates are found in services (6.6% in education, 8.7% in health and social work, and 8.5% in hotels and restaurants). These differences can be observed across all psychosocial risks (exposure to physical violence, threat of violence, bullying and/or harassment, and unwanted sexual attention).

A high level of occupational skill or specialization does not appear to offer protection in this respect. Thus, if the two types of workplace violence are distinguished (internal from fellow workers and third party violence), some clear differences can be seen among occupational levels in activities such as health, education, or the public sector. Professionals with more senior positions have a high level of exposure to external violence but comparatively low levels of exposure to violence from colleagues. One explanation is that they experience higher levels of interaction with people other than colleagues. In this sense, about 50% of public sector workers reported that at least three-quarters of the time their job involves dealing directly with non colleagues (i.e. customers, students, patients, etc.), compared to just 38% for private sector workers.

Exposure to any form of violence or bullying at work has negative implications for employees (Di Martino, H., et al., 2003).

Violence and harassment have a very major impact

Those affected by violence and harassment in the workplace tend to report higher levels of work-related ill health. According to the EWCS 2005, the proportion of workers reporting symptoms of psychosocial risk factors, such as sleeping problems, anxiety, and irritability, is nearly four times greater among those who have experienced violence or bullying and harassment than for those who have not. The negative impacts of violence and harassment are sizeable and not exclusively psychological or mental (see figure 4.1). For organizations, this means financial costs in terms of sickness absenteeism, premature retirement, higher staff turnover, and reduced productivity.

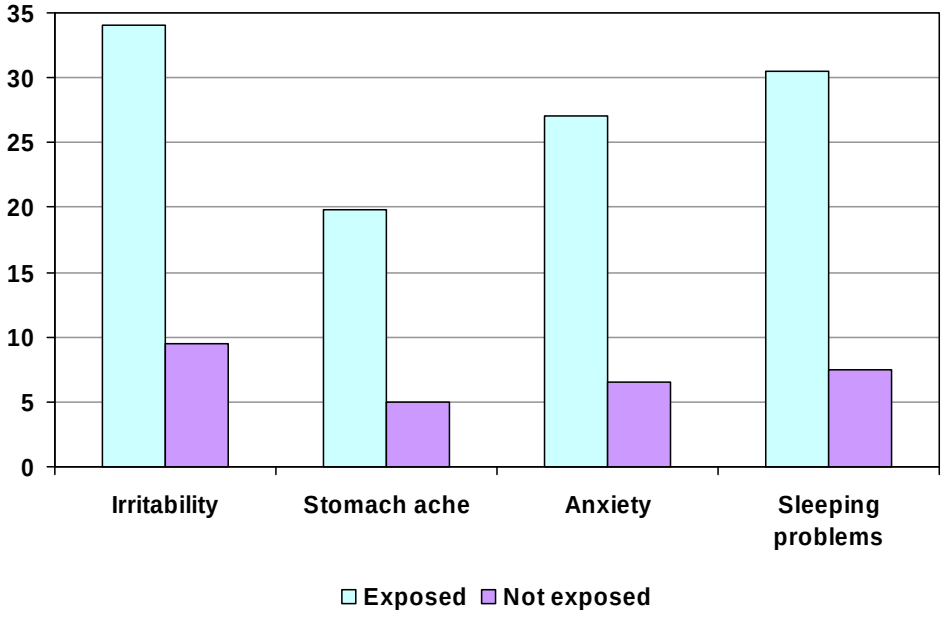

Figure 4.1 Violence at work: percentage workers in the EU-27 experiencing such a problem versus those not experiencing it. Source: EWCS, 2005

Dutch data show that the average length of time for workers to drop out from depression or burnout may be up to about 4 years. Leaving work because of issues that result in PTSS means absence from work will last much longer, on average up to more than 11 years, indicating that most workers with PTSS will probably not resume working; they are likely to end it through retirement or another ultimate reason (Blatter, B., et al., 2005). The data indicate that although the prevalence of this psychosocial risk may be less than other psychosocial risks, its impact may be much more costly for society, the enterprise, and for the individual.

Interventions

One important development in managing this problem is the *Framework Agreement on Harassment and Violence at Work*, adopted in 2007 by the European social partners (ETUC, Business Europe, UEAPME and CEEP) (ETUC/CES, et al., 2007). The aim of the agreement is to increase awareness and understanding on the subject by employers, workers, and their representatives, as well as to provide them with an action oriented framework to identify, prevent, and manage this type of problem.

The PRIMA-EF project([3]) is a collaborative project funded by the EC 6th Framework Programme that focuses on developing a European framework for psychosocial risk management, with a special focus on work-related stress and workplace violence. One of its aims is to raise awareness and promote understanding, engagement, and best practices with respect to the issues of concern amongst stakeholders and social partners, including small and medium-sized enterprises (SMEs).

Preliminary results, however, indicate that awareness of these agreements is low amongst stakeholders. To overcome this, the project includes the following activities (amongst others):

- Development of detailed recommendations and evidence-based best practice guidance on the management of psychosocial risks, work-related stress, violence, and harassment issues at the workplace;
- Analysis of key issues relating to implementation of best practices in the context of different enterprises and in particular SMEs;
- Development of guidelines for: employers, employees, trade unions, occupational health physicians, general practitioners, and other applied occupational health and safety professionals (such as occupational health psychologists).

The situation in Europe on the regulation of workplace violence is extremely varied and changing (EFILW, 2003). EU bodies are playing a significant role fostering new developments in this area. At national levels some countries have introduced specific new legislation to tackle the problem (Sweden, France, Belgium, The Netherlands, and Finland), while in other cases (Ireland, UK, Germany) more general and already existing rules (criminal, civil, health, and safety) are considered sufficient.

Some European countries (Denmark and Luxembourg) have implemented non-legislative measures such as codes of practices, regulations, and collective agreements, while others (Italy and Spain) have only made initial efforts in this area. Among the first group of countries with specific legislation, Sweden has adopted some especially good measures. Since 1993 Sweden deals with violence from an organizational perspective, through ordinances combining prevention strategies, rather than containing violence on the individual level. The ordinances require employers to plan and organize work in a way that seeks to prevent the occurrence of violence and victimization.

([3]) http://prima-ef.org/default.aspx.

In addition, there have been initiatives at organizational and company levels (EMCC, 2004). These initiatives are intended to maintain a good working climate and to deal with violent situations and incidents when they arise. Measures may include:

- Workshops and periodic meetings with employees to discuss work satisfaction, job problems, etc.;
- Codes of conduct and rules regarding interpersonal behaviour;
- Leadership and training for managers to deal with managing violence and harassment;
- Staff training and communication;
- Risk assessment and action plans;
- Surveys and interviews of staff in at-risk departments;
- Reporting forms and operational protocols;
- Material resources (i.e. alarms);
- Special centres for support and counselling to victims.

Recommendations on violence and harassment

The available data show that, even though it is exceptional, violence and harassment in the workplace has been increasing in Europe over the past years, and has both psychological and physiological effects on those affected. From a policy perspective, harmonization of the different national regulations and competences in this area is a major challenge. Development of the Framework Agreement signed by the European Social partners and follow-up on this agreement are crucial as well. A sectoral perspective would be a good, positive stimulus. The sectoral view may be an interesting starting point, since some sectors are more exposed to specific risks than others (for instance, in Ireland a specific Task Force was set up to identify the sectors most at risk and to develop practical prevention programmes and a co-ordinated response from state agencies). Finally, lines of support for initiatives at the company level are necessary.

4.4 Work-life balance

Trends

The expert forecast on emerging psychosocial risks points to poor work-life balance as a growing concern and affecting more and more workers. Work-life balance is about people exercising control over when, where, and how they work.([4]) A good balance is achieved when an individual's right to a fulfilling life inside and outside paid work is accepted and respected as the norm, to the mutual benefit of the individual, business, and society. Changes in work organization such as a greater demand for flexibility, new work arrangements, mobility on the labour market, and intensification of work lead to greater pressure on workers and to a spill-over into private life. Changes in the characteristics of the workforce, which includes more working women, single parents, and households with dual careers, less family support, and in some cases more dependent older relatives, mean that there are more workers who require a good work-life balance.

([4]) http://www.eurofound.europa.eu/areas/industrialrelations/dictionary/definitions/WORKLIFEBALANCE.htm

The European Working Conditions Survey (2005) asked how well respondents' work fits within their non-working life. Overall, a high proportion of workers answered positively (77% of men and 83% of women) (EFILW, 2007 (c)). There were some differences among EU Member States and groups of people, however:

- Workers in Austria, Denmark, and Finland report a relatively high level of satisfaction, and workers in Greece, Italy, and Latvia report a relatively low level of satisfaction with their work-life balance;
- People who are single with no children and older people report a relatively high level of satisfaction, and people with children report a relatively lower level of satisfaction with their work-life balance;
- Employees and male workers in blue collar occupations are relatively satisfied, while women in managerial or clerical occupation are relatively less satisfied with their work-life balance compared to male blue-collar workers;
- Workers with high levels of task autonomy experience higher levels of satisfaction with work-life balance, workers with multiple drivers for pace of work, working at high speed, working to tight deadlines, experiencing interruptions, ambient risks, and ergonomic risks are relatively less satisfied with their work-life balance;
- Workers with working time autonomy report relatively high levels of satisfaction, but workers working more than 35 hours and working regular and sometimes unsocial hours report relatively lower levels of satisfaction with their work-life balance.

Attitudes towards part-time work differ among EU countries (Parnanen, A., et al., 2005). On the one hand, part-time work is perceived as a good way of combining work and family life, enabling women to find a suitable balance between work and career. In this respect it is voluntary. On the other hand, part-time work is sometimes regarded as a sign of a disadvantaged labour market position. It can be of low quality and provide only a low income; moreover, it is often performed on an involuntary basis (the person would prefer a full-time job or to remain outside the labour market).

The EWCO report on combining family and full-time work focuses on the relationship between work-life balance and working time flexibility for working parents. There are significant differences among countries; in particular the impact of motherhood on work-life balance differs significantly. In some countries the proportion of mothers employed full time who experience a poor work-life balance is about double that of their peers without children. In other countries the differences are minor. The most mothers dissatisfied with their work-life balance are found in Italy, Greece, Germany, France, Spain, and the Czech Republic (Parnanen, A., et al., 2005).

A complete lack of all forms of flexibility in working time for parents employed full time is most prevalent in Portugal, Greece, Spain, and Ireland, whereas the greatest flexibility is found in Finland, Sweden, and the UK. Overall, men have more flexibility than women. A surprising result of the EWCS, however, is that parents with reasonably flexible working times tend to have a poorer work-life balance than those with fixed or predictable working hours. This may be partly explained by the strong correlation between flexibility and working overtime, so it is mainly linked to the negative aspects of working time flexibility. Work flexibility as such has positive aspects as well, such as the ability to adjust working hours to personal and family needs.

Impact

Failure to have a decent work-life balance may lead to stress and other health consequences for workers. According to a meta-analysis, work-home interference (work demands negatively affect functioning at home) leads to stress related outcomes (burnout, depression, general psychological strain, physical symptoms, or somatic complaints), work-related outcomes (turnover intention, less job satisfaction, less organizational commitment, poorer job performance), and non-work outcomes (e.g. less life satisfaction, less marital satisfaction) (Allen, T.D., et al., 2000).

Prevention and intervention

Innovative working time and work-life balance policies can have a variety of positive impacts on the company level, including enhanced employee performance, reduced absenteeism levels, better recruitment and retention potential, as well as greater overall time efficiency. Some or all of these benefits can enhance a company's overall productivity and competitiveness (EFILW, 2006 (b)).

Problematic issues for work-life balance across European countries include (EFILW, 2007 (d):

- Lack of childcare facilities;
- Long, irregular working hours and lack of flexibility in working time;
- Unequal distribution of household work and caring tasks among men and women.

There is a variety of good practices regarding work-life balance in several European countries (EFILW, 2007 (d). These include initiatives promoting:

- Individual flex time;
- Employees in a company collectively organizing their own working hours;
- Working parents' childcare needs provided by the company;
- Reduction of working time, including part-time work;
- Training in time and stress management;
- Flexibility of work hours when family emergencies occur.

Recommendations

The reports '*Work-life balance - Solving the dilemma'* (EFILW, 2007(e)) and 'Working time and work-life balance: a policy dilemma?' (EFILW, 2006 (b)) include several policy pointers for improving work-life balance.

First, these pointers deal with providing flexibility in work contracts. The recommendation on flexibility is not associated with flexible contracts because it does not suggest that permanent contracts should be promoted, but it does advocate the ability to agree on flexible working times and encourages making it available voluntarily for (larger) part-time jobs for both men and women. This opportunity should be especially promoted for men, since in those countries where this is possible; it is women and not men who do the part time work (e.g. (Kauppinen, K., et al., 2003).

Second, the pointers include providing (better) facilities to support dealing with homecare obligations. These may be in the period when people are just starting their families and have small children who need to be cared for, or when parents are in need of care by their adult children. Thus, maternity and parental leave, as well as facilities for childcare and eldercare, need to be developed, particularly in those countries where such facilities are rarely available.

This is particularly true for countries or EU regions where the problem of an ageing workforce poses a real danger to the labour market and the social security arrangements, as far as they exist. Particularly in countries that have or will soon have a shortage of workers, the motivation to include every potential worker in the labour market and help him or her to work as long as possible should have top priority. This means that motivational aspects play a role, particularly in the long run. Every facility or arrangement will have to be regarded favourably, not only by the employer, sector, or government, but by the worker as well. It will have to be the parties in power (government as well as employers) that need to understand they should include a long-term focus on the viability of the organization's or country's economics, and that this means the workers need to be motivated and committed to their work and organization. The latter should also help them (the organization and country) to raise the next generations of workers and respect the previous generation of workers.

When interventions are devised, they should target high-risk groups, i.e. workers who show a high incidence of long or irregular working hours: those in agriculture and fisheries, the self-employed, senior managers, healthcare workers, etc.

In the Fourth European Working Conditions Survey, working fathers in particular expressed the highest level of dissatisfaction with their ability to reconcile their work and non-work lives. The survey does not explicitly state that men may be willing to play a greater role in adapting their work hour arrangements, however.

Apart from the EWCS, there are surprisingly few solid statistical data at the EU or national levels about work-life balance. This area should be taken more seriously by survey researchers (EFILW, 2007 (d)). In this regard it is also desirable to capture the positive aspect of a work-life balance, i.e. to address the reasons why workers choose a particular profession or stay in a specific job.

Furthermore, experts underlined that more research is needed to better understand the relationship between a poor work-life balance and ill health, and that it is important to analyze separately the subsequent health outcomes for women and men (European Agency for Safety and Health at Work, 2007 (a)).

5. Emerging OSH risks predominantly related to dangerous substances, new technologies, and physical issues

5.1 Nanoparticles

Trends

Nanotechnology presents a major opportunity for economic and sustainable development for many countries, and has applications in many industrial sectors (e.g. coatings, plastics, food, and medicine). Many research institutes and R&D departments are researching and exploring the possibilities of nanoparticles. New applications are constantly being developed, leading to a rapid increase in new products and production processes. According to estimates, US$1 billion worth of products on the nano scale or manufactured with the aid of nanotechnology will be on the market by the year 2015 (Lux Research, 2004). At present, large scale production and use of nanoparticles is mainly confined to substances such as carbon black, metal oxides, and fumed silica.

Nanoparticles are produced in various ways, depending on the desired functional characteristics (size, surface characteristics, symmetry, and purity), which results in various physical forms for downstream use, i.e. powder (dry), or suspensions (liquid). To use and apply nano materials in the production chain, dispersion of the nano materials in the product, which is often made possible by modification, is the most challenging part. There is an ongoing debate on whether nanoparticles have more unique properties than their larger counterparts which makes them qualitatively different. Moreover, does the extent of their toxicological effects over 'ordinary' particles outweigh their uniqueness? This debate is partly fed by a debate on the relevance of the methodologies used to investigate the toxic effects of nanoparticles. Further, the metric dose relevant for the observed effects has not been fully agreed upon. Currently, there is also no agreement on the relevant exposure metric for inhalation exposure, e.g. mass concentration ($\mu g/m^3$), number concentration (p/cm^3), and total particles per surface area concentration ($\mu m^2/cm^3$), or the relevant exposure measure e.g. average concentration, peak concentration, and cumulative concentration (average $*$ time).

Impact

Information on the hazards of nanoparticles is limited, but rapidly expanding (DEFRA, 2007). On the basis of initial findings, the potential health risks include inflammatory diseases of the lung, secondary effects on the cardiovascular system, tumours, and possible adverse effects on the brain.

Exposure through inhalation is generally seen as the most important route during production and manipulation of dry (nano)particles. **Dermal exposure** is especially relevant if the particles are dispersed in a liquid. **Oral exposure** is generally considered less relevant for the workplace. In figure 5.1 an example is given for a product chain of a coating product in which the exposure moments are depicted. It can be argued that inhalation exposure to discrete nano sized aerosols will be likely to occur in most exposure scenarios, since both aerosol dynamics theory and the results of recently conducted studies (Seipenbusch, M., 2008) show that primary nanoparticles agglomerate very rapidly. Moreover, it has been demonstrated that the packaging configuration of nanopowders results in relatively few nano sized aerosols during simulated downstream use (Schneider, T., and Alstrup Jensen, K., 2008).

The relevance of these observations may be limited, however, since: a) little is known about the mechanisms of de-agglomeration, b) the external surface area of agglomerates of nanoparticles is equal to the sum of the individual components, and c) future nanoparticle types may have different agglomeration characteristics than the present types since they are driven by desired functionalities. There are very few data published that are relevant for inhalation exposure assessment. Major drawbacks of the currently available measurement devices are their size, weight, limited portability, and their inability to discriminate manufactured nanoparticles from other background particles.

The relevance of dermal exposure from deposition of aerosols, direct contact with powder or liquids, or contact with contaminated surfaces or equipment is not clear yet. Preliminary results of structured observations of different types of activities related to production and use of nano materials show that dermal exposure to powders and liquids is likely to happen (Brouwer, D,.et al., 2007). Most studies indicate a very limited penetration of nanoparticles through the skin. The effect of the modifications to enable or enhance dispersion of nanoparticles in a material on both the dispersion of the material and penetration through the skin, however, has not yet been extensively investigated.

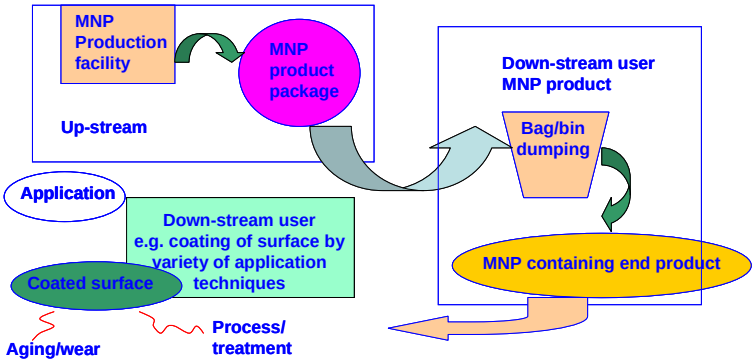

Figure 5.1 Potential for exposure to manufactured nanoparticles (MNP) in different exposure scenarios

Prevention and intervention

A precautionary approach([5]) is recommended, since an appropriate risk evaluation is impossible because of the incomplete picture for both the hazard and the exposure to nanoparticles. A generic approach to mitigate exposure is the control hierarchy.

([5]) A definition of the precautionary principle was taken from Wikipedia: The precautionary principle is a moral and political principle which states that if an action or policy might cause severe or irreversible harm to the public or to the environment, in the absence of a scientific consensus that harm would not ensue, the burden of proof falls on those who would advocate taking the action. The principle aims to provide guidance for protecting public health and the environment in the face of uncertain risks, stating that the absence of full scientific certainty shall not be used as a reason to postpone measures where there is a risk of serious or irreversible harm to public health or the environment. There are many definitions of the precautionary principle. Precaution is caution in advance, or 'caution practiced in the context of uncertainty'. All definitions have two key elements: (1) an expression of a need by decision-makers to anticipate harm before it occurs. Within this element lies an implicit reversal of the onus of proof: under the precautionary principle it is the responsibility of an activity proponent to establish that the proposed activity will not (or is very unlikely to) result in significant harm. (2) The establishment of an obligation, if the level of harm may be high, for action to prevent or minimize such harm even when the absence of scientific certainty makes it difficult to predict the likelihood of harm occurring, or the level of harm should it occur. The need for control measures increases with both the level of possible harm and the degree of uncertainty.

Many (inter)national standardization bodies, e.g. BSI, ASTM, ISO, and (supra) governmental organizations, e.g. OECD, have addressed issues related to safe production and use of nano materials.

Most control measures and recommendations are similar to those for toxic dusts or aerosols, although their performance has not been evaluated for nano materials in a structural way. Recently, data on the effectiveness of filter (materials), clothing, and glove materials against nano aerosols have been published. (Nanosafe, 2008; Pui, D.Y.H., et al., 2008). The results indicate a very good performance for filter and non-permeable materials.

In addition to the limited data on effectiveness, evaluation of the performance of control measures with respect to exposure and risk reduction is also hampered by the absence of exposure limits. To bridge this knowledge gap, safe practices for production and use are defined based on state-of-the-art knowledge and expertise (ISO/TC 229, 2007).

Recommendations

Within Framework Programme 7, the EU has initiated several topics in the area of health, safety, and environmental (HSE) impact of nanoparticles, which have been identified by Commission services and national authorities as regulatory priorities, i.e. particle characterization, hazard characterization, exposure and effects assessment, and measurement and sampling. In addition, the HSE regulatory aspects of nano materials have been reviewed, research needs have been identified, and recommendations have been issued to improve the implementation of legislation (European Commission, 2008). As indicated, only limited data are available on exposure, effects, and risk. This lack of data complicates monitoring the effectiveness of legislation and policies and makes it difficult to recommend specific measures for controlling the risks.

