

## The global and European work environment – numbers, trends, and strategies

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**Objective** This paper reviews the present indicators, trends, and recent strategies to tackle major global and European problems in safety and health at work.

**Methods** We reviewed employment figures, mortality rates, occupational burden of disease and injuries, reported accidents, surveys on self-reported occupational illnesses and injuries, attributable fractions, and the most recent information on the problems from published papers, documents, and electronic data sources of international organizations, European institutions/agencies, and public websites. We identified and analyzed programs and strategies to reduce the work-related negative outcomes at various levels.

**Results** Work-related illnesses that have a long latency period and are linked to ageing are clearly on the increase, while the number of occupational accidents has gone down in industrialized countries thanks to prevention and structural changes. We have estimated that globally there are 2.3 million deaths annually for reasons attributed to work. We refer to prevention methods as a “toolbox” and categorize the following as “individual tools”: legislation and enforcement, information on the existing state of problems and capacities (profile), knowledge of solutions and good practices, communication and promotion to increase awareness, and collaboration and networking for exchange of good practice. Global, regional, national, and sectoral strategies and systems cover these issues, reflecting their respective priorities.

**Conclusion** In the present political situation and serious economic downturn, legal measures need to be supplemented with economic justification and convincing arguments to reduce corner-cutting and avoid long-term disabilities, premature retirement, and corporate closures due to a poor work environment.

**Key terms** indicator; management system; mortality estimate; occupational safety and health; OSH; policy; program; work-related accident; work-related disease.

Globally, 2.3 million deaths are attributed to work. Most of these correspond to diseases (1.95 million), while accidents are a specific problem for those regions dominant in manufacturing. In Europe, we have estimated that there are 167 000 work-related fatalities of which 159 500 are caused by disease. The average rate of disability and absence from work can be some 25% of the workforce in Europe (1, 2). There are numerous players in the field of occupational safety and health (OSH). In addition to the competent OSH authorities, governmental and other institutions, the social partners, various OSH networks and professional organizations as well as international organizations [eg, the International Labour Organization (ILO)

([www.ilo.org/public/english/protection/euportal/en/](http://www.ilo.org/public/english/protection/euportal/en/)) and the World Health Organization (WHO) ([www.who.int/occupational\\_health/en/](http://www.who.int/occupational_health/en/))] contribute to the achievement of modern, effective, and efficient occupational health and safety. In Europe, the European Union (EU) and affiliated European Free Trade Area (EFTA)/European Economic Area (EEA), candidate and pre-accession countries have established close collaboration structures and strategies (<http://osha.europa.eu/en/organisations>). These organizations have implemented a wide range of policies, strategies, programs, profiles, infrastructures, and systems to support enterprise-level action to reduce accidents, ill-health, absenteeism, and premature retirement due to poor working conditions.

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## Materials and methods

### Occupational accidents

We obtained the latest global and European quantitative indicators on occupational accidents from the European statistics office (Eurostat) and ILO reports provided by national governments; however, data is not available for the entire workforce in most countries. Using average and proxy figures, we calculated accident frequencies for WHO regions in the three different economic sectors: primary (agriculture, fishing), secondary (manufacturing and construction sectors), and tertiary (services, government, transport). These calculations were used to estimate the number of fatal accidents in individual countries; we obtained the complete workforce data and the number of workers from the ILO and other employment sources in the sectors concerned (3).

### Work-related diseases

The causes of work-related diseases are complex (4). In some cases, a work-related factor may be the only cause of the disease, but it is much more common for work-related aspects to increase the risk of disease together with other factors. In addition, work-related factors often aggravate an already existing disease. Although the ILO recently established a new list of occupational diseases (5), the definition and recording of such diseases depends on administrative decisions in each member state of the EU. It also appears that the EU countries most often reporting occupational diseases are those with the best systems of protection, including the recording and compensation of such diseases. "Work-related disease" covers a broader range of diseases than "occupational disease", encompassing all diseases where work is a contributory cause. For example, there could be ten cases of diseases, for which a work-related factor is estimated to have contributed a 30% increase in risk in each case; the remaining 70% would then be the result of causes unrelated to work. Epidemiologically, ten cases of a disease, each with a 30% contribution from a harmful occupational exposure, would be the equivalent of three cases of the same disease that could have been prevented by avoiding the harmful occupational exposure. However, identifying these three cases would not be easy. According to the applicable compensation system, either nobody (as is usually the situation), some, or all ten cases could be recognized as an occupational disease. One way to identify the prevalence of these diseases is to carry out labor force surveys that are designed to get information about self-reported diseases (and injuries). When these surveys are done effectively, and the population surveyed is aware of the possible causes of work-related diseases, they can provide a good estimate of the magnitude of the problem.