Nevertheless, some general recommendations can be made:

- Elimination or reduction of exposure should be considered a first step in a precautionary approach. The effectiveness of control measures for nano materials should be evaluated;
- For specific exposure scenarios, good practices should be defined and consequently quantified for relevant exposure parameters. Benchmarking of other scenarios to the defined good practices could be used for a relative risk assessment;
- Appropriate measurement strategies for estimating personal exposure should be developed. Easy-to-use portable devices will be necessary within such an approach, as well as guidance on the relevant exposure metrics and measures;
- The potential risk related to dermal exposure to nanoparticles or materials should be further explored. Methods for quantifying dermal exposure to nano materials should be developed;
- To enable an appropriate risk assessment in the near future, i.e. combining hazard and exposure, toxicological studies should focus on establishing dose-effect relationships for relevant dose metrics in a structural way;
- It is recommended that all exposure metrics and measures should be considered for risk evaluation, for the time being;
- Pre-market tools for hazard and exposure screening should be developed to stimulate the development of inherently safer nano materials.

5.2 Endocrine disruptors

Trends

An endocrine disruptor is an exogenous substance or mixture that alters the functioning of the endocrine system and consequently causes adverse health effects in an intact organism, its progeny, or (sub)populations (Damstra, T., et al., 2002). Concerns have been raised in recent years over the potential adverse effects that may result from exposure to these chemicals. Effects on wildlife and human health of EDCs (endocrine disruptor chemicals) were first announced by Rachel Carson in 1962 in her book *Silent Spring* (Carson, R., 1962), based on a growing body of knowledge. Those concerns have now increased.

The concern about EDCs is directed at both humans and wildlife. In response to this, several programmes have been started. The European Commission considers EDCs as substances of such high concern that they may be subject to authorization with respect to REACH.([6]) For more than 10 years the Commission has increased its research activities on EDCs.([7]) To increase the visibility of endocrine disruption and to make project results available to the public, the EC launched two Websites: the endocrine disruptor Website and the endocrine disruption research Website.

Man-made chemicals such as polychlorinated biphenols (PCBs), dioxines, several pesticides, plasticizers (phthalates), and nonylphenol are considered EDCs. **The most controversial is bisphenol A**. Recent research suggests that high volume chemical bisphenol A plays a role in endocrine disruption (Bonefeld-Jørgensen, E.C., et al., 2007; Welshons, W.V., et al., 2006). In January 2007 the European Food Safety Authority (EFSA) considered the total daily intake (TDI) of bisphenol A as acceptable for newborns (EFSA, 2006). In April 2008 the Canadian federal health department, Health Canada, classified bisphenol A as a dangerous substance requiring regulation. The Canadian federal health department is the first regulatory body in the world to rule that bisphenol A endangers people, especially newborns, infants, and the environment (Health Canada, 2008). Since bisphenol A is a high volume production chemical, this may be the reason for rising concern about scientific bias. Because the research is difficult and the economic interests strong, there is a potential for bias. The source of funding for the studies appears to be closely correlated with positive or negative findings in published articles (table 5.1) (Vom Saal, F.S., and Hughes, C., 2005; Willyard, C., 2007).

Table 5.1 Biased outcome due to source of funding in low-dose *in vivo* bisphenol A research as of December 2004. Values shown are numbers (in %)

	Research findings	
Source of funding	BPA is harmful	BPA is not harmful
Government	94 (90.4)	10 (9.6)
Chemical corporations	0 (0)	11 (100)

Overall, it seems clear that the effects of EDCs are highly controversial, leading to uncertainty about the measures to be taken. Canada seems to be the first country to take specific action (see the next section). In Europe implementation of the new chemicals regulation, REACH, may have an effect on the use of EDCs.

([6]) REACH = Registration, Evaluation, and Authorization of Chemicals.

([7]) EU-sponsored EDC-related projects: Ongoing 5th and 6th Framework projects, Completed projects and the Credo Cluster.

Impact

Analysis of health effects on humans, while generating concerns, has until recently failed to provide firm evidence of direct causal associations between low-level exposure to chemicals with EDCs and adverse health outcomes. Despite these difficulties, it has been suggested that exposure to EDCs plays a role in adverse health outcomes, and serious concerns remain. Several studies indicate that **EDCs do have reproductive effects**, changed neural development and functioning, and they affect immune function in different forms of cancer such as testicular and prostate cancer, and may lead to breast cancer. It is known that occupational exposure to **pesticides may cause** reduction in human fertility and sterility.

Very recent results show a low proportion of male births (37% boys to 63% girls) and low birth weights for sons of flour mill worker fathers. A causative factor for this declining sex ratio may be fumigants (Milham, S., and Ossiander, E.M., 2008). Such fumigants are also used to disinfect sea containers. Temporal increases in the frequency of development abnormalities for the male reproductive tract, particularly cryptorchidism and hypospadias, have been reported most recently in sons of mothers and fathers exposed to pesticides (Fernandez, M.F., et al., 2007).

Concerns have been raised about the influence of EDCs on the timing of puberty, but the possible mechanisms of action and role of other factors, such as nutrition, need to be clarified. Data from human studies clearly indicate that prenatal exposure to certain EDCs (e.g. PCBs) can have adverse effects on neurological development, neuroendocrine function, and behaviour. Some of these effects appear to result from altered thyroid or neurotransmitter function, but in most instances, endocrine mechanisms have not been demonstrated. A recently published study describes the effect of bisphenol A, a widely used chemical, on mimicking the neurotoxic actions of estrogen in developing cerebellar neurons (Le, H.H., et al., 2008).

PCBs, polychlorinated dibenzofurans (PCDFs), and polychlorinated dibenzodioxins (PCDDs) have been reported to alter immune parameters following accidental, occupational, and general population exposures. Recent findings suggest effects of maternal exposure to phthalate (DEHP) during fetal and/or neonatal periods on atopic dermatitis in male offspring (Yanagisawa, R., et al., 2008).

Numerous human epidemiological studies and experimental laboratory studies have been conducted to determine whether environmental EDCs may contribute to an increased risk of breast cancer, but the current scientific evidence does not support a direct association between exposure to environmental EDCs and increased risk of breast cancer. All the studies published to date have measured EDC exposure levels in adult women. The claim that the time of life when exposure takes place (e.g. prenatal, neonatal, childhood, adolescence) may be the most critical factor is supported by human data on radiation and smoking and by basic research on animal models. Research is urgently needed to address the role of timing of exposure. In April 2008 the European Parliament was informed about the evidence that the rise in breast cancer is linked to environmental influences such as EDCs (Kortenkamp, A., 2007; 2008).

Risk factors for testicular cancer are associated with disorders of androgen production or action. There are also limited data from animal studies that exposure of the male foetus to high levels of estrogen may increase the risk of developing testicular cancer. Although the data are limited, some evidence suggests that the incidence of cryptorchidism and hypospadias may show similar geographic differences to the incidence of testicular cancer and that these conditions may be developmentally linked. The potential roles of other environmental factors (e.g. diet, occupational exposures) in testicular cancer are unknown and need to be investigated.

Exposure to herbicides or polyaromatic hydrocarbons has been linked to prostate cancer, but the evidence is weak, the mechanism is unknown, and more research is needed. A recent study shows an association between prostate cancer and bisphenol A Wetherill, Y.B., et al., 2005).

Much is still unknown, but there are several examples where the mechanism of action is clearly related to direct perturbations of endocrine function and ultimately to adverse *in vivo* effects. These examples also illustrate the following important issues:

- Exposure to EDCs during the period when 'programming' of the endocrine system is in progress may result in a permanent change of function or sensitivity to stimulatory/inhibitory signals;
- Exposure in adulthood may be compensated for by normal homeostatic mechanisms and may therefore not result in any significant or detectable effects;
- Exposure to the same level of an endocrine signal in different life history stages or different seasons may produce different effects;
- Because of cross talk among different components of the endocrine systems, effects may occur unpredictably in endocrine target tissues beyond the system predicted to be affected.

The absence of adequate exposure data is the weakest link in determining whether the observed adverse effects in humans are linked to EDCs. Data are limited for accidentally highly exposed groups. Most exposure information has focused on the presence of persistent organic pollutants in Europe and North America. Data on the magnitude and trends of global human exposure are limited. Potential sources of exposure are through contaminated food, contaminated groundwater, combustion sources, and contaminants in consumer products. Information on exposure during critical development periods is generally lacking. The exposure data sets that exist are primarily for various environmental media (air, food, water) rather than the most relevant internal exposure (blood, tissue). Limited exceptions are human breast milk and adipose tissue samples. Worldwide, comparable data sets for assessing exposures to EDCs for humans are not available. Such information is essential to adequately evaluate exposure-response relationships in field and epidemiology studies and to use these relationships to produce credible risk assessments.

Prevention

Prevention very much depends on uncertainties about the effects of EDCs. Obviously, high level occupational exposure should be prevented through adequate occupational hygiene measures or through substitution of less harmful compounds. Low-level exposure for the general public will need a more thorough approach by tackling the problem at its source: cease producing the substances with clear endocrine disruptive effects. Uncertainty about the effects and the vast economic interests will make this a difficult issue to pursue.

Recommendations

The evidence that high-level exposure may impact humans indicates that this potential mechanism of toxicity warrants our attention. Uncertainty about the possible effects of chronic, low-level exposures to a number of chemicals with endocrine-disrupting potential and the fundamental roles played by the endocrine system in maintaining homeostasis, make understanding the potential effects posed by exposure to such chemicals an obvious international priority.

There is a need to identify life stages and species or high-risk groups that are more vulnerable to the effects of EDCs and to understand how this mechanism of toxicity may affect individual populations and communities. Strengthening international collaborative efforts in the following broad research areas will help resolve uncertainties and should be considered a high priority:

1. *Biology underlying endocrine-mediated effects*
    - Expand basic knowledge about endocrine systems in humans and wildlife;
    - Elucidate the range of mechanisms by which endocrine disruption may interfere with reproductive/population success, immune function, neurobehaviour, and development of cancer at all levels of biological organization and at key stages of life cycles;
2. *Methodology*
    - Develop improved methodologies for assessing dose-response relationships at environmentally and endocrinologically relevant concentrations;
    - Develop more specific and sensitive biomarkers for detecting endocrine-mediated effects in individuals and populations;
3. *Monitoring*
    - Extend monitoring of trends in relevant human health outcomes to provide information that is comparable across regions and over time;
4. *Identifying endocrine disruptors*
    - Continue to identify chemicals (persistent and non-persistent, naturally occurring and anthropogenic) that are the most likely candidates for high-impact effects in populations at environmentally relevant concentrations;
    - Identify 'hot spots' for exposure or effects that warrant particular concern;
    - Focus work on populations/subgroups most likely to be susceptible to endocrine disruptors;
    - Assess the role of endocrine disruptors relative to other environmental stressors on the fitness of populations;
5. *Database development*
    - Develop better global data on status and trends in environmental contamination, exposure, and health outcomes;
    - Improve international coordination for sharing information on effects caused by endocrine disruption.

5.3 Allergies caused by exposure to chemical and biological agents

Trends

Increasingly more workers suffer from allergies([8]) caused by exposure to biological and/or chemical agents. The reasons for the increasing prevalence of allergic disorders noticeable over the past decades (UCB Institute of Allergy, 2004; Statistisches Bundesamt, 2000) are still not clear. Allergy seems to be an especial problem of industrial developed civilizations. Environmental differences are more likely than genetic differences to account for the observed geographical variations. There are many chemical substances known to be sensitizers, to which workers in many sectors are exposed. The list includes synthetic chemicals as well as naturally occurring substances of geological or biogenic origin. Some examples are shown in Annex 3.

([8]) Allergies are hypersensitivity reactions of the immune system to specific substances called allergens or sensitizers. The most important targets of allergens are airways (asthma, rhinitis) and skin (eczema, urticaria). The anaphylactic shock is a medical emergency and constitutes the most severe form of an allergic reaction.

New operations augment the number of workers at risk: biohazards in waste treatment plants (e.g. selective sorting, manufacture of compost) are a leading trigger for allergies; it has recently been agreed that it is one of the 10 most emerging biological risks within the framework of an expert survey organized by the European Agency for Safety and Health at Work (European Agency for Safety and Health at Work, 2007 (c)).

In addition to biological agents, chemicals as well as proteins in natural materials can be regarded as skin sensitizers. Frequent and prolonged exposure to weak skin irritants such as water, detergents, and fragrances may lead to skin diseases, which can be regarded as one of the main occupational diseases in industrial countries (Uter, W., et al., 2001). Epoxy resins are one of the most important polymeric systems that are mainly and increasingly used in adhesives, paints and coatings, sealants, inks, varnishes, and reinforced polymer composite structures with glass fibre, carbon fibre, or metal substrates.

Impact

Most of the occupational skin diseases are hand eczemas, but also work-related contact urticaria, photo dermatitis, contact leukoderma, asthma, infectious dermatitis, and skin cancer occur (Dickel, H., et al., 2002). All these negative health effects can be found among healthcare workers (masseurs, physiotherapists, and geriatric nurses), hairdressers, cleaners, and food handlers, as well as tile setters and terrazzo workers (Tang, M.B., et al., 2005; Bock, M., et al., 2003).

Workers affected by epoxy resins include construction workers, painters, workers in the electrical and electronics industry, and employees who manufacture composite products (Tavakoli, S.M., 2003). They may suffer from severe irritation of the eyes, the airways, the skin, and mucous membranes, as well as from allergies (Crepy, M.N., 2002; Tarvainen, K., and Kanerva, L., 2000; Jolanki, R., 1991; Kiec-Swierczynska, M., and Krecisz, B., 2003).

Despite serious health effects in some cases, there is also a lack of research data. For example, this is the case for moulds exposure in indoor workplaces. Potentially, any employee can be exposed to this risk. This is true particularly for workers in the agricultural sector, manufacturing operations, and waste treatment activities who are at risk from fungi such as Cladosporium, Alternaria, and Penicillium (Gots, R.E., et al., 2003). This exposure may also lead to allergies and irritations (Husman, T., 1996).

Prevention

Allergies are often life-long, and although treatable, they are mostly not curable. Once acquired, avoidance of the disease causing agent is the best approach to managing an allergy. Thus, patients suffering from an occupational allergy are often forced to abandon their jobs. Second, attention is focused on other preventive measures as well. Sometimes it appears to be easy to effectively protect against occupational allergens, but such interventions are generally very specific. In Annex 3 several examples of good practice in preventing allergies have been described.

Recommendations

Surveillance systems and proper statistics enable us to estimate the incidence of work-related allergies, describe the characteristics of affected workers, and implement and facilitate health interventions. The lack of harmonized national registers for occupational diseases makes the respective Eurostat figures very fragmentary.

One excellent national effort is that of the United Kingdom. There, the first of several clinically-based national reporting schemes for occupational disease was developed in 1989. This scheme, the Surveillance of Work-related and Occupational Respiratory Disease (SWORD), relies on systematic, voluntary, and confidential reporting of all new cases seen by consulting chest physicians. EPI-DERM, a scheme for surveillance of occupational skin disease by dermatologists, was begun in 1993. SWORD, as well as EPI-DERM, also cover allergic disorders (Meredith, S., and McDonald, C., 1995).

There is a need for methods which can identify the allergenic potential prospectively of industrial chemicals, especially for respiratory tract sensitization. Simultaneously, the number of test animals should be reduced or their suffering reduced. The 'Sens-it-iv' project([9]) (duration: 2006-2010) in the European Community's 6th Framework Programme for Research aims at developing alternatives to the animal models currently used to recognize potential skin or lung sensitizers.

Nevertheless, there remains a lack of reliable tools for the quantitative risk assessment of allergens. Epoxy resins, for instance, are of considerable commercial relevance, with a growing number of applications (adhesives, paints, coatings, etc.), but most epoxy resin system components are sensitizing because of their intrinsic chemical reactivity (Tavakoli, S.M., 2003). Replacing stronger sensitizers with weaker ones when formulating epoxy resin systems could probably help to prevent occupational allergies if sufficient data were available to rank these components according to their sensitizing potency.

Since not all allergens can be banned from workplaces, young people with extreme allergies should be identified in appropriate medical examinations at an early age and advised with respect to their vocational choice. In general, job training should include instructions on safe handling of (occupational) allergens, and sick persons must be professionally guided.

5.4 Occupational risks related to global epidemics

Trends

A global epidemic or pandemic disease is defined as an epidemic outbreak of a severe infectious disease which affects a large number of people and spreads worldwide in a short period of time. Since the 16th century ocean navigation has led to populations exchanging pathogens. In the past, epidemics such as the Bubonic Plague (Black Death) or the Spanish flu made people fear the threat of biological agents.

Whereas earlier pandemics circled the globe in six to nine months, today new biological agents can reach any continent in less than three months because of air travel. Besides the increased speed and volume of international transport of humans, animals, and products, agricultural expansion and intensification, increasing numbers of immuno-compromised people, ecological factors, as well as other aspects related to the disease-causing agent, contribute to the emergence and spread of diseases.

The European Agency for Safety and Health at Work in Bilbao reported that occupational risks related to global epidemics can be regarded as an emerging issue (European Agency for Safety and Health at Work, 2007 (c)). Pathogens such as the severe acute respiratory syndrome (SARS), avian influenza (see Annex 3), Ebola, and Marburg viruses are new or newly recognized. In addition, new outbreaks of well-characterized outbreak-prone diseases such as cholera, dengue, measles, meningitis, and yellow fever still emerge (Thiermann, A., 2004; Galli, M., 2004).

([9]) Sens-it-iv. Novel Testing Strategies for In Vitro Assessment of Allergens. (http://www.sens-it-iv.eu/).

Impact

Workers are certainly affected by these diseases and pathogens. It is difficult to **identify the occupations most at risk**, since sources of exposure vary and involve people, animals, plants, as well as goods. In the case of the transmission of zoo noses, workers in contact with live or dead infected animals or with aerosols, dust, or surfaces contaminated by animal secretions (INRS, 2006; Haamann, F., 2006; IUF, 2006; WHO, 2005 (a)) are at higher risk than the general population. At risk occupations include e.g. workers in farms, slaughtering facilities, workers involved in the disposal of carcasses, the cleaning and disinfection of contaminated areas, as well as workers in veterinary services and research (ECDC, 2006; Van Borm, S., et al., 2005; Servas, V., et al., 2005; ABAS, 2006; Advisory Committee on Dangerous Pathogens, 2005).

In addition to these occupations, workers in the field of food production, including food processing and food preparation in hotels, restaurants, and catering services (Mettler, H., 1999; DGUV, (s.a.); Gurock, P., and Schmengler, J, 1998; BGW, 1998 (a); (b)) are at risk for pandemics such as avian influenza.

Due to globalization, the risks of importing vectors of tropical diseases such as mosquitoes and other arthropods have increased. Such vectors may be brought in by imported goods and particularly by those in water. Therefore, workers handling international trade containers are at risk of mosquito-borne Dengue fever (Rodhain, F., 1991; WHO, 2008; Malard, S., et al., 2003; Schaffner, F., and Karch, S., 2000; Le Bâcle, C., et al., 2005). Besides Dengue fever, malaria, yellow fever, West Nile fever, Japanese and St. Louis encephalitis can be attributed to mosquitoes (Schaffner, F., and Karch, S., 2000; Le Bâcle, C., et al., 2005; Rodhain, F., 1996). Moreover, trading in exotic domestic pets such as bats (Berges, M., and Kleine, H., 2002), prairie dogs (BGN, 2008; Guarner, J., et al., 2004; Reed, K.D., et al., 2004) or reptiles exposes international trade workers to zoo noses (Brown, D., 2004; Cunningham, A.A., 2005).

In the case of human-to-human transmission, **healthcare workers** are most at risk (Canadian Labour Congress, 2005; Varia, M., et al., 2003; Li, W., et al., 2005). Percutaneous injuries may lead to infections such as Hepatitis B, Hepatitis C, or HIV infections (see Annex 5) since they are almost exclusively caused by needle stick injuries. In addition to healthcare workers, workers controlling epidemic outbreaks (BGW, 2004) as well as staff in diagnostic laboratories, veterinarians, and veterinary researchers can also be regarded as at risk (Meredith, S., and McDonald, C., 1995; Gurock, P., and Schmengler, J, 1998; BGW, 1998 (a); (b)). For instance, Marburg haemorrhagic fever can be traced back to laboratory workers who had close contact with African green monkeys (Linthicum, J.K., and Kramer, V., 2002; WHO, 2005 (b)).

Prevention

Measures such as border closure and travel restrictions may delay but cannot stop the introduction of a micro-organism into a foreign country (Statistisches Bundesamt, 2000; Brown, D., 2004; WHO, 2005 (b)). Instead, regularly updated national preparedness plans (see Annex 5) are necessary to adequately respond to global epidemics (European Commission, (s.a.)).

In this context, collective organizational measures for effective forecasting, surveillance, prevention, and control of global epidemics should be accompanied by personal protective measures. Organizational measures such as restructuring hospitals into smaller, geographically independent units, with separate equipment and unit isolation by controlled ventilation systems, should be reconsidered (Varia, M., et al., 2003; Booth, T., et al., 2005).

These kinds of organizational changes are also recommended for the livestock industry (Benbrook, C., 2004). Although the use of personal protective equipment (PPE) must be seen as a last resort, it is important to develop efficient, adequate PPE such as surgical masks against infectious risks (Dreller, S., et al., 2006). In particular, workers with direct contact with living or dead contaminated animals, as well as healthcare and laboratory workers in contact with these infections should take standard hygienic precautions to prevent global epidemics.

Policy recommendations

Whereas the World Health Organization (WHO) distributes general information such as 'the way to health at work' as well as more specific material such as 'Biosafety manual for laboratories' or 'Infection control guidelines for healthcare facilities', the International Labour Office (ILO) focuses on occupational risks from biological agents in the field of agriculture as well as on risks such as HIV/AIDS and infectious diseases like SARS in the workplace.

Since **global epidemics require a global response**, it is of the utmost importance to find new ways of cooperation as well as information sharing and management (WHO, 2004; Rial-González, E., et al., 2005). Collaboration should be improved, in particular among public health, occupational safety, and environmental protection authorities. as well as local, regional, national, and international authorities involving several disciplines. Organizations such as WHO and ILO, as well as European level and national governments and (international) professional bodies, need to stimulate and organize this cooperation, information sharing, and management.

On the European level Directive 2000/54, including the information on hygiene, personal protection equipment, and health surveillance is supposed to protect workers from risks related to exposure to biological agents. Implementation of this directive, however, varies, greatly depending on national needs and risk perceptions. Moreover, the European Centre for Disease Control (ECDC) publishes information such as recommendations with regard to avian flu (Kosk-Bienko, J., 2007).

During a **recent evaluation of the Directive**, the relevance of the classification of biological agents was discussed. It was noted that the classification is exclusively based on the infection potential of biological agents. It was also suggested that allergenic and/or toxic biological materials be included. These may be products from different groups of biological agents such as endotoxins, mycotoxins, or enzymes. In particular, it was suggested that the classification should be amended for all Risk Group 1 agents and especially for actinomycetes. Risk Group 1 organisms should be amended, because some of them have high sensitizing or toxic potential, which is very important, especially for risk assessment of activities where the exposure to biological agents is unintentional.

Furthermore, the scope of the directive should be amended for products of microbial origin such as endotoxins or mycotoxins because they are present, accompany, or follow the presence of the organisms, and may be the reason for the sensitizing or toxic effects on the organisms. These have to be considered in the risk assessment as well as for their infectious potential. In addition, the inclusion of genetically modified organisms in the risk group classification should be considered.

At the time this report was written a proposal for including regulations on the use of safe instruments to protect healthcare workers against needle stick injuries has been prepared by the Institute for Statutory Accident Insurance and Prevention in Health and Welfare Services (Berufsgenossenschaft für Gesundheitsdienst und Wohlfahrtspflege, BGW), represented by Dr. Christoph Deininger and the DGUV representatives in Brussels.

This inclusion is also in the interest of the German Federal Ministry for Work and Social Welfare (Bundesministerium für Arbeit und Soziales, BMAS, Communication to European Commission in 2006).

Since 2002, the BMAS has proposed the following issues several times to the Commission:

- Establishment of guidelines for the risk classification of biological agents comparable to the approach used for chemical agents;
- Examination and/or adaptation of the existing classification of biological agents (parasites, bacteria, moulds);
- Amendment for new biological agents, e.g. SARS or the H5N1 virus;
- Amendment for harmonized arrangements for risk assessment of activities where the exposure to biological agents is unintentional.

Although the risk factors which might lead to an emergence of a new disease are very complex and vary from one another, a systematic method for monitoring changes in risk factors and in conditions associated with such outbreaks may also help to increase alertness. In addition, a review of past events may help identify key trends and bring to light guidance for the future (WHO, 2004).

5.5 Electromagnetic field (EMF) hazards

Trends

Electromagnetic fields (EMF) are an environmental factor with a very complex physical structure (in frequency: from static fields to 300,000,000,000 Hz (300 GHz), modulations, and levels). In some cases EMF can also be called non-ionizing radiation or electromagnetic radiation. EMF emission occurs in a variety of applications, such as: induction heaters, dielectric and resistance sealers, welding devices, electrolytic installations, electric power distribution installations, radio and TV transmitters, wireless telecommunications equipment, including mobile phone network base stations, radar, Radio Frequency Identification (RFID) systems, metal detectors (MD), and antitheft gates, diagnostic and therapeutic medical equipment such as: electro-surgery units, physiotherapeutic diathermy, Magnetic Resonance Imaging (MRI) scanners, etc.

Impact

The levels of exposure in some areas of occupational environments exceed by several thousands the level typical for general public exposure. There is a **lack of systematic data** on the population of workers exposed. According to the European Commission and national statistics available in some countries, it can be estimated from a few million to a hundred million Europe wide. The categories of workers that can be identified as EMF-exposed groups are extremely varied: large industrial factory workers, SMEs, the self-employed, low-status workers, highly educated and trained staff (such as healthcare staff or surgeons), pregnant workers, and mothers.

There is also a lack of systematic data on gender and age of exposed workers. Based on expert professional experience, among the exposed workers, in general there are more males, but among healthcare staff, female workers are dominant. In general, EMF-exposed workers are adults, and also include elderly workers. But EMF exposure can also be found among teenagers who are learning how to perform a job, e.g. in welding schools.

Occupations with permanent EMF exposure can be identified among train and tram operators and some workers in power plants, but there the level of exposure is usually relatively low. Very high levels of exposure usually only occurs in events of a few seconds or a few minutes, and is repeated during a shift (MRI workers' exposures) up to thousands of instances (sealer operators).

Such a variety of exposed groups leads to **many questions about the health risk of EMF exposure for particular groups** and what legislative measures are necessary for sufficient protection against overexposure. For example, what is the permissible exposure level for pregnant workers - in some countries exposure of unborn children is permissible up to the same level as exposure for the general population; as a consequence, increased EMF exposure of pregnant workers is prohibited. There is no common international approach in Europe, however.

New hazards in this field come from EMF exposures associated with the use of new types of appliances (such as high field MRI scanners) or new applications of technologies designed years ago (such as RFID and antitheft devices). New risks in this area can also be the result of increased sensitivity to exposure of particular groups of workers, such as workers with medical implants or workers receiving long-term medical treatment or pregnant workers. The number of highly sensitive workers is rising in a population that is increasing in age. Risks associated with EMF were identified as one of the rapidly rising risks in work places by the Bilbao Agency (European Agency for Safety and Health at Work, 2005 (b)).

Serious acute effects that occur during exposure to high-level EMF are well known (such as induced currents and nerve excitation or elevated temperature and burns on exposed tissues), and the protection of workers against such adverse results of exposure is covered by the requirements of the Framework Directive and **Directive 2004/40/EC**.

The scientific background for health risk evaluation remains limited, especially for long-term exposure (at low levels or an increased level over that which is accepted for the general public) and exposure to EMF of new frequencies recently explored in electrical appliances. Further actions should be focused on the gaps in current systematic data. These new types of EMF exposure characteristics should be considered along with updating scientific knowledge in this area.

Power frequency magnetic field exposure appears to be well explored, however: the IARC classified this exposure as possibly having an elevated cancer risk (IARC, 2002). Even in this area, better understanding of the nature of the relationship is needed. Recent research on hazards associated with EMF exposure (epidemiological and laboratory) was concentrated on general public exposure, mainly for mobile phones. Such exposure for the general public is significantly different from on the job exposure; extrapolating the results from research on general public exposure to assess the EMF risks among workers is of only limited value.

Long(er) term low-level **EMF exposure** from wireless communication comes about from new and emerging technologies. The results of investigations are still inconclusive for long-term low-level exposure to radio frequency EMF, including radiation from mobile phone systems. Nevertheless, it is still valid to conclude that low frequency low-level exposure to magnetic fields may possibly be carcinogenic. Long-term workers' exposures at increased levels (e.g. in industrial or healthcare enterprises) can also be found. Recent research has indicated that for neurodegenerative diseases and brain tumours, the link remains uncertain. New studies on the health risk for highly exposed workers for both types of exposure are lacking (SCENIHR, 2007; ICNIRP, 1998; 2001; 2004; IARC, 2002; WHO, 1993; 2006 (b); 2007).

Experimental and epidemiological data from intermediate frequency EMF are very sparse. Therefore, assessment of acute health risks in this range is currently based on known hazards at lower and higher frequencies. Proper evaluation and assessment of possible health effects from long-term exposure to intermediate frequency fields are especially important because human exposure to such fields (both for the general public and for workers) is increasing from new and emerging technologies (such as new welding technologies, antitheft systems, MRI scanners, etc.).

The most inadequate database for risk assessment is for static magnetic field exposure. Developments in technologies involving static magnetic fields, e.g. with MRI equipment, require occupational exposure risk assessment. Very limited data exist on EMF and other environmental and health related factors, such as drugs for medical treatment, other types of radiation, etc. Thus, EMF exposure for workers is still among the research priorities (WHO, 2001; 2006 (c); EMF-NET/WHO, 2005).

Prevention

Protective measures to reduce EMF at its source (better design of devices emitting EMF) can efficiently protect all categories of exposed persons, including self-employed workers, illegal workers, and the general public who may not be covered by the OSH system nor informed about existing hazards. It could also improve public trust in institutional measures taken for health protection, which is important because of the low level of public trust in current institutional statements on the health risk from EMF exposure. Reduction of EMF at the source and labelling of sources can also protect people with medical implants (such as cardiac pacemakers) and can protect their privacy. The population of workers with medical implants is increasing because of the ageing of the work force.

Recommendations

Scientific knowledge needs to be updated to cover new types of EMF exposure. EMF exposure of workers is still among **research priorities** (WHO, 2001; 2006 (c); EMF-NET/WHO, 2005). Scientific knowledge on the health risk from occupational EMF exposure is still limited. Recent studies have been focused on low-level exposure to the general public and workers. This group, which includes almost the entire population exposed to EMF from electric appliances, power, and broadcasting/wireless installations, is so large that even a small health risk rate (meaning a small individual health risk) can result in serious consequences among the population (a significant number of diseases).

Latency for health effects such as cancers exceeds 10-15 years, so for new types of exposures continuous monitoring of health results is important (e.g. the health status of workers operating with high field MRI devices or cancers related to wireless technologies). So far, there is no registry of exposed workers, and as a result research on long-term effects of exposure is very difficult. The population of highly exposed workers in one country is too small for well informed epidemiological studies. Only international cooperation on a European-wide level can address this research problem. A more active role by institutions from the insurance sector in monitoring the hazards of adverse health effects of long-term EMF exposure would be welcome because of the multitude of factors: migrations, self-employments, subcontracting, outsourcing, which make it very difficult to follow the personal history of exposures for particular workers.

A variety of practical problems arises with **implementation of the provisions of Directive 2004/40/EC**, and the still open question about the population at risk from static magnetic fields, as well as from low and intermediate frequency EMF.

This resulted in a decision by the Commission to trigger the procedure for postponing the deadline to implement the directive. An amendment provided an additional 4 years for implementation. ([10]) A need to modify the directive was identified, which led to an opportunity for detailed analysis of various countries' experiences with legislation in this field. Countries such as those in Scandinavia, Poland, and Spain have already implemented national legislation on occupational EMF exposure. A survey of legislation of systematic measures and comparative analysis of national experiences could support the work of the Commission to amend the provisions of the EMF directive.

Finally, better legislation is needed to **improve routine OSH practice** and to solve the above problems (appropriate to particular groups, e.g. legislative measures to protect magnetic resonance workers in medical centres, estimated to be a few thousand in Europe, could be different than the provisions focused on welders, who exceed a hundred thousand in one country). New legislation should be open to new approaches, for example, current labelling of EMF sources in the workplace is required only for exposures hazardous to healthy workers, and must take into account the increasing population of workers wearing medical implants, labelling areas with elevated EMF (acceptable for some, but of special concern for those with implants), and should be considered effective, low cost measures of protection.

Legislative measures should also be adjusted to diverse lifetimes of particular applications which emit EMFs, such as mobile phone handsets which are usually in use no longer than 1-3 years; new generations can be redesigned. Industrial sites, for example, are very different: electrolytic installations can be in use for many decades, and any redesign is extremely difficult. Surveys of various legislative measures for protection against EMF exposure in different European countries could lead to a new approach and more efficient practical solutions.

Systematic evaluation of the number of exposed workers and characterization of the sources, with attention to national variations, should also be executed. Such data are essential to analyze the likely impact of any new provisions on EMF in the workplace.

5.6 Sustainable energy resources

Trends

The global discussion on climate change and, at the same time, the sharp increase in the prices of fossil fuels have led to an explosion of initiatives for exploring alternative sources of energy supply. The most prominent areas are mentioned on the site of the European Commission([11]) and in an overview of European research programmes for renewable energy.([12]) They include technologies such as solar buildings, wind, photovoltaic, biomass, small hydro, solar thermal power, ocean energy, solar chemistry and solar materials, bio fuels, etc. The figures below depict the relative contribution of the different kinds of alternative energy resources and the overall contribution of renewable resources to the energy consumption in the European Union (see figures 5.2 and 5.3).

([10]) Directive 2008/46/EC of the European Parliament and of the Council of 23 April 2008 amending Directive 2004/40/EC on minimum health and safety requirements regarding the exposure of workers to the risks arising from physical agents (electromagnetic fields) (18th individual Directive within the meaning of Article 16(1) of Directive 89/391/EEC).

([11]) http://ec.europa.eu/energy/res/index_en.htm.

([12]) http://www.eurec.be/.

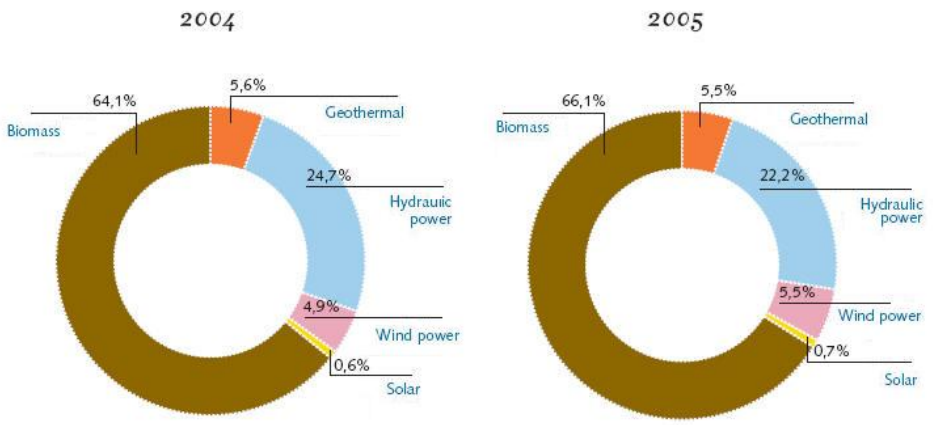

Figure 5.2 Proportion of each resource in renewable primary energy production (in %)

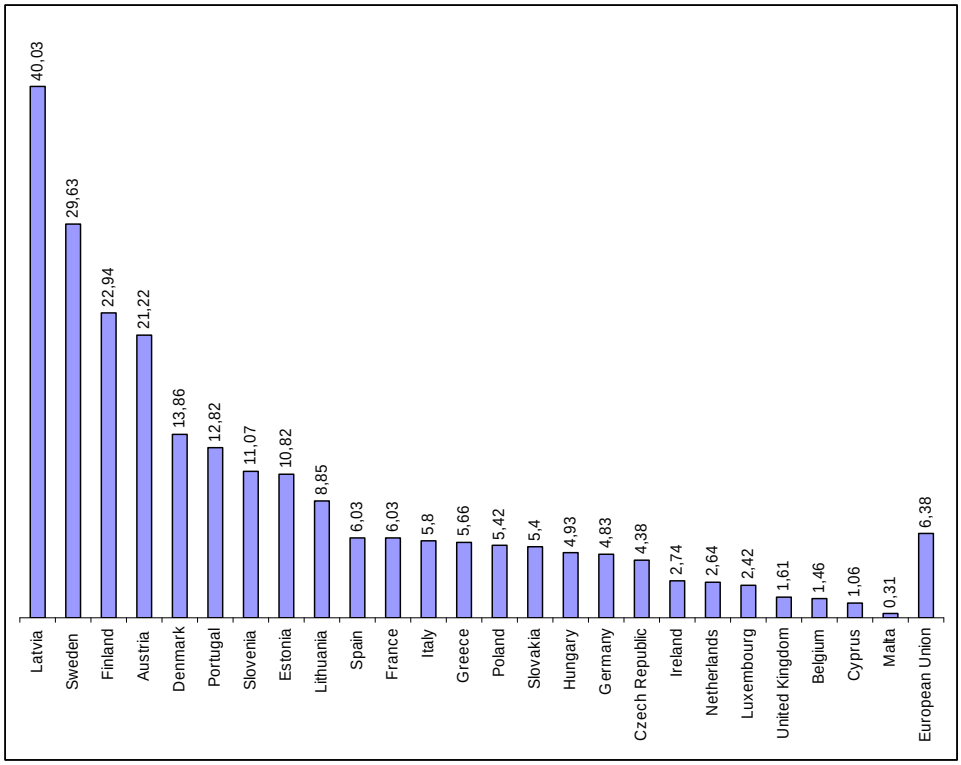

Figure 5.3 Proportion of renewable energies in primary energy consumption by European Union countries in 2005 (in %)

These figures and the targets in the strategic plan of the EC, the European Strategic Energy Technology Plan (SET Plan), imply a great increase in research, technology, development, and implementation of a vast number of technologies and the emergence of whole new sectors in industry worldwide.([13]) The European Renewable Energy Council, representing the European industry, trade, and research sectors, estimates that in Framework Programme 7 more than 50% of the research budget not earmarked for nuclear energy will be spent on renewable energy research.([14]) This trend is supported by legislation such as the European Renewable Energy Directive and national legislation in the EU member states.

([13]) http://ec.europa.eu/energy/res/setplan/index_en.htm.

([14]) http://www.erec-renewables.org/.

With respect to occupational health and safety matters, this implies that a tremendous **diversity of issues will arise**, and many will contain normal industrial risks. For each of the above new technologies production, maintenance of installations (wind turbines, solar devices, geothermal installations, etc.) and handling of new types of fuels such as hydrogen and bio fuels will sharply increase in the coming decades. Occupational health issues vary from working at heights (for example, in wind turbines), handling chemicals in the production of solar cells, to exposure to exhaust gases from engines using bio diesel as a fuel.

Impact

There are a few estimates available for the number of workers active in the renewable energy sectors. In **Germany,** the estimate for 2006 was that 236,000 people had jobs in the renewable energy sector.([15]) Extrapolation to the European Union means that this sector will employ millions of workers in the coming decades. Health effects and safety risks have already been evaluated in some areas, although the data are very scarce. Information on the occupational risks for these new industries is fairly scattered.

Some examples include a report on the occupational risks of bio fuels in the Scandinavian countries, with the main focus on health problems caused by micro-organisms (Madsen, A.M., et al., 2003). Also, the safety issues of hydrogen have been evaluated quite extensively. Some references to reports are given here (Vincent, W., 2004; Cadwallader, L.C., and Herring, J.S., 1999; 2007; EPA, 2004). For others, such as the addition of biogas to existing natural gas networks, where biohazards are an issue, there have been proposals that evaluate the technical as well as the health issues (Van Burgel, M., et al., 2006). In Germany a recent study underlines the considerably increased carcinogenic and mutagenic potential of vegetable oils over ordinary diesel fuel and the particular risks this implies for professional drivers and garage staff (Bünger, J., et al., 2007).

Prevention and recommendations

Since the industries involved in renewable energy are so diverse, **prevention strategies are also very diverse** and will have to fall back in large part on general principles such as risk assessments by companies and sector organizations. For specific sectors, such as bio diesel and biogas, additional studies are required, especially for exposure to compounds resulting from the production processes of these fuels. These range from bacteria and fungi to chemicals that are formed in the production of such fuels. Some guidelines have already been published, for example, for chemicals emerging from the production of bio diesel (IFC, 2007) and for hydrogen fuel in vehicles (U.S. Department of Transportation, 2007). Continuous attention, however, is needed because of the large number of new technologies being developed and the planned implementation extent of these technologies in the coming decades.

([15]) http://www.erneuerbare-energien.de/files/pdfs/allgemein/application/pdf/ee_jobs_2006_ kurz.pdf

6. Specific target groups

6.1 OSH risks for an ageing workforce

Trends

Three phenomena are currently responsible for the increase in the ageing workforce in most modern societies, and they will continue to do so in future decades. They are: (1) reduced fertility rates, (2) increased life expectancy, and (3) governmental strategies to prolong the duration of working life to ensure the effectiveness of pension schemes and social welfare systems (EFILW, 2005 (b)). Thus, it is vital that occupational safety and health (OSH) methods also take the needs of older workers into account.

Impact of the ageing workforce

Changes due to ageing start at different ages and develop at different rates depending on the individual (Samsom, M., et al., 2000). Physical and physiological performances diminish with age ((Landau, K., and Weißert-Horn, M., 2007; Rohmert, W., et al., 1992; Hettinger, Th., and Wobbe G., 1993): these include hearing and vision, muscular strength, and cardiovascular capacity. The time needed to recover also increases with age.

In addition, a decline in certain mental functions and an increase in response time have been linked to ageing (Heineken, E., and Fischer, J., 2006). On the other hand, older workers have increased skills, effective communication, experience, flexibility in terms of time and commitment, loyalty, and reliability (Maintz, 2992; Lehr, U, 2003). As a result, older workers can often compensate for their deficits. Sometimes they even have an advantage over younger workers.

Interventions

Various types of action may enable older workers to continue to work in good health, as illustrated by figure 6.1 (Ilmarinen, J., and Tempel, J., 2002; BAuA, 2004).

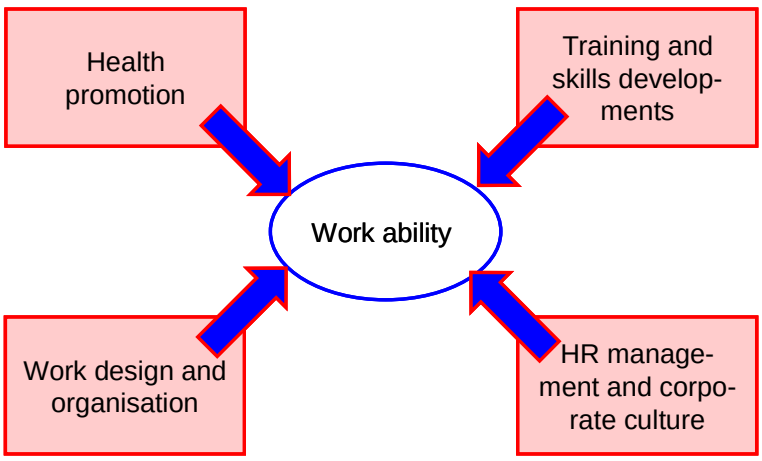

Figure 6.1 Areas of action according to Ilmarinen (Ilmarinen, J., and Tempel, J., 2002; BAuA, 2004)

1. Health promotion and raising awareness
   Efforts to promote health in the workplace do not yet pay sufficient attention to older workers. **Not more approaches, but rather a different kind** is needed for this age group (Arbeitsgemeinschaft der Spitzenverbände der Krankenkasse, 2007). For example, physical (endurance) exercise has been shown to improve those mental functions that decline with age (Falkenstein, M., and Wild-Wall, N., 2008). To help younger workers get sufficient physical activity as well (Bös, K., et al., 2007; Bös, K., 2003), workplace health programmes should aim at all age groups.