We used the disease- or disorder-based attributable fraction (AF) method to obtain the numbers of work-related diseases in this paper. The AF is a percentage of those negative outcomes of problems (mortality in this case) that can be attributed to work. AF calculations have been performed only in a few countries based on detailed information on exposure estimates, the number of workers exposed to each hazard or factor, and the scientifically demonstrated risk rates for the exposure of each factor. Although exposure conditions vary by country, we have used the exposure details and adjusted attributable fractions for various WHO regions. Calculating the fraction percentage from the total mortality (data from the WHO) caused by the problem, we obtained the number of fatalities caused by each disease or disorder (6).

### Attributable fractions

The most important AF values are as follows: (i) work-related cancer AF=8.4% (13.8% male, 2.2% female) of all cancer deaths; (ii) asbestos: lung cancer and mesothelioma AF=15% (Australia) and 12.2% (Finland); (iii) external tobacco (passive) smoke, lung cancer and circulatory diseases, AF lung cancer = 2.0–4.0%; (iv) circulatory system diseases AF=12.4% (14.4% male, 6.7% female); (v) respiratory system diseases AF=4.1% (6.8% male, 1.1% female); and (vi) communicable diseases AF=8.8% (4.8% male, 32.5% female, the latter being high due to the health sector occupational infections).

Our study largely used the attributable fraction values calculated by Nurminen & Karjalainen (7). We compared the method of calculation, reliability of outcome, and validity in extrapolating the values to global conditions with the findings of other studies that have estimated the global burden and been identified as the most reliable of the existing estimates (8).

While work-related mortality is a key indicator of the magnitude and trends of problems, it does not cover all issues properly. Another significant factor is the loss of working capacity caused, for example, by musculoskeletal disorders or psychosocial factors at work. These seldom lead to fatal outcomes, however, the economic loss can be massive due to usually long absences from work and permanent disabilities. Recent country statistics have indicated that some 10% of the workforce may be placed on permanent disability pension and that, in many countries, the average retirement age is around 57 years rather than the expected 65 or more years (2). This early retirement causes the loss of another 7–10% of the workforce. The sickness absenteeism rate is usually around 5% of those employed. As a result some 22–25% of the potential workforce is out of work and usually most of the compensation and premature pension entitlements are paid by society. The factors leading to this situation need to be better identified.

## Results

A summary of the global number of fatal occupational accidents and diseases is presented in table 1. The numbers seem to be gradually increasing due to the application of more accurate methods in their calculation and the gradual shift from diseases, which have been less work-related in the past, to those that have a higher work-relatedness (ie, higher attributable fractions due to work).

The figures of the European region in table 2 focus mostly on work-related diseases. However, the total impact of the occupational burden of disease, in terms of lost years of life, is lower for diseases than for accidents for each individual case. This is caused by the fact that fatal accident victims, on average, are relatively young while work-related diseases, such as those related to cancer and circulatory diseases, kill workers at an advanced age.

Figure 1 lists causes of death in different age groups in 25 member states of the EU (EU-25). It illustrates the different risks prevalent at each age group: accidents for young people, cancer, and circulatory diseases for the ageing. The AF for work-related reasons is present in each group.

## Non-fatal risks and negative outcomes

British (9) and Finnish (10) surveys on self-reported work-related illness concluded that 4.5% of those ever employed, 6.8% of the economically active population in the UK (2.0 million of 29 million workers), and 8.3% of those employed in Finland reported annually one or more work-related illnesses that caused absence from work. If conditions in the wider regions were comparable to those in the UK and Finland, every year 15.4–18.7 million workers in the EU's 27 member state countries (EU-27), and 198–242 million globally, would suffer from work-related illness. The biggest causes of work-related illness in Europe are musculoskeletal diseases and psychosocial disorders (mental health); it is likely that communicable diseases would have much higher prevalence in the tropical countries of the world.