2. HR management and corporate culture
   Corporate culture and the ways employees are treated and supported have a great influence on health, well-being, and ability to work. Showing older workers that their skills and experience are valued, including them in decision-making processes and strategic considerations, and practicing targeted information management are important approaches, especially when it comes to HR management of older workers (Brädel-Kühner, C., 2007).

3. Work design and organization
   In addition to general prevention strategies, i.e. ergonomic workplace design (Zieschang, H., and Freiberg, S., 2006) and healthy breaks and working hours (Oppolzer, A., 2006; Beermann, B., 2005), other measures are needed to adjust the work(place) to the diminished capacities of older workers, e.g. additional lighting, distinct differences among acoustic signals, etc. Physically stressful tasks should not all be shifted to the younger generation. The guiding principle should be prevention for all generations (Hoffmann, M., and Zieschang, H., 2005).

4. Training and skills development
   As a rule, the learning process for older people differs from that of younger ones. Older workers need a learning environment free of disruption and, to keep them motivated, an approach that reflects their real-life work. It is important that incentives be given to continue education for older people (Buck, H., et al., 2002). In addition, measures should aim at knowledge transfer between the generations from an early stage([16]) to reduce the risk of losing important company-specific expertise when older workers retire.

Conclusions and policy recommendations

1. Networks are a helpful way of dealing with demographic change. Examples of good practice are being collected by networks ([17]). Networks are being used to share knowledge and even share workers to optimize the fit between individual capacity and the tasks to be performed.

2. A preventive approach aimed at all employees is needed to cover all generations and ensure a good match with their various needs and skills. Specific measures for older workers should be introduced carefully to prevent social marginalization and stigmatization.

3. All stakeholders, i.e. social partners, health insurers, accident insurance institutions, pension providers, and government, should coordinate their strategies and actions (INQA, 2005).

([16]) RESPECT - Research Action for Improving Elderly Workers Safety, Productivity, Efficiency and Competence Towards the New Working Environment. Results. http://respect.iccs.ntua.gr/

([17]) INQA, Gute Praxis zum Thema Demographischer Wandel. http://www.inqa.de/Inqa/Navigation/Themen/Demographischer-Wandel/gute-praxis.html

6.2 The bottom of the labour market: migrants, illegal, and precarious workers

Trends

The proportion of precarious contracts has significantly increased during the last two decades (Fuchs, T., 2006). The Eurofound report on temporary agency work (EFILW, 2005 (a)) indicates that the number of temporary agency workers and the economic importance of the sector have been increasing rapidly in most European countries in the last two decades.

Also, the number of **migrant workers** has increased over the last decades. In short, the inflow of foreigners has been growing fast, and at an increasing rate, in the EU. Moreover, it should be reiterated that these estimates only pertain to legal migration (Ambrosini, M., and Barone, C, 2007). The overall increasing trend in immigration masks significant differences among countries. Austria, the Czech Republic, France, Ireland, Italy, Poland, Spain, and the UK have experienced a marked growth in inflow, both in absolute and in relative terms. In other countries the upward trend is less pronounced, and for Denmark, Germany, and the Netherlands a declining trend can be detected, which is likely related to the restrictive migration policies of these countries in recent years.

Non-nationals account for a statistically significant proportion of the total labour force in the EU. According to Eurostat data, non-nationals represented 5.2% of the total labour force in the EU25 in the first quarter of 2006. Eastern European countries benefit from the contribution of migrant workers to a minor extent, while in certain Western European countries - namely Austria, Belgium, Germany, and Spain - migrant workers represent around 10% of the labour force. In the above statistics, it is difficult to take into account the existence of undeclared work among migrants, although this is known to be relatively widespread in some EU countries. Overall, it can be concluded that in several countries foreigners face exposure to undeclared employment, with negative implications for their working conditions.

In many countries migrant workers are employed on **temporary contracts** more often than nationals are. This applies to Austria, Belgium, Cyprus, Finland, Hungary, Italy, the Netherlands, Slovenia, Spain, Sweden, and the UK (though with great variations across sectors in the latter case). In Estonia, France, and Malta, however, little difference emerges in this respect according to migrant status. For Denmark, Germany, Ireland, and Portugal, as well as for most eastern European countries - the Czech Republic, Latvia, Lithuania, Poland, and Romania - no information is available from the national reports.

The reasons for **migrants' higher exposure** to atypical employment contracts include the following:

- Government policies that issue work permits of limited duration, as in Belgium, Cyprus, Hungary, Luxembourg, and Slovenia, hence forcing the limited duration of contracts;
- The high incidence of seasonal work among migrant workers, particularly in agriculture, as mentioned in the Austrian and Italian reports;
- In Finland migrant workers are employed in some areas of the public sector where recourse to temporary employment contracts is particularly widespread;
- In Sweden and the UK, temporary work agencies play a particularly important role as recruiters of migrant workers.

Impact

According to the EU-OSHA, workers in new forms of employment and contracting practices, including precarious contracts (e.g. temporary or on-call workers) are more vulnerable. They usually perform the most hazardous jobs, work under poorer conditions, and often receive less health and safety training, increasing the risk of work-related accidents. Moreover, data show 'ambiguous conclusions in relation to working conditions in the Temporary Agency Work sector' and that temporary agency workers 'have less access to supplementary training than other employment types'.

Also, migrants are more often involved in accidents, (lethal) injuries and occupational diseases (Ambrosini, M., and Barone, C, 2007). Companies' occupational safety and health (OSH) policies pay little attention to these groups. Many prevention instruments (such as training, instruction, procedures) are not understood by migrant workers because of language barriers. Work that has considerable exposure to health and safety risks is not improved by employers because foreign and illegal workers are eager to perform such jobs without complaining. Crucial issues in this respect are:

- There is no monitoring infrastructure for these issues;
- Are these workers sensitive to the same triggers as other workers?
- Are these groups at higher risk because of diabetes or other specific illnesses?

European countries attract migrant workers to varying degrees for various reasons. This variation depends on economic structures, labour market policies and strategies, social policies of the hosting countries, as well as the motivation of the migrant workers. The proportion of foreign workers assumes diverse profiles and significance throughout the European countries, but a recent report from the European Foundation for the Improvement of Living and Working Conditions (Ambrosini, M., and Barone, C, 2007) identified some similarities: migrant workers are 'segregated into low-paid jobs that offer limited opportunities for upward mobility'.

In several countries hazardous jobs are often rejected by nationals, whereas immigrant workers tend to take up the most hazardous and unhealthy of the unskilled jobs. Figures on exposure to risks and accidents indicate a serious health and safety concern regarding these workers. According to this report, it is possible to find evidence of a greater propensity for migrant workers to suffer from work related accidents in Austria, Spain, Italy, the Netherlands, and Cyprus. Also in Portugal statistics show that immigrant workers experienced almost 15% of the total deadly accidents at work in 2003, whereas foreign citizens living in the national territory accounted for only 2.4% of the total resident population. In Luxembourg 22% of work accidents occur on the way to or from work; therefore, the cross-border workers constitute the high-risk category.

According to the European Working Conditions Survey 2000, **temporary agency workers** only differ from employees with permanent contracts in that the former are highly dissatisfied with their employment situation. A Finnish study, quoted in the Eurofound report, found that the job situation itself could be a stress factor: 42% of all temporary agency workers in the study felt that insecurity about work continuity was a cause of stress. These figures support the idea that the risk of marginalization from successive short-term contracts and the resulting discontinuity in a career added to the worker's isolation. A context of unstable labour markets increases the feeling of job insecurity and augments the level of work-related stress.

Prevention and interventions

To minimize language barriers with respect to occupational safety and health information and training, the Portuguese Working Conditions Authority (by then, Institute for Development and Inspection of Working Conditions) developed an innovative campaign at the beginning of the 2000s. It published and distributed leaflets containing some basic health and safety rules for the construction sector in the main languages of the migrant workers' countries of origins, such as: Crioulo from Cape Verde, Romanian, and Russian. Unfortunately, no assessment of the impact of this campaign was publicized.

According to a report on emerging psychosocial OSH risks (European Agency for Safety and Health at Work, 2007 (a)), only few attempts have so far been undertaken to protect workers in precarious contracts. One possible intervention would be to implement policies which oblige employers to provide workers under fixed term contracts and in temporary agency work with instruction and training on how to perform their work safely before they start working, as well as at regular intervals. Moreover, realistic hazard assessment should also be exercised.

Recommendations for immediate action

- Provide a common framework aiming at greater harmonization to protect all workers, independent of their nationality or type of contract.
- Enhance the processes and methodologies of labour inspection to guarantee full respect for the legal framework, especially with respect to safety and health at work for all workers, independent of their nationality or type of contract.
- Establish mechanisms to guarantee equal access to training in general and OSH training in particular for all workers, independent of their nationality or type of employment contract.
- Assess the main difficulties experienced by migrant workers and temporary agency workers with respect to organizational safety and health.
- Assess the main difficulties and restraints experienced by companies and organizations employing migrant workers and temporary agency workers when implementing organizational safety and health measures equally for all workers.

Recommendations for longer term actions

- Develop measures to promote greater involvement of social partners with respect to OSH for migrant workers, temporary agency workers, and other precarious workers.
- Perform more extensive research on occupational risks for migrant workers, temporary agency workers, and other precarious workers.

6.3 The self employed

Trends

Increased flexibility in recent years has contributed to a greater diversification of employment status (EFILW, 2007 (f)). The number of self employed workers appears to have increased in the majority of European countries since the 80s (EIRO, 2002). According to the 4th European Working Conditions Survey (EFILW, 2007 (f)), 11% of European workers are self employed working as single individuals, and 5% are self employed with personnel.

The typical self employed person is an older male worker who is less skilled than the rest of the workforce; but this is less often the case if self employed individuals who work in agriculture are excluded. Furthermore, the 4th European Working Conditions Survey[18] reveals that the percentage of the workforce that is self employed is highest in the then candidate countries - Croatia and Turkey - (44% without employees, and 8% with employees) and in the southern European countries - Cyprus, Greece, Spain, Italy, Malta, Portugal - (20% and 3%, respectively).

It is lowest in the Scandinavian countries and the Netherlands (7% without employees, and 3% with employees). In the EU27, self employment is concentrated in agriculture, construction, hotels, and restaurants, wholesale and retail trade, and real estate. In almost all countries investigated from 1999 to 2004, self employment among migrants increased as a percentage of total self employment. Moreover, its proportion within migrant employment has been growing (Ambrosini, M., and Barone, C., 2007).

Impact

Research reveals that **self employed workers** report have more autonomy at work and more control over working time but less social support than employees (European Agency for Safety and Health at Work, 2007 (a)). Data from the EU-15 in 2000 show that health outcomes are worse for the self employed than for permanent or temporary employees. The self employed reported more stress, higher levels of fatigue, more backaches, and more muscular pains (Benach, J., et al., 2002). Work arrangements (for employees, independent contractors, and small business owners) do not differ in stress and life satisfaction when both demographics and work characteristics were considered (job autonomy, job pressure, number of hours worked per week) according to a study from the U.S. Prottas, D.J., and Thompson, C.A., 2006).

The issue of the rising number of **'economically dependent'** workers (EIRO, 2002) is relevant from an industrial relations point of view. These workers are formally self employed (they usually have some sort of service contract with the employer), but they depend on a single employer for their income (or a large part of it). Economically dependent workers do not generally benefit from the protections granted to employees, both in law and collective bargaining, including provisions for health and safety, information and consultation, working time, vocational training, and social protections. They generally lack the benefits ordinarily obtained by the self employed, both financially and in quality of work (see example, Annex 4). They also fall outside the traditional reach of trade union representation. In many cases, however, it is a free choice to work independently, despite lower levels of social protection, in exchange for more direct control over employment conditions and terms of remuneration (EIRO, 2002).

Prevention and intervention

In general, employers without employees who are self employed are not represented by any national organization. In **the Netherlands,** there is an organization that represents the self employed at the national level in the transport sector (VERN) (Jettinghoff, K., et al., 2003). Also, one Dutch trade union (FNV) pays special attention to self employed workers without personnel.

Specific injury prevention strategies for the self employed can be developed on a national or sectoral level to provide information and enhance awareness of safety and health issues at the workplace.

[18] Almost 30,000 European workers were interviewed in 31 countries (all then EU25 Member States plus Bulgaria, Croatia, Norway, Romania, Turkey and Switzerland)

Recommendations

Self employed workers in general are not covered by Community directives on health and safety at work or by national legislation in certain member states (EFILW, 2004). The Council Recommendation of 18 February 2003 concerning improvement of the protection of health and safety at work for self employed workers recommends promoting the health and safety of self employed workers in the context of member state policies to prevent occupational accidents and diseases, and recommends taking measures to improve the situation for this section of the labour force. As the recommendation is non-binding, the Parliament called on the Commission to propose compulsory measures if the steps taken by national governments do not lead to an adequate standard of protection within four years. The recommendation includes a clause to review the effectiveness of existing national measures or measures taken subsequent to its adoption.

Some member states have already introduced legislative measures to safeguard the legal status of economically dependent workers and vulnerable self employed workers (e.g. Germany, Italy, and Spain) (EIRO, 2002). These approaches reflect efforts on the part of legislators, the courts, and social partners to tackle problems in this area. Anti-discrimination rights, health and safety protection, guarantees of minimum wages, as well as safeguards for collective bargaining rights have been selectively extended in several member states.

Member states can be further encouraged to introduce legislative measures to safeguard the legal status of economically dependent workers and vulnerable self employed workers.

6.4 Small and medium sized enterprises

Trends: increase in SMEs and subcontracting

In addition to an increasing rate of self employed workers, the number of micro, small, and medium-sized enterprises (SMEs) is increasing. Nearly two million new SMEs([19]) emerge every year.([20]) SMEs are socially and economically important, since they represent 99% of all enterprises in the EU, provide around 65 million jobs, and contribute to entrepreneurship and innovation.([19]) More and more countries understand that employment and economic growth to a large extent depend on SMEs (European Commission, 2003).

These enterprises tend to **predominate in sectors which are less capital intensive** and where economies of scale are not crucial. For example, in construction, they account for nearly 90% of all jobs, and in wholesale and retail trade, hotels, and restaurants, the figure is close to 80%. SMEs also dominate in business and other services, with nearly seven out of ten people who work in these sectors being employed in an SME. By and large, they are businesses with a high growth and employment potential.([19])

([19]) On 6 May 2003, the Commission adopted a new Recommendation, 2003/361/EC, for the definition of small and medium-sized enterprises (SMEs). Under the new definition, a 'medium-sized enterprise' is an enterprise that employs fewer than 250 persons and that has an annual turnover not exceeding EUR 50 million, and/or an annual balance sheet total not exceeding EUR 43 million. A 'small enterprise' is an enterprise that employs fewer than 50 persons and whose annual turnover and/or annual balance sheet total does not exceed EUR 10 million; a 'micro enterprise' is an enterprise that employs fewer than 10 persons and whose annual turnover and/or annual balance sheet total does not exceed EUR 2 million.

([20]) http://www.eurofound.europa.eu/areas/industrialrelations/dictionary/definitions/SMALLANDMEDIUMSIZEDENTERPRISE.htm.

There is also an increase in network-based organizations, where companies have retreated to their core competence by outsourcing ancillary functions and forming chains of suppliers and subcontractors (Goudswaard, A., 2002). Since the 1980s, large companies have resorted to outsourcing services, thereby contributing to the creation of a dense network of smaller companies integrated in the supply chain (EFILW, (s.a.)).

Impact of the growing number of SMEs on health and safety

The literature on SMEs (Sørensen, O.H., et al., 2007) consistently concludes that:

- There is a higher risk of severe and fatal accidents in small enterprises; (SMEs record a disproportionate 82% of all occupational injuries, rising to about 90% for fatal accidents (European Agency for Safety and Health at Work, 2004);
- There is a higher risk of less severe accidents if the underreporting thesis is correct;
- There are only scattered data about other hazards;
- Large enterprises have better OSH management systems; (a lack of financial and organizational resources means that many SMEs have only limited occupational safety and health (OSH) experience and capacity (European Agency for Safety and Health at Work, 2004)).

A **Danish study** showed that company size was positively related to physical working conditions in private independent enterprises but negatively related to physical working conditions in private partial enterprises (Sørensen, O.H., et al., 2007).

The negative impact of new flexible work arrangements, such as subcontracting, on working conditions has two aspects (Goudswaard, 2002):

- Conditions of work: describing the practical working conditions;
- Conditions of employment: describing the contractual regulations and status under which people are employed, trained, and paid.

In the first scenario exposure to risk is shifted to the external, flexible workers or subcontractors. Those are workers who perform the dirtiest, most dangerous, and most monotonous jobs under relatively poor ergonomic conditions. They are not as well protected as permanent employees since they often fall outside the jurisdiction of committees that monitor working conditions, or of trade unions. In the second scenario, even with no difference in actual working conditions, a gap develops between permanent and non-permanent workers in job security, access to training, career prospects, and remuneration (the conditions of employment).

The main disadvantage of contract work is that as the number of people and companies involved in projects and work processes increases, it becomes more difficult to coordinate responsibilities and monitor the work process. Difficulties in controlling occupational risks arise, leading to an increase in the accident rate. Improving safety in chain management is therefore crucial in an increasingly complex world (Zwanikken, S.L.J., et al., 2007).

Problems of discrimination can arise when workers are involved in extended chains of subcontracting. The ‘dual employer’ situation adds to the complexity of the employment relationship (European Commission, 2006). Several member states have sought to address such problems by making principal contractors responsible for the obligations of their subcontractors under a **system of joint and several liability**.

Such a system encourages principal contractors to monitor compliance with employment legislation on the part of their commercial partners. It has been argued, however, that such rules may serve to restrain subcontracting by foreign companies and could therefore present an obstacle to the free provision of services in the internal market.

In the building and construction sector in **The Netherlands**, a so-called 'Safety Checklist for Contractors' (In Dutch: VCA) has been implemented. This is a certificate that was developed and agreed upon. It restricts larger contractors to using smaller (sub)contractors only if they have such a certificate. Recently, the Dutch government agreed to support making non-certified employers/subcontractors liable when they apply for jobs where such liability is requested. Where employment agencies are not certified (those who do not have a VCA certificate) and do not pay full minimum wages to contract workers, they may be excluded from a job.

Prevention

The literature on preventive activities in SMEs is scattered and 'there is a lack of evaluation and intervention studies, both in terms of effect and practical applicability'. Therefore, it is important to carry out more comprehensive research on the complete intervention system (Takala, J., 2007).

A report on the current Status of Workplace Health Promotion in 2001 mentions that implementation of extended occupational health and safety tasks faces some problems in SMEs (Federal Association of Company Health Insurance Funds, 2001):

- Labour inspectorates are insufficient to visit a majority of SMEs, so sanctioning legislation in SMEs is particularly problematic;
- SMEs have very little financial latitude and tend to use the cheapest OSH services, resulting in below standard care;
- Most small companies do not have an occupational health and safety infrastructure and therefore lack fundamental skills and qualifications; there is a large gap between formal occupational health and safety systems and the pragmatic thinking of small entrepreneurs which is geared to running a business;
- Small entrepreneurs have a negative perception of occupational health requirements, e.g. the obligatory risk assessment;
- There is a lack of co-operation between labour inspectors, preventive services, and other resources to make occupational health and safety efficient in SMEs;
- Furthermore, there is not yet systematic access for all enterprises to protective and preventive services in Europe, especially not in the countries of southern Europe and Ireland (Kuhn, K., 2007). It is also difficult to reach SMEs, in particular the smallest ones.

The European Agency for Safety and Health at Work has carried out a great deal of work on best practices for SMEs (Takala, J., 2007). The Agency has also launched three SME funding schemes intended to promote good practice at the SME level. The first scheme focused on accident prevention (2001-2002), the second on risk reduction (2002-2003), and the third (2003-2004) continued the second scheme. The overall aim was to identify, communicate, and support activities and projects that fulfilled these objectives.

The initiatives that encouraged SMEs to adopt good occupational safety and health practice consisted of training related to the prevention of accidents and avoidance of health risks, providing information and communications that promote health and safety, and identifying effective good practices that reduce dangers to health and safety. An independent evaluation demonstrated that the schemes added value, and the impacts of the projects would continue to be felt in the medium and long term.

Recommendations

Recommendations mentioned in the literature to stimulate occupational safety and health practice in SMEs include (Takala, J., 2007; Kuhn, K., 2007):

- Focus on particular sectors or risks so action can be targeted, precise, and sector relevant;
- Tools and support should not be too expensive or complicated;
- Tools and support should be disseminated through personal contact (face to face, through tailored information which uses trusted intermediaries);
- Combine OSH interventions with economic incentives;
- Combine active interventions with practical documentation and tools;
- Involve the different partners (employers, employer associations, workers, trade unions, occupational health services, insurance companies, public authorities);
- Demystify OSH procedures, such as risk assessment;
- Promote systematic access for all enterprises to protective and preventive services in Europe, especially in the countries of southern Europe and Ireland;
- Invent ways to reach SMEs, particularly the smallest ones.

Situations in which large numbers of contractors work together have a large number of interfaces and scope for uncertainty about who is responsible for what (Goudswaard, A., 2002). It is important to find solutions that focus on more than just one workplace. Contractors often do not have their own counselling system and cannot participate in the counselling system of the client. In the future OSH management should not stop at the physical boundaries of the company, but should be expanded to include the entire organizational structure. Special support is needed for the SMEs.

Some suggestions for strategies mentioned in Goudswaard include:

- Implementing all contractors in a common integrated safety and health system;
- Supporting communication and co-operation among all system partners;
- Supporting SMEs in their administrative work.

Furthermore, a literature study reveals that it is especially important to co-operate in the early stage of a project; this is crucial for controlling safety when subcontractors are involved (Zwanikken, S.L.J., et al., 2007).

When different parties work together, it is of special importance to clarify responsibility for the working conditions and safety of workers, especially when foreign contractors are involved.

In 2007 the European Commission presented the Community strategy 2007-2012 on health and safety at work (Takala, J., 2007). With respect to SMEs, the communication concludes that certain types of employment are more vulnerable. SMEs have fewer resources to put complex systems of worker protection in place, and some of them are more affected by the negative impact of health and safety problems.

It is a challenge to deal with new employment trends, including the increase of self employment, outsourcing, and increased employment in SMEs. In the Commission's view, SMEs should be supported in the implementation of legislation. There is a need to respond better to the circumstances and needs of SMEs, particularly with regard to risk assessment and involvement in training of workers. Furthermore, one of the objectives is to adapt the legal framework to changes in the workplace and simplify it, particularly in view of SMEs.

7. Overall prioritization of risks and a sample of national approaches

7.1 Prioritization of risks

In an attempt to pull together the conclusions on the emerging risks and present an overview, with some prioritization, the group of authors rated the emerging risks identified on four dimensions:

- number of workers exposed,
- exposure duration,
- effect of the risk on the worker, and
- probability that this effect would occur.

Overall, we found that the emerging risks could be rated on these dimensions. For **multiple risks**, however, only the number of exposed workers could be estimated. What makes this difficult is the large diversity of risk combinations (see also chapter 3.2). It appears that the combination of psychosocial and physical stressors occurs often, and when it occurs the exposure duration is long but may show a low to intermediate interactive effect. The effects are likely to be ill health, i.e. musculoskeletal and mental health problems, cardiovascular disease, and absenteeism. Dropping out of work is likely to include early disablement for work. A combination of dangerous substances, however, may result in a strong interactive effect, with only limited time between exposure and effect. Examples of the latter are exposure to tobacco, smoke, and asbestos or radon (chapter 3.2). These strong interactive effects may also have a significant and immediate impact.

Physical inactivity, work intensification, and work-life (im)balance are very prevalent emerging OSH risks, often with a long exposure duration, but their effects are estimated as of medium importance. In some specific target groups, such as the bottom of the labour market where workers are exposed to multiple risks, the effects can be considered of high importance.

Several less frequent emerging OSH risks such as violence and harassment at work, allergies, and global epidemics are considered to have high impact on workers exposed to these risks. The latter types of emerging risks are known to expose workers in specific sectors and occupational groups.

Job insecurity is considered an emerging risk, but the different research groups estimate the number of exposed workers differently. It appears that workers are hardly exposed to job insecurity in some European regions (particularly in the 'old' EU-15 member states), whereas very many workers are exposed to this risk in other European regions, particularly in the newer member states. When exposed to this risk, exposure is long, particularly in the regions where many workers are exposed.

EMF is a specific emerging occupational risk particularly prevalent in specific sectors (such as healthcare, certain sectors in manufacturing and public administration such as the waste management industry and transport). The exposure is medium to high for workers in these sectors, and the exposure duration long. The impact is relatively low, however. Particularly in those sectors where the probability of exposure and impact is high, the priority is considered high as well.

An emerging occupational risk which is not yet highly prevalent and is estimated to have an exposure duration and impact of medium to low importance is **sustainable energy sources**. This risk is really a future occupational risk, and the number of workers exposed is rapidly increasing.

Table 7.1 An overview of the risks and ratings of importance for the four criteria identified

Emerging risk	Long-term impact				Ranking
	Number of workers exposed	Exposure duration	Effect	Probability	
1. Physical inactivity	5	5	3-5	3-4	4-5
2. Multiple risk factors	5	nk (1-5)	nk (3-5)	nk (3-5)	5
3. Job insecurity	2-4	4	3-4	3-4	3
4. Work intensification	4	4-5	3-4	4	4
5. Violence and harassment	2	1-4	4-5	2-3	4
6. Work-life balance	4	4	2-3	3-4	3
7. Nanoparticles	1-4	2-3	nk	2	2-4
8. Endocrine disruptors	1-4, nk	3-4	2-5	2-3	4
9. Increase in allergies	3-4	4-5	4	3	4
10. Global epidemics	1	2-4	5	2-4	3-4
11. EMF	3-5	4-5	2	1-4	4
12. Sustainable energy resources	1-2	2-3	1-2	1-2	1

nk = not known.

7.2 Emerging risks, priorities, and specific target groups

In table 7.2 the emerging occupational risks are characterized by their prevalence in or importance to specific target groups. To attain some selectivity in scores, a combination has only been scored as important (yes) when there was little dispute on the score.

Most emerging occupational risks are considered to be prevalent in **SMEs**, including physical inactivity, which is an emerging risk that is somewhat dependent on the sector. Generally, those sectors dealing with increasing ICT experience physical inactivity. Many SMEs will be confronted with this risk, as well as with work intensification, work-life imbalance, nanoparticles (particularly in specific sectors), and sustainable energy sources.

Self employed workers will also be exposed to most of the same emerging occupational risks as SMEs. It is unclear, however, whether industries dealing with sustainable energy sources should to be considered among emerging occupational risks for the self employed as well.

Women, on the other hand, who are not identified as a specific target group in this report, are very often confronted with emerging OSH risks such as violence and harassment (sexual harassment in particular) and work-life balance. This led to the score of ‘y’ for gender.

As for physical inactivity among **older workers**, multiple risk factors and work-life (im)balance are considered to be clear emerging risk factors for OSH. For some risks we do not know whether they are of particular importance for the older worker, such as endocrine disruptors, nanoparticles, and allergies.

Workers at the bottom of the labour market are also exposed to a number of emerging risks with respect to OSH: they are exposed to multiple risks, both physical and psychosocial risks, including traditional risks such as heavy work and low job control, but also to emerging risks as presented here, such as violence, harassment, and job insecurity.

On several occasions the combination of emerging risks and specific target groups resulted in a 'not known' which were only occasionally the result of a lack of available data. More often it was because the specific combination was not within the scope of research (and implementation), or was not followed up in known best practices.

Table 7.2 Specific target groups, and the need for special attention to emerging risks

	Special attention needed				
Emerging risk	Gender	Older workers	Bottom of the labour market	Self employed	SMEs
1. Physical inactivity	y	y	nk	nk	y
2. Multiple risk factors	nk	y	y	nk	nk
3. Job insecurity	nk	n	y	y	y
4. Work intensification	y	n	y	y	nk
5. Violence and harassment	y	n	y	nk*	nk*
6. Work-life balance	y	y	nk	y	y
7. Nanoparticles	nk	nk	n	n	y*
8. Endocrine disruptors	y	n	n	n	n
9. Increase in allergies	n	nk	n	n	y*
10. Global epidemics	n	n	nk	n	n
11. EMF	n	y	y	n	n
12. Sustainable energy resources	n	n	n	n	y*

y = yes; n = no; nk = not known, * = sector specific.

7.3 National approaches

Several European countries have already developed, more or less systematic ways to approach the emerging risks identified in this report, or some interesting initiatives could be identified. A sample of such national approaches on the following emerging risks was inventoried:

- Physical inactivity at work;
- Violence and harassment at work;

- Management of dangerous substances in SMEs;
- Allergies;
- Older workers.

Since the present research group included only a select number of EU countries[21], only specific country initiatives are covered here. Those studies known to deal with specific emerging risks in other countries will also be presented. Of course, not all countries included have a national approach (yet) on the topics presented here. More detailed descriptions of example national approaches can be found in Annex 6.

7.3.1 National approaches to physical inactivity at work

In some of the contributing countries such as Spain and Portugal, no specific strategies could be identified within the area of physical inactivity at work. In some other countries they could be identified.

The Netherlands has taken an initiative to develop a set of guidelines with recommendations for the amount of physical activity and for the recovery time from static muscle load (Commissaris, D.A.C.M., and Douwes, M., 2007). Further objectives of the initiative were to develop and/or evaluate appropriate assessment methods, to develop measures to meet the guidelines, and to implement the guidelines.

In sum, the recommendations in these guidelines to reduce physical inactivity are:

- Be physically active, also during the working day. It is recommended that:
  - In an 8-hour workday, an adult employee accumulates 30 minutes or more of moderate intensity([22]) physical activity, during work, during the lunch break, or on his/her way to or from work;
  - In an 8-hour workday, continuous standing is limited to 1 hour; continuous sitting to 2 hours, and the total standing duration does not exceed 4 hours;
- With respect to recovery time, it is recommended that:
  - In an 8-hour workday, an adult employee take a break of at least 7½ minutes in the morning and at least 10 minutes in the afternoon after each work shift of at most 1½ hours. Recovery consists of either a rest period or another task, to relax the dynamic load on the neck/shoulder area. There should be a rest period at least once in the morning and once in the afternoon;
  - Within each 1½-hour work shift, an adult employee should take a break of at least 30 seconds after at most 20 minutes. Recovery consists of rest in this case.

Both recommendations aim to tackle the sustained character of low-intensity static loading in the neck/shoulder area by restricting the duration of the loading period. These interventions are supposed to reduce work-related short-term loading effects in the neck/shoulder area, such as local fatigue and discomfort. We did not find sufficient scientific evidence to claim a decrease in long-term loading effects, i.e. (diagnosed) work-related MSDs in the neck/shoulder area. It is plausible, though, that these recommendations contribute to decreasing the risk of such disorders.

More scientific evidence is needed to base the recommendations on a specific amount of physical activity and prove their effects.

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[21] The Netherlands, Germany, Poland, Portugal, Spain

([22]) At least 4 MET (Metabolic Equivalent) or 200 kCal above resting metabolism, or 30% HRR (Heart Rate Reserve).

In **Germany** a new OSH strategy has been adopted which is targeted at reducing musculoskeletal stress and disorders. It includes reduction of mental strain and promotion of systematic safeguarding of occupational safety and health in companies with the common issues of 'tasks involving imbalanced stress or low mobility' (DGUV, 2007). This does not yet appear to have been translated into specific legislation, regulations, or other good examples on how to tackle physical inactivity, however.

In the new Member States national approaches to this OSH area are unknown. In **Poland**, however, the Council for Dietary, Physical Activity and Health was established by the Ministry of Health on 12 November 2007. The chairman of the Council is the Head of the National Labour Inspectorate. The main aim of this council is to increase awareness of the influence of dietary habits and physical activity on health.

The Council activity focuses on:

- Preventing overweight and obesity in Poland, with special consideration to the recommendation of the Commission of the European Communities 'Strategy for Europe on Nutrition, Overweight, and Obesity related health issues';
- Defining priority activities in the area of promoting good dietary habits, physical activity, and health, and defining ways of putting these ideas into effect;
- Supporting initiatives on public health, especially pro-health habits and control of overweight-based diseases;
- Encouraging activities to promote a healthy life style (diet, physical activity) in the mass media.

The activities presented above do not specifically target the occupational setting, but pertain to the public health domain. Activities in the public and occupational health domains, however, appear to be closely linked with our area of concern, considering the involvement of the Labour Inspectorate.

7.3.2 National approaches to violence and harassment at work

Some national approaches can be seen in the area of violence and harassment at work. For Germany, Spain, and Poland national approaches are unknown.

In **The Netherlands,** relevant acts that deal with the issues of violence and harassment are the Health and Safety Act (Arbeidsomstandighedenwet art. 1.3e, Arbobesluit art. 2.15), and the Equal Treatment Acts (Awgb and Wgb m/v).

The new Health and Safety Act (Amendment Stb. 2006, 675) came into effect on 1 January 2007, and obliges employers to: 1) identify causes of psychosocial risks (risk inventory), 2) implement measures to eliminate or reduce exposure, 3) provide information and instructions to employees, and 4) report and register accidents related to violence and harassment that lead to hospitalization of an employee.

The concepts of violence and aggression, sexual harassment, and bullying are explicitly mentioned in the articles that refer to psychosocial risks. At the sector level employers and employees (representatives) have a responsibility to compile and publish a Health and Safety Catalogue (Arbocatalogus). In this catalogue sector policies on violence and harassment are recorded, including specific measures to be taken.

The Equal Treatment Act contains articles on discrimination and intimidation. Since 2005 sexual harassment has explicitly been mentioned in the Equal Treatment Act for men and women.

An example of a nationwide initiative in the Netherlands is the introduction of Safety and Health Covenants. These voluntary covenants are concluded among government, employees, and workers in order to establish agreements for improving working conditions and reducing sick leave and occupational disability in specific economic sectors. The covenant programme was triggered in 1998 by the Dutch Ministry of Social Affairs and Employment. By the end of 2007, when the covenant programme ended, 69 covenants had been ratified, affecting over 50% of all Dutch workers. Most covenants covered a timeframe of 3 to 4 years. Depending on the risk profile for a particular sector, each covenant targeted a specific set of risks. In total, 14 covenants covered the issue of violence and harassment. In these covenants quantitative targets for risk reduction were set, and a declaration of intent was made regarding implementation of specific measures. The covenant programme had a major impact in reducing sickness absence, agenda setting, and disseminating knowledge on the effectiveness of interventions in the Netherlands.

Another example of a nationwide approach to workplace violence and aggression in the Netherlands is the inter-departmental programme, Safe Public Task, which is coordinated by the Ministry of the Interior. This programme aims to decrease aggression and violence against all employees, and includes a public task to reduce this by 15% within a three-year period. The programme involves setting standards for house rules/codes of conduct, disseminating best practices, tools, and guidelines, and conducting additional research. Also, specific agreements are made with police and the public prosecutor on how to punish perpetrators.

In **Portugal** there have been several national initiatives on violence and harassment. It is certainly an issue that is on the national agenda.

1. *Plano Nacional para a Igualdade - Cidadania e Género 2007-2010 (National Action Plan for Equality – Citizenship and Gender 2007-2010)*
   Under the objective 'To promote equality of opportunities and treatment between men and women in the labour market', the Ministry of Labour and Social Solidarity and the Ministry for Economy and Innovation worked together to disseminate the contents of the Labour Code 'as a means to re-enforce the fight against moral and sexual harassment in the work place'. One of the activities they undertook was the development and dissemination of informative brochures about the legislation among social partners.

   A second objective was to 'fight and prevent gender discrimination based violence'. Here the Ministry of Labour and Solidarity are working together with the Commission for Equality in Work and Employment, the Authority for Working Conditions, and the Ministries Council Presidency Commission for Citizenship and Gender Equality to:

   - promote sensitization and information actions regarding sexual harassment, its specificities, and consequences in public and private organizations, and
   - produce and publish informative brochures on sexual harassment at the work place.

2. *Plano de Acção Inspectiva 2008-2010 (National Action Plan for Labour Inspection 2008-2010)*
   Under the Programme, Promotion of safety and health at the work place, and the Action, Emerging risks, are included development of methodologies for occupational risk prevention inspection visits related to harassment. The actors are the labour intensive industries, tertiary sector, workplaces with customer contact, and passenger transport.

   Development of the programme consists of:

   - elaboration of information and dissemination instruments;

- elaboration of instruments supporting the preparation, accomplishment, and evaluation of inspection activity;
- internal training;
- information sessions;
- inspection control action;
- evaluation of immediate and mid-term results.

In **Poland** the Labour Code Act of 14 November 2003 (Journal of Laws of 1998, No 21, item 94) was amended (Dziennik Ustaw, No. 213, item 2081). Some other laws contain new articles on different types of discrimination in the workplace such as equal treatment for all groups of workers, employer obligations directed to proper social coexistence, including prohibitions against mobbing and sexual harassment.

In Warsaw on 8 December 2007, a conference was organized on immoral propositions: Mobbing and sexual harassment in the workplace by the 'Feminoteka' Foundation in cooperation with other partners on the project Gender Index. The organizers defined an immoral proposition as:

- providing the lowest salaries because there are hundreds of workers ready to undertake the job,
- humiliating a worker in front of others, mocking, and threatening him or her,
- comments by a superior which have a sexual background, indecent SMS and e-mails,
- a boss proposing an obligatory meal to the boss's assistant,
- proposition of work for sex to desperate single mothers.

The conference aimed to put forward and answer the following questions:

- How to object to mobbing and sexual harassment?
- Could a court case be won against mobbing?
- Do the unions and non-governmental organisations help workers in this matter?
- Are there employers who implement good practices on mobbing and harassment?

The impact of this conference was not evaluated, and there is no clear indication whether any Polish employers have implemented good practices on mobbing and harassment.

7.3.3 Management of dangerous substances in SMEs

Portugal does not specifically refer to dangerous substances, but there is a specific programme for SMEs (up to 20 employees), which represents about 90% of Portuguese entrepreneurs: the '*Plano de Acção Inspectiva 2008-2010' (National Action Plan for Labour Inspection 2008-2010)*. This programme consists of a campaign to evaluate risks and develop preventive strategies in micro and small enterprises by evaluating prevention planning and risk assessment for such enterprises in the primary, secondary, and tertiary sectors.

Development of the programme includes:

- Creation of working groups composed of labour inspectors and staff from the promotion of safety and health at workplace services to elaborate information and provide support materials for the inspections activity;
- Training labour inspectors and prevention staff;

- Sensitization and information actions through the media, publications, seminars, workshops, and other events;
- Development of strategies, information methodologies, and inspections actions;
- Inspection controls;
- Evaluation of immediate and mid-term results.

Recently, a book was published 'Within REACH?; managing chemical risks in small enterprises' (Walters, D., 2008). It contains summaries on emerging risks from physical and chemical sources, two of which - endocrine disruptors and nanoparticles - can be regarded as part of the management of potentially hazardous substances.

For chemicals such as nanoparticles, it is estimated that exposure is worst in small companies (see table 7.2). The data provided by David Walters therefore are a good source for comparing national approaches to the management of nanoparticles and endocrine disruptors. This summary compares the situations for handling chemicals in **Germany, Sweden, the Netherlands,** and the **UK**. Although the occupational risks have long been recognized and regulations have been in place for decades, research and development lead to new chemicals as well as new data on their effects. The approaches taken by these four countries offer a view of policy options for handling hazardous substances, and more generally for chemical and physical hazards.

Legislation

Beginning in the 60s and 70s, national legislation on chemicals has been influenced by gradual transposition of European directives into national laws. The main approaches consist of the regulations dealing with marketing chemicals, as, for example, producers' obligations on labelling and data safety sheets, and the obligation of employers to protect workers from adverse effects of chemicals, such as risk assessments, the use of occupational exposure limits, risk management strategies, instructions, etc. In total, some 60 regulations deal in some way with chemical management (Walters, D., 2008).

In addition, transposition of directives has been different in each country, which makes comparison of the legislative structures too complex for the scope of this summary. The new European chemical regulation, REACH (registration, evaluation, authorization, and restriction of chemicals), has been in effect from June 2008 and will replace most of the older directives. With respect to policy options, it is clear that the introduction of REACH leaves no room for discussion on new legislation in the coming years, although evaluations of REACH may lead to discussions on amendments within a few years. Since the legislation will be harmonized at the European level, the legislation itself is not useful for comparing possible future national approaches.

Enforcement

Exposure to chemicals is most prevalent in small and medium sized companies, and therefore, it affects many enterprises. Inspection efforts can never cover a substantial percentage of the companies using hazardous substances. Germany has a double system of inspection: one through the federal and state inspection agencies and a second one through the sectoral accident insurance institutions. The latter have both legislative and inspection authority. This institutional sectoral approach is advantageous in dealing with chemical management since the problems are generally sector specific and require considerable knowledge of the sector (Walters, D., 2008).

Sweden has a special agency for inspection of chemicals in which inspectors have the necessary specialist knowledge. In 2003, there was an inspection campaign directed at improving chemical management in SMEs. In **The Netherlands** inspection authorities have been closely involved in the VASt programme ([23]), a programme in which sectors having action plans for improving chemical management are less burdened with inspections. Unlike the double inspection system in **Germany**, the specialized inspection agency in Sweden and the involvement of inspection authorities with improvement programmes, in the **UK** there is no special incentive or effort. On the contrary, the inspection capacity of the Health and Safety Executive has been under pressure for some years.

Structural support for chemical management

Generally speaking, knowledge infrastructures differ considerably in the four countries. Some common aspects are worth mentioning in this summary, however. Since chemical management requires specific competences that are often not available in small companies, expert support should be made available. Occupational health and safety (OSH) service companies could provide this knowledge. In **The Netherlands,** contracts with OSH services were mandatory from the mid 90s until July 2005, when the EU forbade mandatory contracts. Also, OSH services in the Netherlands were required to have occupational hygienists under contract, who had to have certificates of their professional education. Risk assessments of companies had to be approved by the OSH service. No such obligations are in effect in the **UK**, where a free market approach has prevailed in the last decades. In **Sweden,** the Chemical Inspectorate centralizes knowledge on chemical management and provides advice for companies. In **Germany,** the sectoral insurance agencies provide specialist knowledge dedicated to the industry. Companies must be members of and contribute to these agencies. Both state and sectoral agencies contribute to the creation and dissemination of knowledge on chemical management.

Voluntary programmes

Voluntary programmes are being carried out in some industries, especially the chemical industry, which promotes safe handling of chemicals through its Responsible Care and Product Stewardship programmes. Because these programmes are essentially international, they will not be discussed here. In **The Netherlands** is a long-standing tradition of tackling social problems through consensus among social partners and government. This has been applied to OSH through tripartite covenants and chemical management in the VASt programme. These covenants covered a large part of the working population in the Netherlands (some 64 covenant programmes have been implemented). The VASt programme included some 24 sectoral action plans to improve chemical management. This way of organizing working conditions is typical of the Dutch approach, but such large scale voluntary ways of operating are not common in the other European countries. It should be noted that in the **German** situation the sectoral insurance organizations are governed by representatives of employer and employee organizations, thus creating a basis for implementation of control measures. Also, in **Sweden** social dialogue is traditionally an important asset as a basis for improving working conditions, including chemical management.

([23]) VASt programme: directed at improving chemical management in SMEs in high risk sectors. The programme ran from 2003-2007.

Development of guidelines and tools

Numerous tools have been developed for risk assessment and for making workplace instructions. (Walters, D., 2008). Most resources for development of tools are provided by the **German** system, where federal, state and sectoral insurance agencies have been developing tools. In the **UK** the HSE developed a tool that has become a standard for risk assessment. Plans for further development of this tool to provide assistance in all matters of chemical management, including safety, storage, etc., however, have been postponed because of limited resources.

In **The Netherlands,** tools have predominantly been commissioned by the national government to research organizations. A statement of affairs by TNO indicated the existence of some 146 tools. Information on the use of these tools is however very scarce (Walters, D., 2008).

An interesting effort is the development of guidelines for downstream users of products where sectoral agencies have investigated alternative products on the market and rated them with respect to the amount of dangerous substances. These ratings have been made available for the whole sector. Examples of these are the PISA system for building materials in the Netherlands and the WINGIS system in Germany for 13 groups of products for the construction industry. These ranking tools help companies purchase the least hazardous products.

Another development is the approval of risk assessment tools, such as the Stoffenmanager (Chemical manager) in the Netherlands by the Labour Inspection agency, thus promoting the use of such a tool. More traditional instruments provide information on chemicals in the national language. In the Netherlands the 'Chemiekaartenboek' has been an independent standard for information on hazards and advice on handling chemicals for over 25 years. It is a commercial product produced by a research institute and a publisher. In Germany sectoral organizations provide databases with information on chemicals, although these are not all publicly available or they are not easy to use for people in small enterprises. In Sweden such a database is also available from the state agency for chemical management.

Summary

The sectoral approaches have been generally very successful in providing guidance and tools for chemical management in SMEs, the most vulnerable group. Tripartite organizations play a crucial role in achieving sectoral improvements. The Netherlands is an example of how this can be brought about through voluntary programmes. Although this information applies to chemical management in general, it is possible to extrapolate from these experiences when considering policy options for emerging risks of substances deemed hazardous to workers or humans in general.

7.3.4 Allergies

There is only some information on allergies in Germany and the Netherlands.

In **Germany,** there is a joint prevention campaign of statutory health insurance and accident insurance institutions to improve skin health called '*Your skin. The most important 2m^2 of your life*'. This joint prevention campaign was launched in 2007 to improve skin health. Over a period of two years, 120 accident insurance and health insurance institutions will campaign for an improvement in attitudes to the largest organ in the human body. The declared goal of the campaign is: Fewer cases of skin disease.

Of around 25,000 confirmed cases of occupational disease in 2005, the statutory accident insurance institutions noted some 9,500 cases of occupational skin disease. In this context, allergic and irritating eczema, which very often engender allergic eczema, play an important role. Skin diseases are the largest category of occupational diseases, by a clear margin. High costs are also incurred by the health insurance institutions. Altogether, the direct costs attributable to skin diseases amount to some four billion Euros each year.

In addition to the co-organizing institutions, the campaign has the support of numerous partners such as the German regional governments, dermatological bodies, and relevant professional associations. The institutions involved emphasize that the campaign's broad base makes it the first of its kind on both national and international levels. It can reach everyone, from kindergarten children, through employers and employees, to pensioners.

The prevention campaign includes an umbrella campaign and approximately 120 institutional campaigns that are especially geared towards the target groups of the co-organizing institutions. The umbrella campaign maintains a central Internet platform www.2m2-Haut.de, and promotes the campaign goals via poster publicity, TV spots, as well as through national or regional events:

The campaign calls for an official health representative to be present at the three large German city marathons in Hamburg and Cologne (2007) and Berlin (2008). In addition, it produces all types of information materials for health protection at work and in leisure time, and these are made available to the public. The results of the campaign will be subject to evaluation.

In **The Netherlands,** special attention has been paid to detecting allergies in the context of safety and health covenants. For instance, the bakery sector carried out a project on baker's asthma, supported by both employers and employees. It resulted in better insight on the exposures to wheat and flour dust and enzymes, sources of baker's asthma. Better working procedures, housekeeping measures, and preventive equipment were also introduced in this sector. Exposure to allergens was also a topic in the OSH covenants for the healthcare, hairdressing, and cleaning sectors.

7.3.5 Older workers

The EU set a target to increase the employment rate for older people. For this to be successful, governments, social partners, and organizations need to work together to develop the skills and employability of older people, while maintaining the health, motivation, and capacities of workers as they age. Policies and practices aimed at improving opportunities for older workers and at extending working life, particularly within companies, have developed significantly over the last decade. The European Foundation for the Improvement of Living and Working Conditions recently published a couple of reports with examples and good practices from (new) member states and acceding countries (Taylor, P., 2006; Mandl, I., et al., 2006; Naegele, G., and Walker, A., 2006).

Germany developed a national approach to address the greying work force.

1. *The first initiative relates to activities of the Statutory Accident Insurance Institutions*
   Currently, two guidelines on demographic change are being developed. One guideline addresses SMEs and/or the health and safety inspectors of the Statutory Accident Insurance Institutions. Another one addresses companies. This initiative will give practical guidance on how to prevent risks for workers exposed to particular risks, including among older workers. These programmes offer training, applied research, symposia, meetings, and conferences.

2. *In addition, government approaches have been initiated in Germany*
   The BAuA([24]) created a German-wide project called INQA - Initiative for New Quality of Work (Initiative neue Qualität der Arbeit, www.inqa.de). INQA started in 2001, and is a confederation of companies, social partners, social insurance funds, foundations, the federal government and federal states:

   - There are several INQA working groups (TIK - Thematischer Initiativkreis) on special subjects. One group is working on topics of demographic change, another is dealing with lifelong learning;
   - There is an INQA database with examples of good practice which is filled with successful activities and schemes in the area of demographic change by enterprises. So far, 210 examples of good practice have been collected;
   - The demographics network (Demographie-Netzwerk - ddn) of INQA is a communication platform developed by INQA in which enterprises exchange their experiences and learn from one another how to deal with changes and cope with challenges.

3. *Projects initiated by the Federal Ministry of Education and Research*
   There are two transfer projects promoted by this ministry, resulting in Internet platforms:

   - www.demotrans.de: This project includes:
     - testing exemplary solutions to the topics of awareness, consultation, and transfer;
     - balanced age structures and innovation ability of companies;
     - age-related work and personnel policy;
     - employment and new fields of occupation for older employees;
     - solutions to the action areas are transferred by providing an impartial picture about older employees, increasing job chances for older employees, improving cooperation among different age groups within the company, and devising action options for companies, politics, and associations;
   - www.demowerkzeuge.de: in this project 20 practically tested procedures and instruments, as well as 100 examples from companies, are presented as a base of knowledge and experience about the topic.

4. *Other examples and further approaches*
   Several institutes in Germany pay attention to demographic changes. The Bertelsmann Stiftung, an exclusive private foundation, launched 'the Demographic Change Campaign' on 6 December 2005 at a conference that brought together political and social leaders to discuss the complex challenges. In the coming years demographic change and its impacts will be addressed in three focus areas: families, education, and social cohesion.

   The Böckler Stiftung promotes research activities in the area of demographic change.

   The Max Planck Institute (MPI) makes a fundamental contribution to gaining a deeper understanding of the causes and consequences of demographic change.

In **The Netherlands**, there were some initiatives to stimulate older worker to join the labour force. All initiatives were mainly driven from a labour market perspective rather than an OSH perspective. The latter was present but very secondary to the labour market perspective.

([24]) Federal Institute for Occupational Safety and Health (Bundesanstalt für Arbeitsschutz und Arbeitsmedizin).

1. *Government measures*
   Most important policy measures by the Ministry of Social Affairs and Employment to stimulate labour force participation for the aged are (www.szw.nl; SZW, 2002):

   - Fiscal encouragement for the VUT[25] early retirement schemes will be abolished (originally announced for 2005, but postponed one year). This will stimulate the transition from pay-as-you-go early retirement schemes to funded schemes. It is assumed that older employees will work longer because retiring later leads to a higher pension benefit;
   - From January 2004 the obligation to seek work for employees older than 57.5 has been reintroduced;
   - A prohibition on age discrimination in work, professions, and vocational education has been introduced. Unless an objective justification can be provided, the use of age criteria for recruitment and selection purposes is prohibited. The Act was passed in December 2003 and became effective in March 2004. The prohibition can have far-reaching consequences for age stipulations in Collective Labour Agreements;
   - From January 2004 employers are no longer obliged to pay a disability insurance contribution for employees older than 55. When hiring new employees the threshold is 50;
   - In 2001 the Ministry of Social Affairs and Employment set up a temporary Taskforce for Older People and Employment, which ended in 2003. The main goal of this taskforce was to identify and communicate ways to keep older workers in the labour force for a longer period of time.

2. *Collective labour agreements*
   In a growing number of collective agreements arrangements are made for employees who want to continue working after they reach retirement age (Labour Inspectorate, 2002). Other arrangements for older employees in collective agreements relate to:

   - Pre-retirement leave, extra non-working days/holidays for older workers;
   - Extra training leave for older workers;
   - Adjustment of tasks/work load reduction for older employees;
   - Adaptation of working hours for older employees (this pertains to overtime, working on weekends, shift work, and odd hours);
   - Shorter working hours for older employees;
   - Career opportunities/career change demotion (limitation of consequences for the amount of pension benefit received).

3. *Encouraging good practices in personnel management in Dutch companies: The Cum L'Oude (old) Prize*
   To trace good practices with respect to age awareness in personnel management and employment policy, an award was given by the Taskforce for Older People and Employment to the Dutch company with the best performance in this area.
   Goals:

   - To balance the age structure among employees of an enterprise (age diversity management);

[25] VUT = Dutch acronym ' Vervroegde Uittreding' (early retirement)

- To provide older workers with better possibilities to continue their career;
- To enhance labour participation for 45+ workers;
- To stimulate and spread good examples/best practices, raise awareness, feed the debate and public discussion to influence public opinion towards a new mentality.

4. *National fund to improve the employability of elderly workers*
   From 2004 to 2008, the Dutch Ministry of Social Affairs and Employment offered a grant of 21 million euros to industries and companies to stimulate the employability of elderly people. Industries or companies can ask for a sum of up to 40,000 euros to develop projects to enhance the employability of elderly workers. A special Website was established (www.leeftijdophetwerk.nl) to offer information, links, and tools to companies.

7.3.6 Overall evaluation of national approaches

Thus, there is a large variety in national approaches to some of the emerging risks identified in this report. These approaches range from legislative initiatives to social agreements and sectoral initiatives, and although the review presented here does not cover all EU countries, it is clear that in the old member states such as the Netherlands and Germany it is possible to identify more examples of a national approach to these risks than for EU countries in southern Europe and the newer European member states.

Such examples may provide some directions for facilitating national approaches in other regions of the EU, but first several major problems will have to be addressed. In a recent article (Woolfson, C., et al., 2008), the 'employee's voice' in working conditions was explored within the context of an enlarged EU in which most of the new arrivals are post-communist countries. They indicate that one of the cornerstones of the EU's previous occupational health and safety strategy (2002-2006) was to **promote a 'culture of risk prevention'** in the workplace. This goal was to be achieved by relying on 'legislation, the social dialogue, progressive measures and best practices, corporate social responsibility and economic incentives and on building partnerships between all the players on the safety and health scene'. Such an approach is predicated on encouraging a participative working environment in which employees can raise issues of workplace health and safety, including emerging risks, through elected workforce representatives. In this analysis, however, the ongoing problem of social dialogue in the new Member States remains unacknowledged in the current European Commission Strategy on occupational health and safety. Woolfson, et al., conclude that the 'harmonization' and improvements in workplace safety and health are neither certain, nor as positive as is often assumed. Moreover, embracing less formal legislation as a preferred route to health and safety improvements in the workplace at a European-wide level may not be appropriate in the context of the problems of the new member states. They conclude by stating that, ironically, the 'participatory deficit' is much more likely to be addressed by employers conceding a greater voice on a voluntary basis than by trade unions. The main driving force these authors identify is the human resources crisis due to the inability (or unwillingness) of (Baltic) employers to match western standards of pay. By turning to less insoluble working environment issues, employers may be able to counteract personnel leaving the company and ensure future employee retention.

8. Policy options and considerations, suggestions, and recommendations

In the previous chapters of this report a great deal of evidence was presented that there are **12 emerging occupational risks**, and that **four specific target groups** should be additionally considered in this regard (the main recommendations are reviewed in Annex 7). One of the arguments in support of the latter is that several (emerging) risks come together in some of these specific target groups.

The recommendations as presented in the previous chapters are combined and discussed in this final chapter, and are presented here only as policy options, since we believe the European Parliament should take a leading role in deciding what to do at each stage. Some of these options may more explicitly be given the status of policy suggestions or recommendations.

We cluster policy options along the following categories:

1. Broader policies to influence the emergence of the new risks;
2. New legislative arrangements: development, adaptation, and enforcement of legislation;
3. Economic incentives;
4. Research and Development needs;
5. Development and of European and national capabilities;
6. Promoting the integration of emerging risk control on OSH management;
7. Promoting Corporate Social Responsibility with respect to emerging OSH risks.

8.1 Broader policies to influence the emergence of the new risks

Emerging OSH risks do not arise in a vacuum, but are driven by technological, economic, demographic, or other social developments. In a way this 'conclusion' repeats the introduction that elaborates on the drivers of emerging OSH risks. The most proactive policy option for influencing emerging risks is to integrate OSH considerations in policies that influence the technological, economic, demographic, or other social developments mentioned. As an example, the fast development of ICT may have impacts on work organizations and emerging psychosocial risks, and increasing 'physical inactivity' at work. Additionally, the emerging risks mentioned in this report are seldom only OSH risks. Often they go hand in hand with public health risks or environmental risks. They are associated with economic issues within Europe, with differences among EU regions in demands for labour, prices for labour, social security regulations, resulting in a migration of workers - assumed to be partly temporary - within the EU as well as across EU borders, when possible.

Consequentially, the emerging OSH risks within the European workers (or should we say the worker in the EU) should not be one in splendid isolation. Emerging OSH risks should be seen as a broader topic of emerging risks in the related fields of OSH, public health, and environmental protection. As a consequence, policies on public health and environmental protection may envision similar needs to influence the technological, economic, demographic, or other social developments. The consequences of endocrine disruptors and nano technology are typical examples of emerging public health and environmental risks.

The social impacts of the emerging OSH risks additionally include the costs of those risks. In many countries psychosocial risks are an important and rapidly increasing burden for public health and social security costs, but musculoskeletal risks are important as well. They are often secondary (and sometimes even primary) in social costs, depending on the particular country.

The developments associated with emerging OSH risks have great relevance not only for OSH policies, but also for policies on employment, economic development, equal opportunities, innovation and competitiveness, public health, social cohesion, and social security.

8.2 New legislative arrangements

Occupational Safety and Health is already a highly regulated area. The policy questions are: are the existing regulatory requirements sufficient, should they be adapted, or is it mainly a matter of greater compliance and better enforcement?

A general policy dilemma is that more legislative requirements may hinder technological and social innovation. Reluctance in development of new legislative requirements by social partners is therefore expected. It is advisable to deal with discrepancies between partners in a balanced way.

The EU Framework Directive is clearly also relevant for emerging risks. In itself this does not need adaptation. On the topic of EMF there appears to be an urgency for the amendment of the 2004/40/EC on EMF to be put into force.

The major policy challenge appears to be that existing requirements are also implemented and applied to the various emerging risks. This is likely to require extra stimuli to foster compliance, including strengthening enforcement agencies and other professional agencies in their capabilities to do so.

8.3 Economic incentives

An important policy option, in principle, is to develop economic incentives that help the invisible hands of market forces to reduce and control the emerging risks. This would be in accordance with the 'polluter pays principle' (i.e. preventing shifting of consequences).

Tax arrangement could include dedicated charges on relevant items associated with social developments, or liabilities for future health and safety consequences of specific economic activities.

Taxation, however, is mainly a national responsibility. Charges may hinder innovation, and liabilities are generally not stimulating for proactive policies.

The most useful suggestion seems to be (temporary) dedicated charges on some technologies, whereby the yields are earmarked for research on potential negative impacts and the development of alternative technological options to reduce these impacts.

8.4 Research and development programmes

Several paragraphs on emerging risks state that **sufficient knowledge is not yet available** to make reliable risk assessments. In some cases, especially with nano and endocrine disruptors, the issue is even more fundamental, as validated methods for measuring negative impacts are not yet available.

Research may also be needed for solutions to emerging risks. Just measuring and assessing problems is not in itself a guarantee that sufficient knowledge of potential solutions is available. This may require further research.

In the section on economic incentives the option of economic charges for specific developments is mentioned as a potential source to fund dedicated preventive research.

The first option, however, is to integrate explicit attention to emerging OSH risks and their social impacts in existing research and technological development (RTD) programmes, such as the 7th Framework Programme, and earmark significant budgets for such RTD efforts.

8.5 Development of European and national capabilities

Recognizing, assessing, reducing, and controlling emerging risks require new social capabilities that have hardly been needed up to now. These cannot be directly influenced by the European Parliament, but it can stimulate their development in several ways. Specific attention is needed for capabilities in new member states, as these are generally less well developed there.

Important factors in national and European capabilities in this respect are:

- The availability of (validated and) practical methods and tools (including measurement or monitoring of risks);
- The availability of sufficient expertise in relevant sectors of industry, government organizations, and consultancies;
- The availability of capabilities for research and development in universities and other knowledge organizations.

The development of validated and practical methods and tools (including measurement or monitoring of risks) can be stimulated by dedicated RTD efforts.

The availability of sufficient expertise can be encouraged by setting up European networks, and conferences to stimulate exchange of know-how among experts of different member states. It can also be stimulated by dedicated activities for new member states.

The availability of capabilities for research and development in universities and other knowledge organizations can be stimulated by European RTD programmes (including the exchange of researchers) and by scientific conferences and networks.

8.6 Promoting the integration of emerging risk control in OSH management

EU legislation specifies that companies are obliged to systematically manage OSH risks. This is also true for emerging risks. In everyday practice, however, emerging risks are often ignored or neglected in OSH management.

There is also the issue of (lack of) awareness, (lack of) expertise, (lack of) validated instruments, as well as cultural elements: it is difficult to prioritize assessment and management of risks that were never before regarded as relevant for the organization. This is even more true if the risks are intangible, e.g. psychosocial risks, or when health impacts only occur after a long incubation period, or even in future generations (as is the case with endocrine disruptors).

Therefore, it may be very useful to start European and national initiatives to promote integration of emerging risk control in OSH management. The aims should be to promote awareness, develop in-company expertise, expertise in OSH services, validated instruments, and change the culture of ignorance.

8.7 Promoting corporate social responsibility with respect to emerging OSH risks

Companies and other organizations are increasingly adopting the concept of responsible business practices or corporate social responsibility (CSR). This entails integrating social and environmental concerns in business practices, and communicating them to stakeholders on a voluntary basis (European Commission, 2001). It also means taking ethical issues into consideration in business decisions. Safety and health at work is increasingly seen as an important dimension of CSR (Zwetsloot, G. and Starren, A., 2004).

Apart from mandatory requirements, emerging OSH risks certainly constitute an important area for corporate social responsibility. Companies should therefore be encouraged to include this dimension in their responsible strategies, their dialogues with employees or their representatives, and also in dialogues with external stakeholders (e.g. social security agencies, insurers, public health institutions, and government agencies, including labour inspection).

Encouraging emerging risk control as an element of CSR may have the following aims:

- Increased awareness of relevance and social relevance for emerging OSH risks;
- Promotion of best or good practices, e.g. via awards for companies that manage the emerging risks in an efficient way;
- Initiating networks of companies to exchange experiences and good responsible business practices with respect to emerging OSH risks;
- Encouraging non-traditional external stakeholders (e.g. social security agencies, public health institutions, insurers, and perhaps specific patient organizations) to play a role in stimulating responsible business practices with respect to emerging OSH risks (especially with a view to the potential or actual social impacts of these emerging risks);
- Encouraging CSR-practicing companies to include sections on emerging OSH risk control in their external reporting.

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Annex 1 Trends technology use and skills from 1995 to 2005, by country cluster

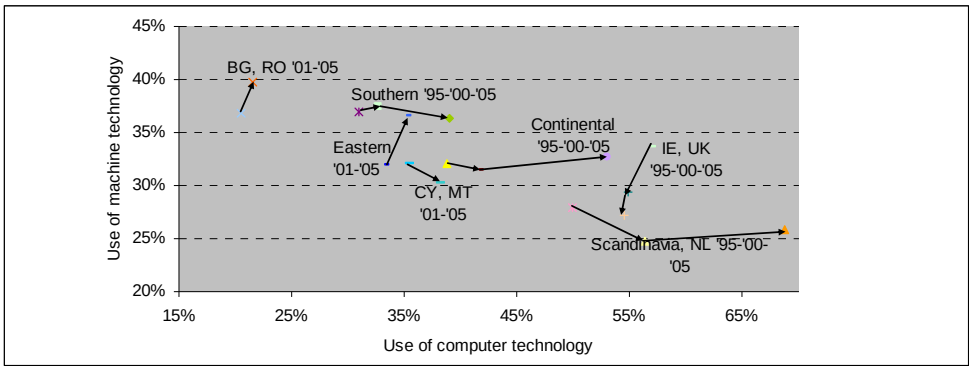


Figure A1.1 Use of technology (computer or machine) in time by country cluster([26])

Source: Joling, C., and Kraan, K., 2008

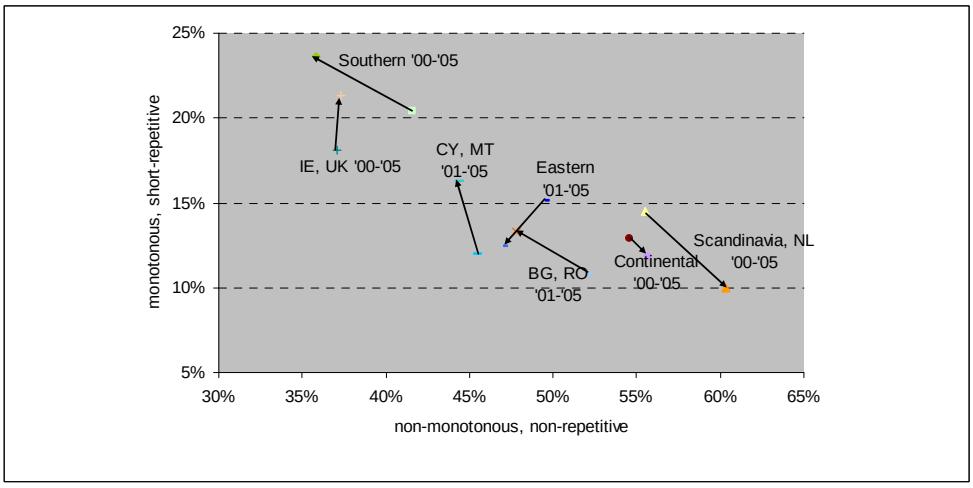
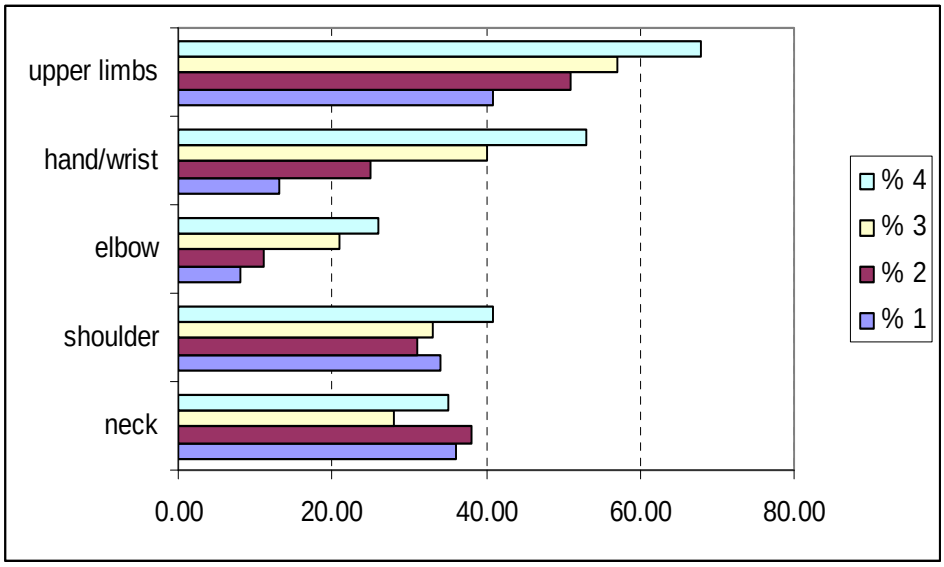


Figure A.1.2 Task monotony versus variety, indicating skill use by country cluster in time

Source: Joling, C., and Kraan, K., 2008

([26]) Continental countries: Austria (AT), Belgium (BE), Germany (DE), France (FR), Luxembourg (LU); Ireland and the United Kingdom: IE, UK; Eastern countries: Czech Republic (CZ), Estonia (EE), Hungary (HU), Lithuania (LT), Latvia (LV), Poland (PL), Slovenia (SI), Slovakia (SK); south-eastern countries: Cyprus (CY), Greece (EL), Malta (MT); southern countries: ES, IT, PT; Scandinavian countries and the Netherlands: Denmark (DK), Finland (FI), Sweden (SE), the Netherlands (NL); acceding countries: Bulgaria (BG), Romania (RO).

Annex 2 Prevalence of complaints and combined exposure (%)



1 low physical, low psychosocial 3 high physical, low psychosocial

2 low physical, high psychosocial 4 high physical, high psychosocial

Source: Devereux, J.J., et. al., 2002

Annex 3 Additional information on allergens

Sample of important allergens present at the workplaces

Allergen	Affected professions (examples)
Nickel and cobalt	Automobile and aircraft industry workers, electroplaters
Chromates	Construction workers, mechanics, tanners, automobile, and textile workers
Methacrylates	Dentists, dental technicians
Formaldehyde	Pathologists, embalmers
Persulphates	Hairdressers
Isocyanates	Manufacturers of chemical foams, plastics, varnishes, and spray paints
Epoxy resin system components	Construction workers, floor layers
Enzymes	Bakers, enzyme and washing powder producers, textile workers
Certain flavours and fragrances	Bakers, confectioners, cooks, caterers, chemists
Food allergens	Cooks, caterers, fruit merchants
Animals/animal products, such as dander, hair, saliva, and excrements (e.g. dust mites, cat, mouse, rat allergens)	Farmers, breeders, animal keepers
Plants/plant products, including wood dust and flour	Farmers, gardeners, florists, lumbermen, carpenters, bakers, millers
Fungi/mould (e.g. *Alternaria*, *Aspergillus*, *Penicillium*, *Cladosporium* species)	Construction workers, (refurbishment), workers in waste processing industries, farmers
Bacteria (e.g. *Saccharopolyspora rectivirgula* or *Thermoactinomyces vulgaris* on hay)	Farmers, compost sorters

Examples of highly specific prevention of allergies

Chromium(VI) has been shown to induce disabling and allergic eczema, especially among construction workers. In the EU, each year hundreds of new cases of invalids occur, with high costs for the occupational insurance systems (Mettler, H., 1999). The substance, however, is only a by-product of clinker burning and not decisive for the expected technical properties of cement. Moreover, it can be ameliorated by adding a reducing agent such as iron salts. Preceded by national initiatives (DGUV, (s.a.)), Directive 2003/53/EC eventually prohibited the supply or use of cement which has a chromium (VI) concentration of more than 2 parts per million.

Corn starch powder on latex gloves acts as a lubricant but is an airborne carrier of natural latex allergens, too. Latex allergy (see photograph) is most frequent in medical staff exposed to latex rubber in gloves, catheters, drip sets, etc., but also occurs in patients who have had numerous operations and surgical procedures. In Germany, there was a nationwide awareness raising campaign from 1997 to 1998 advocating the use of unpowdered latex gloves or appropriate gloves made of another material. These endeavours were accompanied by implementation of a corresponding technical rule. As a result, the number of reported occupational latex allergies in the German healthcare sector dropped by 30%, from 1,262 reported suspected cases in 1998 to 845 in 1999 (figure A4.1). Only four years later, in 2003, not more than 228 cases were reported to the responsible institution for statutory accident insurance and prevention (BG for Health and Welfare Services) (Gurock, P., and Schmengler, J., 1998; BGW, 2004).

Photograph
Located contact urticaria as a result of latex allergy
Source: Gurock, P., and Schmengler, J., 1998

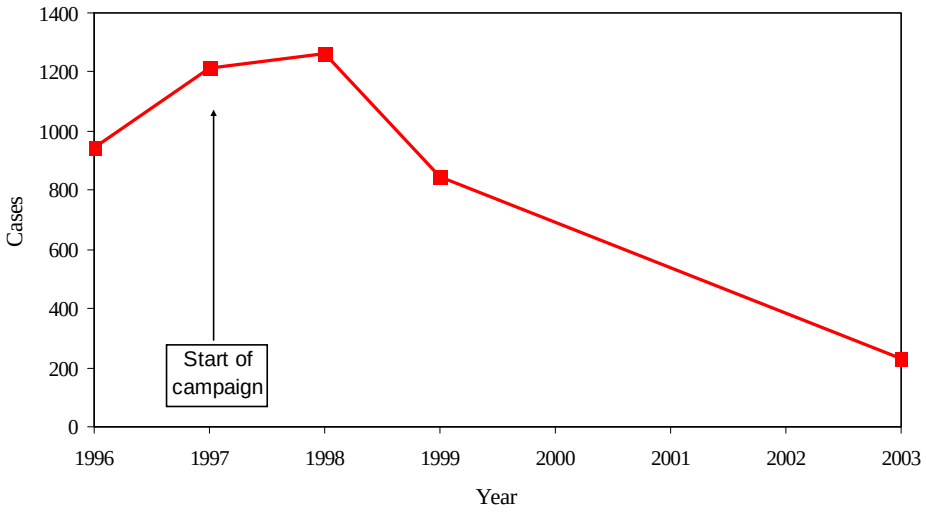


Figure A4.1Confirmed occupational diseases caused by latex allergy in the German healthcare sector

Source: Berufsgenossenschaft für Gesundheitsdienst und Wolfahrtspflege (Institution for Statutory Accident Insurance and Prevention for Health and Welfare Services) (BGW)

In the period from 1986 to 1991, the reported cases of obstructive airway diseases, including allergies, increased fivefold for German hairdressers. This increase was paralleled by a rise in dermal diseases in the same sector. A joint preventive concept (Liese, A., and Berges, M., 2004) of German OSH organizations, social partners, and manufacturers, which was based on a measuring programme using a simulated workplace (Berges, M., and Kleine, H., 2002), led to the introduction of safer cosmetic products (replacement of powdery by pasty formulations) and to a considerable decline of dermal and respiratory allergies in hair salon workers (figure A4.2).

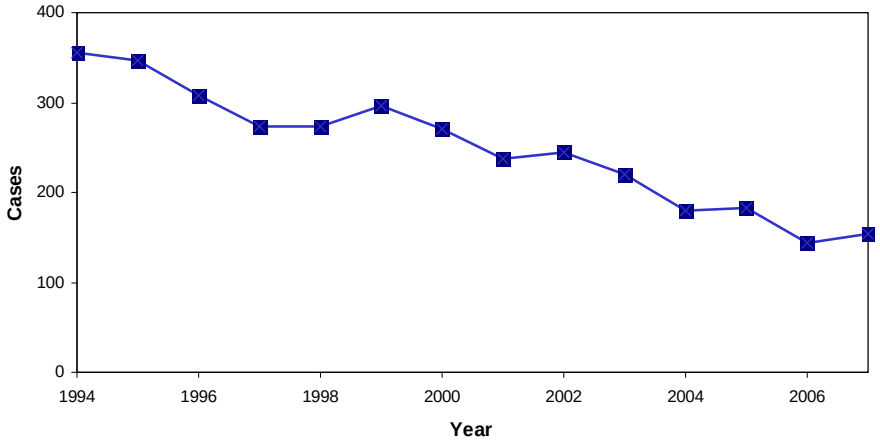


Figure A4.2 Decrease in allergic respiratory diseases (reported suspected cases) among hairdressers in Germany after introducing a preventive concept

Source: Berufsgenossenschaft für Gesundheitsdienst und Wolfahrtspflege (Institution for Statutory Accident Insurance and Prevention for Health and Welfare Services) (BGW)

Most recently, some progress was achieved in the treatment of workers already suffering from an occupational allergy, enabling them to resume their jobs. The German institution for statutory accident insurance and prevention (BG) for the food and catering industry developed a programme for bakers affected by allergy to flour (BGN, 2008). Within this framework the patients are trained to better understand their illness, optimize their medication, combat stress, and minimize flour dust exposure by improving their workplaces and practices. More than 1,400 bakers have undergone the scheme so far, and only very few of them had to give up their profession. A similar programme is offered to the clients of the German BG for health and welfare services, which is geared to skin diseases and especially addresses apprentices, since success is most likely at an early stage of the disorder.

Biohazards leading to allergies as well as to infectious diseases, toxic diseases, and cancers can be found in waste treatment plants, which represent an expanding sector with an increasing number of employees. The risk is related to the presence of organic dust, which contains bacteria, fungi, endotoxins, and microtoxins (Schappler-Scheele, B., et al., 1999). The collection, handling, and treatment of organic wastes, including municipal and medical waste, but especially waste coming from agricultural activities, puts the workers at risk. Particularly workers in areas where bioaerosol concentrations are high such as unloading waste, in service and maintenance activities for machinery, and indoor waste sorting activities are put at risk by biohazards. Although the health outcomes certainly depend on the kind of biological agents used, exposure level, and individual susceptibility of the exposed workers, type III allergy, irritation of the airways, as well as skin diseases and other adverse health effects have especially been observed in industrial, medical, and municipal waste treatment activities (Gladding, T., et al., 2003; Heldal, K.K., and Eduard, W., 2004).

Workers in the agriculture and forestry sector, the textile industry, the sewage, waste and recycling industries, the paper industry, as well as the metal industry and in food production and processing are affected by endotoxins because they are exposed to organic dust (Rylander, R., 1994). The individual susceptibility to endotoxins is known to vary, but in addition to many other negative health effects, the exposure to organic dust and endotoxins is associated with allergies (Song, B.J., and Liu, A.H., 2003).

Annex 4 Example of exploitation of dependent workers

Businesses seek to remain competitive in the globalised economy by avoiding the cost of compliance with employment protection rules, notice periods, and the costs of associated social security contributions. A large road haulage company in Austria, for example, tried to circumvent employment and social security legislation, in order to reduce costs as much as possible in this highly competitive sector. The so-called *'quiet partnership'* model was developed and deployed by this company. In this model the driver as a so-called silent partner acquires a share of the company by signing over his truck as a company property. Since most drivers do not have their own truck, the owner of the road haulage company - through a legally separate firm - offers them rental contracts for trucks. Through this arrangement the truck remains the property and at the disposal of the company, while the truck driver officially becomes an independent entrepreneur, even if he receives the same orders from management as dependent employees do. Moreover, while employees are paid according to hours or distances travelled, silent partners receive a share of the profits, leaving them with the risks, but only a small part of the gains.

Source: Jettinghof, K., et al., 2003.

Annex 5 Epidemics of relevance to OSH

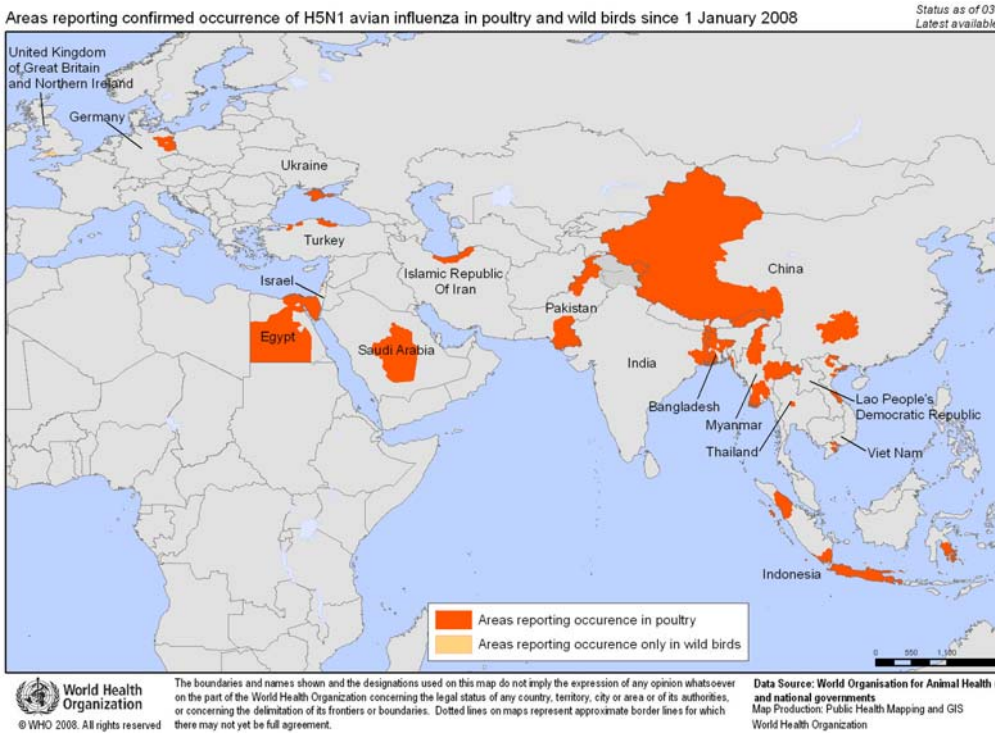


Figure A6.1 Areas reporting confirmed occurrence of H5N1 avian influenza in poultry and wild birds since 1 January 2008

Source: WHO, 2008
http://gamapserver.who.int/mapLibrary/Files/Maps/Global_SubNat_H5N1inAnimalConfirmed_2008_SEMESTER1_20080303.png

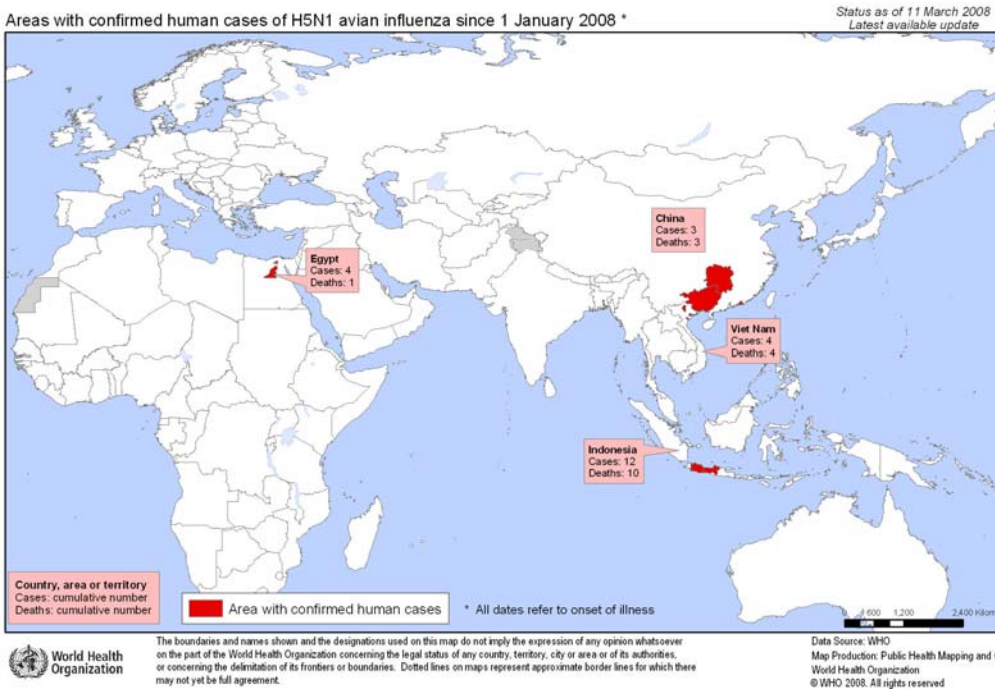


Figure A6.2 Areas with confirmed human cases of H5N1 avian influenza since 1 January 2008

Source: WHO, 2008
http://gamapserver.who.int/mapLibrary/Files/Maps/Global_H5N1Human_2008_FIMS_20080311.png

Table A6.1 Global estimates of epidemics

Global estimates for adults and children, 2007	
People living with HIV	33.2 million [30.6–36.1 million]
New HIV infections in 2007	2.5 million [1.8–4.1 million]
Deaths due to AIDS in 2007	2.1 million [1.9–2.4 million]

The ranges around the estimates in this table define the boundaries within which the actual numbers are found, based on the best available information.

Source: Joint United Nations Programme on HIV/AIDS (UNAIDS) and World Health Organization (WHO), AIDS epidemic update. 2007.

http://data.unaids.org/pub/EPISlides/2007/2007_epiupdate_en.pdf

Table A6.2 Examples of national pandemic plans

Australia

The Department of Industry, Tourism and Resources published 'Being Prepared for an Influenza Pandemic - Business Continuity Guide for Australian Business'.

http://www.innovation.gov.au/Pandemic_Business_Continuity/Documents/BusinessContinuityGuideForAustralianBusinesses20060627130327.pdf

The website also contains recommendations related to influenza pandemics for small and medium businesses.

http://www.innovation.gov.au/Pandemic_Business_Continuity/Documents/PandemicPlanningChecklistForSmallBusiness20060627141916.pdf

Austria

The Ministry of Health, Family and Youth (Bundesministerium für Gesundheit, Familie und Jugend) published the Austrian 'Influenza Pandemic Plan' (Influenza Pandemieplan).

http://www.bmgfj.gv.at/cms/site/attachments/3/6/8/CH0742/CMS1126084167391/pp_englisch.pdf

Canada

The Public Health Agency of Canada published 'The Canadian Pandemic Influenza Plan for the Health Sector'.

http://www.phac-aspc.gc.ca/cpip-pclcpi/index-eng.php

The Association of Canadian Manufacturers & Exporters (CME) developed a continuity planning guide for Canadian business.

http://www.cme-mec.ca/national/template_na.asp?p=22

The Ministry of Health of the Canadian State of British Columbia distributed the 'British Columbia Influenza Pandemic Preparedness Plan - Managing Pandemic Influenza, A Guide for B.C. Industry and Commerce'.

http://www.health.gov.bc.ca/library/publications/year/2006/pandemic_guide.pdf

Germany

The German Robert-Koch-Institut developed the 'National Influenza Pandemic Plan' (Nationaler Influenzapandemieplan).

http://www.rki.de/cln_049/nn_200120/DE/Content/InfAZ/I/Influenza/Influenzapandemieplan.html

New Zealand

The Ministry of Economic Development (MED) of New Zealand distributed a 'Business Continuity Planning Guide'.

http://www.med.govt.nz/upload/27552/planning-guide.pdf

Switzerland

The Swiss Influenza Pandemic Plan (Influenza-Pandemieplan Schweiz) was recently updated by the Swiss Federal Office of Public Health (Bundesamt für Gesundheit).

http://www.bag.admin.ch/influenza/01120/01134/03058/index.html

Further information can be found in a handbook about how to be prepared in businesses with regard to pandemics (Pandemieplan – Handbuch für die betriebliche Vorbereitung) was distributed by the Swiss Federal Office of Public Health (Bundesamt für Gesundheit).

http://www.bag.admin.ch/influenza/01120/01134/03058/04319/index.html?lang=de

USA

The 'Guidelines for State Pandemic Planning' were published by the Department of Health and Human Services of the United States of America.

http://www.pandemicflu.gov/news/guidance031108.pdf

Annex 6 Examples of national approaches and preventive actions

National approach to demographic change (Germany)

Statutory Accident Insurance Institutions

Advisory service

Currently, two guidelines on demographic change are being developed. One guideline addresses SMEs and the health and safety inspectors of the Statutory Accident Insurance Institutions. Another one addresses companies. It will provide practical guidance on how to prevent risks to workers exposed to particular risks, i.e. older people, disabled people, pregnant women, and adolescents.

Training

The German Social Accident Insurance offers a course 'Training to Demographic Consultants', consisting of three seminars which focus on

- health and work ability, ergonomics, and design of the workplace,
- human resource development, work life balance, stress, health risk and health resources, coping strategies, and
- organization of working time, time worked in a lifetime.

Applied research

Model workplaces for older employees have been developed: the basic principle is good design with respect to human engineering and ergonomic criteria. Beyond this, only a small number of special measures are required to adapt workplaces to the needs of older employees. These model workplaces may be used in qualification and in the context of in-plant consultancy.

Networking and information exchange

The German Social Accident Insurance offers several symposia, meetings, and conferences, such as:

- The IGA Congress 'Working healthily, safely, and for longer' is organized annually by the Initiative for Health and Work (IGA). IGA is a co-operation among several Associations of Health Insurance Funds and the German Statutory Accident Insurance;
- The conference 'Product design for all: For young people - For old people?': Can products and work equipment designed for older people also be used by younger people? Or do we need generation specific features?
- The Statutory Social Accident Insurance Institutes organize conferences for their health and safety inspectors as well as for the safety professionals of their insured companies.

Government approaches in Germany

BAuA - Federal Institute for Occupational Safety and Health (Bundesanstalt für Arbeitsschutz und Arbeitsmedizin)

The BAuA created a Germany-wide project called INQA - Initiative for New Quality of Work (Initiative neue Qualität der Arbeit, www.inqa.de). INQA started in 2001 and is a confederation of companies, social partners, social insurance funds, foundations, the federal government and federal states.

- There are several INQA working groups (TIK - Thematischer Initiativkreis) in special subjects. One group is working on topics of demographic change, other deals with lifelong learning. These TIKs develop target group specific characteristics to communicate the advantages of employing older people.
- There is an INQA database with examples of good practice which lists many successful activities and schemes in the area of demographic change by enterprises. So far, 210 examples of good practice have been collected.
- The demographics network (Demographie-Netzwerk - ddn) of INQA is a communication platform created by INQA in which enterprises exchange their experiences, learn from one another how to deal with the changes, and how to cope with the challenges.

Federal Ministry of Education and Research

There are two transfer projects promoted by this Ministry that have URL addresses:

- www.demotrans.de: Approaches of this project are
  - Testing of exemplary solutions on topics of awareness, consultation, and transfer;
  - Balanced age structures and innovation ability of companies;
  - Age-related work and personnel policy;
  - Employment and new fields of occupation for older employees;
  - Solutions to the action fields are transferred by portraying an impartial picture about older employees, increasing job chances for older employees, improving co-operation among different age groups within the company, and devising action options for companies, politics, and associations;
- www.demowerkzeuge.de: in this project 20 practically tested procedures and instruments, as well as 100 examples from companies, are presented as a basis of knowledge and experience about the topic.

Examples of further approaches

The Bertelsmann Stiftung

The Bertelsmann Stiftung is dedicated to serving the common good. Its work is based on the conviction that competition and civic engagement are essential for social progress. The Bertelsmann Stiftung is an exclusively private operating foundation.

Together with the Bertelsmann Stiftung, the German President Horst Köhler has initiated a series of conferences and colloquia to examine the various impacts demographic change has on German society. Thus, the Demographic Change Campaign was launched on 6 December 2005, at a conference that brought together political and social leaders to discuss the complex challenges. In the coming years demographic change and its impacts will be addressed in three focus areas: families, education, and social cohesion.

The Hans Böckler Stiftung

The Hans Böckler Stiftung deals with co-determination, research linked to the world of work and support of students on behalf of the DGB, the Confederation of German Trade Unions. The Böckler Stiftung promotes research activities in the area of demographic change.

Max-Planck-Institute for Demographic Research - MPI (http://www.demogr.mpg.de/)

As a scientific discipline, demography contributes to a deeper understanding of the causes and consequences of demographic change. The MPI analyzes the underlying causes of demographic change, describes contemporary trends, and produces forecasts for the future direction of demographic processes. They also highlight the potential consequences facing society and assist decision-makers in the various political and social institutions by providing them with solid information and expert advice. The German federal government, together with the state governments, each assume half of the funding for the budget of the Max Planck Society.

Example of a stress prevention strategy (United Kingdom)

In the United Kingdom the Health and Safety Executive([27]) (HSE) developed Management Standards for work related stress.([28]) The Management Standards represent a set of conditions that reflect high levels of health, well-being, and organizational performance. They offer organizations continuous improvement through a three-phase stress prevention process/and the development of a supporting 'Indicator Tool' (a two-phase questionnaire to assess employee perceptions of working conditions).

The Management Standards comprise a series of 'states to be achieved', which are statements of good practice in six key stressor areas: demands, control, support, relationships, role, and organizational change. For each stressor area there is also a 'platform statement' which outlines the main aims to be achieved by the organization. To use the new process, an organization's state can first be assessed using the Indicator Tool. Liaising with workers in focus groups enables a further exploration of issues raised. Finally, there may be a formulation of interventions and subsequent review. It is not intended that the standards will be legally enforceable. HSE's aim is for them and their associated methodology to enable organizations to effectively tackle work-related stress, and subsequently reduce both its incidence and prevalence (Counsins, R., et al., 2004).

Example of stress prevention as part of the covenant on work and health in the police sector (The Netherlands)

In the Netherlands the Ministry of Social Affairs and Employment has actively encouraged and subsidized a sectoral approach to risk management. The overall aim has been to achieve a reduction in exposure to sector-specific psychosocial and physical risks of about 10% over a period of approximately three years.

Police sector study

In 1999 the police sector commissioned a sector-wide study on work stress. Particular psychosocial risk factors and risk groups were identified. In consecutive collective agreements, it was agreed to set up a Safety and Health Covenant on work-related stress, using this first study as a baseline. The follow-up study was completed and presented to the sector in summer 2005. In 1999 a random sample of about 10,000 police officers was chosen, and in October 2004 a further random sample of 5,000 police officers was identified. Response rates were 53% and 51%, respectively.

([27]) Single national regulatory body responsible for promoting the cause of better health and safety at work in the UK.

([28]) http://www.hse.gov.uk/stress/standards/index.htm.

Psychosocial risk profile

Figure A7.1 illustrates the psychosocial police risk profile in 1999 and in 2004. It shows that the main psychosocial risks had decreased, except for decision authority and the fit between work and work experience. Despite this reduction in many of the psychosocial risks, the general pattern remained the same. Compared with the average employee in the Netherlands, police officers have greater psychological demands, less autonomy, and greater problems regarding feedback, emotional workload, and in their relations with colleagues and superiors. In addition, more unfavourable than average ratings were found for the match between experience obtained and needed at work, intention to leave, and job satisfaction.

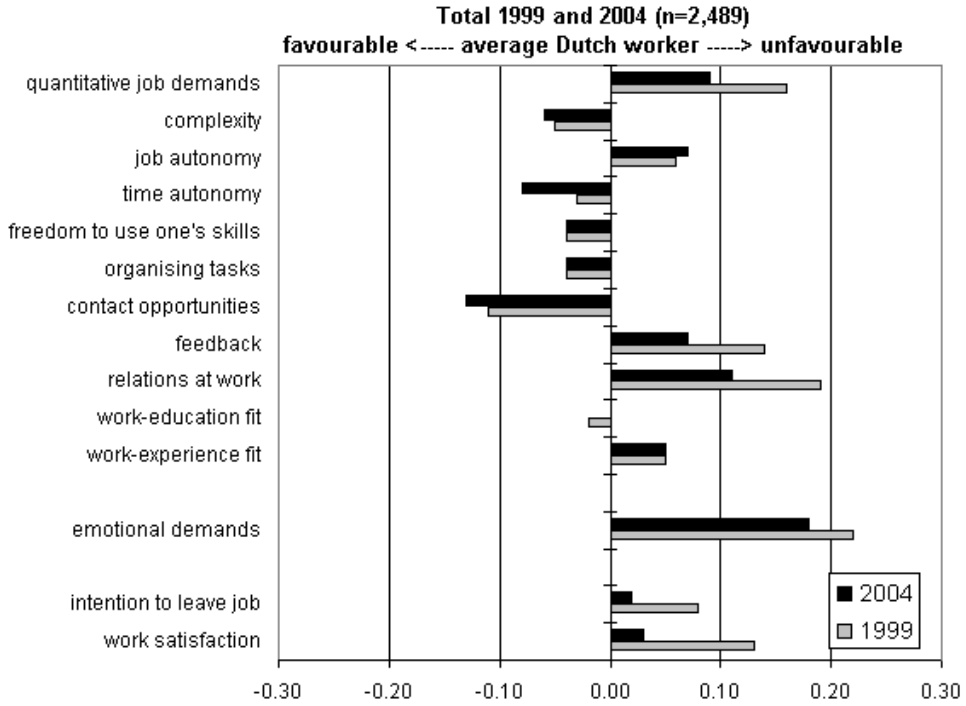


Figure A7.1Risk profile of general psychosocial risks, policing sector, 1999 and 2004

Managing risks and work-related stress

Table A7.1 shows the proportion of police men and women stating that risk reduction measures were offered to them at their workplace, and the effectiveness they attributed to the measures taken.

Measures to manage work-related stress were offered as frequently as more general health promotional (lifestyle) activities, and somewhat less frequently than (general) sickness absence measures and measures directed at a return to work. The police officers rated the work-related stress measures as less effective than the two other measures, however.

Measures aimed at managing aggression and violence were not widely available but, when offered, they were rated as effective relatively often. It appears that these measures were offered to a very specific group of police personnel, which explains why a high percentage of police did not report the measures offered to them.

Measures regarding repetitive strain injuries and capacity management were reported even less often, and were rated as effective by an even smaller group. In general, significant differences were found among the various police departments regarding the effectiveness of the measures.

Table A7.1 Measures taken and their effectiveness, as rated by police officers

Measures directed at	Offered (%)	Rated as effective (%)
Sickness absence and return to work	51	59
Work-related stress	41	40
Health promotion (lifestyle)	41	62
Aggression and violence	30	62
Repetitive strain injuries (RSI)	24	46
Capacity management (reducing irregular work)	19	32

Figure A7.2 illustrates an example of the relation between preventive measures and risk reduction. It shows that police officers who reported that measures combating work-related stress were taken or offered to them in the period from 1999 to 2004 had equal problem levels with job autonomy in 1999 but fewer problems in 2004 than the group that claimed that none of these measures had been taken.

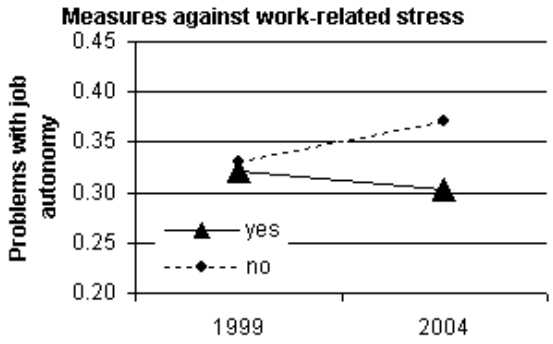


Figure A7.2 Work-related stress measures, in relation to autonomy

Favourable changes with respect to work-related stress measures, as shown in figure A7.2, were also found for time-related autonomy, freedom to use one's skills, problems in organizing work, and in feedback, emotional workload, and contacts with colleagues and supervisor.

Conclusion

The study concludes that the psychosocial risk profile of police in 2004 was comparable to that in 1999, although a significant reduction of over 10% was found in the most significant risk factors. Many measures were taken to manage work-related stress, such as courses, individual training and coaching activities, as well as organizational changes to increase individual control. Some of the employees experiencing these measures rated them as effective, although significant differences were found among police departments and among occupational groups.

Despite the restrictions of the study design, it is plausible that the measures taken were related to the reduction in risks observed. Nonetheless, 80% of the employees believed that measures to manage work-related stress could have been, and can be, more effective.

Key points of the VASt programme, an approach to manage the increase in allergies in the Netherlands

- Placing responsibility where it belongs, i.e. with the business community. The government develops the right conditions and encourages efforts made by the business community, with particular support for small and medium sized enterprises.
- Emphasizing chain responsibility: a knowledge infrastructure tailored to a particular industry, along with effective communication of information and risks about substances down the chain from producer to end user.

- Integrated approach to employee, environmental, and consumer protection in the area of dangerous substances.
- Targeted source measures and maximum restriction on the use of carcinogenic, mutagenic, allergenic, and toxic substances.
- Better quality substance policies in the companies.

For example, the bakery sector performed a VASt project on baker's asthma, supported by both employers and employees. It resulted in better insight on the exposures to wheat, one of the sources of baker's asthma. Better working procedures, housekeeping measures, and preventive equipment were also introduced in this sector.

Example of how research on nanoparticles is organized in The Netherlands

In the Netherlands the Ministry of Social Affairs and Employment started a project in which experts in occupational hygiene, toxicology, and researchers on nanotechnology explore the hazards and risks and describe good practices. The results of the nano project are expected in mid 2008.

Annex 7 Overview of the main recommendations in Chapters 2 to 6

Emerging risk	Special legislation needed	Enforce-ment	More data needed	Info on impact needed	Stimulating social dialogue	Awareness raising	Development of measurement tools	Good practices	Guidelines for development
Physical inactivity				More knowledge needed on recovery time effects. More knowledge needed on health effects of promoting health activity at work.		Perform cost-benefit studies on promoting health activity at work.	Develop objective methods for assessing amount of physical (in)activity.	Develop new interventions and effective intervention strategies.	Yes, see § 3.1. There are directives, but duration of breaks not specified.
Multiple risk factors			Establish environmental health monitoring systems that provide for the systematic collection, integration, analysis, interpretation, and dissemination of information about environmental risk factors, including sources, exposures, doses, and potentially related health effects.	Prospective research needed, (among other things) to study effects of an increased combination of risks from outsourcing and subcontracting. This knowledge should be used to develop computer models to simulate longitudinal exposure (and effects of interventions).			Risk assessment tools are mostly one dimensional, but they should consider interactions. The scope is not generally on risk interaction. More tools should be available to check on joint effects and their impact. These tools should include non occupational exposure as well.		
Job insecurity	Stimulate MS to introduce legislative				Implement policies which require employers to provide	Disseminate knowledge about planned reorganization		Support the development of good practices, particularly in	

Emerging risk	Special legislation needed	Enforce-ment	More data needed	Info on impact needed	Stimulating social dialogue	Awareness raising	Development of measurement tools	Good practices	Guidelines for development
	measures to safeguard the legal status of economicall y dependent workers and vulnerable self-employed workers.				workers under fixed-term con-tracts and in temporary (agency) work with instructions and training on how to carry out their work in a safe way before they start working, as well as at regular intervals. Give workers with temporary contracts access to training and other secondary employment conditions. Social partners at the sectoral level can show the benefits to employers.	and health outcomes to minimize unfavourable outcomes.		NAMES.	
Work intensification	Amendment to existing directives to limit working hours and their dereg-ulation (PT).			Effectiveness of interventions, particularly at an organizational level, aiming also to increase awareness.	Promote stronger commitment from public health, em-ployers, and politicians fpr understanding and preventing	Perform cost-benefit studies on promoting health activity at work.	Develop training programmes re-lated to use of ICT, handling of increasing amounts of in-formation, client contacts etc.	Create, promote, and disseminate more examples of interventions * featuring re-structuring of changes indicating increased job	

Emerging risk	Special legislation needed	Enforce-ment	More data needed	Info on impact needed	Stimulating social dialogue	Awareness raising	Development of measurement tools	Good practices	Guidelines for development
					safety and health risks induced by intensification and increased demands at work.			demands * directed at organizational intervention (e.g. Fatigue Management Systems' * are situated in or representative for new member states (included after 2004)	
Violence and harassment	Harmonizati on of the different national regulations and compe-tences in this area is a major chal-lenge.								
Work-life balance	Establish a European-wide policy for a baseline of high-quality, affordable, flexible childcare through legislation?		More survey studies needed, particularly directed at binding and impacting factors.	More data about impact needed on the impact on work-life (im)-balance, as well as on the effects of interventions/ measures taken by the or-ganization/ country to support work-life balance.	Establish European-wide policy for baseline of high-quality affordable, flexible childcare and elderly care through SD?	Awareness raising of primary impact; since it must be the parties in power who need to understand that they should include a long-term focus on the viability of the organization, countries, or or-			

Emerging risk	Special legislation needed	Enforce-ment	More data needed	Info on impact needed	Stimulating social dialogue	Awareness raising	Development of measurement tools	Good practices	Guidelines for development
						ganizational eco-nomics, which means that the workers should be motivated and committed to their work and organization. The latter should also help the organization or country to raise the next generations of workers and respect the previous genera-tion of workers.			
Nanoparticles			Data on exposure impact, risks, and effectiveness of measures, dermal risks, dose-effect relationships.	Yes			Development of strategies for estimating exposure and measure-ment tools for personal exposure.	Good practices should be defined and quantified for relevant exposure measures. Specific exposure matrices should be developed, enabling proper risk assessment.	
Endocrine disruptors			Identify new chemicals and target groups at risk.	Monitoring of trends and effects.			Database devel-opment. Development of measurement		

Emerging risk	Special legislation needed	Enforce-ment	More data needed	Info on impact needed	Stimulating social dialogue	Awareness raising	Development of measurement tools	Good practices	Guidelines for development
							tools for assessing dose-response relationships. Development of more sensitive bio markers.		
Increase in allergies	Reducing the number of test animals		Proper statistics to measure the incidence and characteristics of affected workers. Alternatives for test animals. Data about ranking sensitizing effects of agents.	Yes		Job training about handling substances	Methods for pro-spective identification of the allergic potential of chemicals. Development of tools for quantitative risk assessment	Identify young people with extreme allergies at an early stage. Guidance for ill persons.	

Emerging risk	Special legislation needed	Enforce-ment	More data needed	Info on impact needed	Stimulating social dialogue	Awareness raising	Development of measurement tools	Good practices	Guidelines for development
Global epidemics	Amendment of Directive 2000/54: Scope and classifica-tion of organisms.		A review of past events may help identify key trends and reveal guidance for the future		Cooperation, in-formation sharing, and management of risks among: public health, occupational safety, and environmental protection authorities, as well as among local, regional, national, and international authorities involving several disci-plines. Organizations such as WHO and ILO, as well as European level and na-tional govern-ments and (inter-national) profes-sional bodies need to stimulate and organize this co-operation, information sharing, and management.	Promote imple-mentation of Directive 2000/54.	A systematic method for monitoring changes in risk factors and in conditions associated with outbreaks may also help to in-crease alertness.		Guidelines for risk classification of biological agents. Adoption of existing classification. Amendment of harmo-nized arrange ments for risk assessment of activities where the exposure to biological agents is unintentional.

Emerging risk	Special legislation needed	Enforce-ment	More data needed	Info on impact needed	Stimulating social dialogue	Awareness raising	Development of measurement tools	Good practices	Guidelines for development
EMF	Amendment of Directive 2004/40/ EC on EMF so that it enters into force in 2012 without further delay.	Risk as-sessment for exposed workers and labelling of EMF sources.	On the number of exposed workers among jobs and countries	On health hazards related to increased level of exposure of workers to EMF, with attention to many years of exposure duration.	On work practices causing EMF risk reduction.	Effects of exposure to radiation from wireless systems used inside buildings (e.g. WiFi).	Personal monitors of EMF exposure of workers. Standardized nu-merical phantoms and software for assessing effects of exposure.	On EMF risk assessment and reduction	On practical implementa-tion of amendment EMF Directive. On design of new electrical devices and reduction of EMF risk.
Sustainable energy resources			More data about safety risks. Additional studies about the effects of compounds emerging from the production of biodiesel. Attention to new technologies and the extent of implementation.						Some guidelines have already been published, e.g. for manufac-turing chemicals related to the production of biodiesel* , and for the use of hydrogen fuel in vehicles**.

* http://www.ifc.org/ifcext/enviro.nsf/AttachmentsByTitle/gui_EHSGuidelines2007_OleochemicalsMfg/$FILE/Final+-+Oleochemicals+Manufacturing.pdf

** http://www.fmcsa.dot.gov/facts-research/research-technology/report/Guidelines-H2-Fuel-in-CMVs-Nov2007.pdf

Annex 8 List of abbreviations

ASTM	American Association for Testing and Materials
BMAS	Bundesministerium für Arbeit und Soziales (German ministry)
BSI	British Standards Institution
CEEP	European Centre of Enterprises with Public Participation and of Enterprises of General Economic Interest
EC	European Commission
EDC	Endocrine Disruptor Chemical
EFILW	European Foundation for the Improvement of Living and Working Conditions (Eurofound)
EIRO	European Industrial Relations Observatory (Eurofound)
EMCC	European Monitoring Centre on Change (Eurofound)
EMF	Electromagnetic Fields
EPI-DERM	A scheme for surveillance of occupational skin disease by dermatologists
ETUC	European Trade Union Confederation
EU-OSHA	European Agency for Safety and Health at Work (the Bilbao Agency)
EWCO	European Working Conditions Observatory
EWCS	European Working Conditions Survey
GP	General Practitioner
HSE	Health and Safety Executive
IARC	International Association for Research on Cancer
ICT	Information and Communication Technologies
ILO	International Labour Office
ICNIRP	International Commission on Non-Ionizing Radiation Protection
INQA	Initiative Neue Qualität der Arbeit
ISO	International Organization for Standardization
IT	Information Technology
MD	Metal Detectors
MRI	Magnetic Resonance Imaging
MS	Member State(s)
MSDs	MusculoSkeletal Disorders
OECD	Organization for Economic Co-operation and Development
OHP	Occupational Health Physician
OSH	Occupational Safety and Health
PPE	Personal Protective Equipment

PTSS	Post-traumatic Stress Syndrome
REACH	Registration, Evaluation, Authorization and Restriction of Chemicals
RFID	Radio Frequency Identification
RTD	research and technological development
RTW	Return To Work
SARS	Severe Acute Respiratory Syndrome
SCENIHR	Scientific Committee on Emerging and Newly Identified Health Risks (DG Health and Consumer Protection)
Sens-it-iv	Research programme for the development of alternatives to animal models
SMEs	Small and Medium Sized Enterprises
SWORD	Surveillance of Work-related and Occupational Respiratory Disease
UEAPME	European Association of Craft Small and Medium-sized Enterprises
UK	United Kingdom
UV-radiation	Ultra Violet Radiation
VDU	Visual Display Unit
WHO	World Health Organization