## Fatalities and other outcomes of injuries and illnesses

Injuries caused by work-related accidents lead to fatalities only when a number of contributing factors co-exist simultaneously. Fatal accidents are just the tip of the iceberg (figure 2). Depending on the type of job, some 500–2000 less serious injuries take place for each

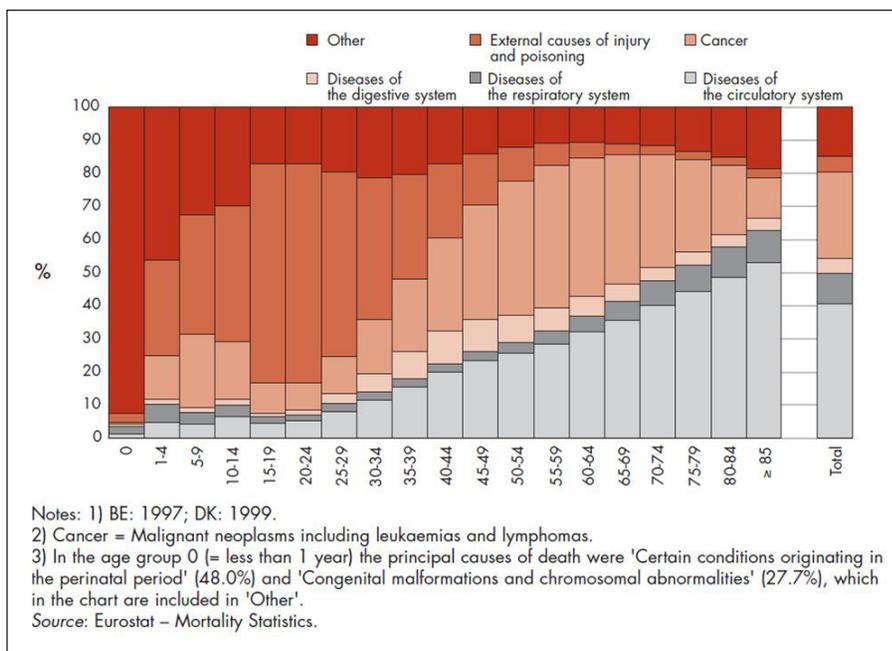
**Table 1.** Global estimates of deaths attributed to work. (ILO = International Labour Organisation; EU-27 = European Union 27 member states)

World Bank region	Economically active population	Total employment	Gross domestic product US\$ in millions 2003	Fatal accidents reported to the ILO (2003)	Accidents causing at least 3 days' absence, reported to the ILO (2003)	ILO estimate fatal accidents 2003	Accidents causing at least 4 days' absence average 2003	ILO estimate fatal work-related diseases	ILO estimate work-related mortality	Deaths caused by dangerous substances
Established market economies	427 681 309	399 268 332	27 862 540	11 210	4 437 294	15 159	14 252 505	269 989	285 148	90 400
Former socialist European economies	193 354 716	151 233 508	1 193 245	2 111	294 440	14 519	13 650 601	170 166	184 685	56 976
China	740 792 400	740 821 700	1 581 075	180	45 944	97 542	91 706 292	334 138	431 680	111 879
India	473 300 000	..	576 119	179	758	46 928	44 120 055	355 863	402 791	119 153
Other Asia & Islands	457 166 678	285 483 688	1 526 515	1 247	96 039	80 567	75 746 706	269 541	350 107	90 250
Sub-Saharan Africa	273 414 298	23 519 156	426 532	15	3 523	57 771	54 314 626	364 551	422 322	122 062
Latin America & Caribbean	222 632 385	190 359 084	1 807 414	2 196	743 282	31 165	29 300 625	107 180	138 345	35 887
Middle East	128 010 251	71 315 475	1 194 265	929	136 263	14 296	13 441 062	73 687	87 984	24 673
World total	2 916 352 037	1 862 000 943	36 167 705	18 067	5 757 543	357 948	336 532 471	1 945 115	2 303 063	651 279
EU-27	225 328 524	205 431 242	11 107 690	4 422	2 672 422	7 460	7 013 545	159 485	166 945	73 989
Eurostat 2006 <sup>a</sup>						5 720				

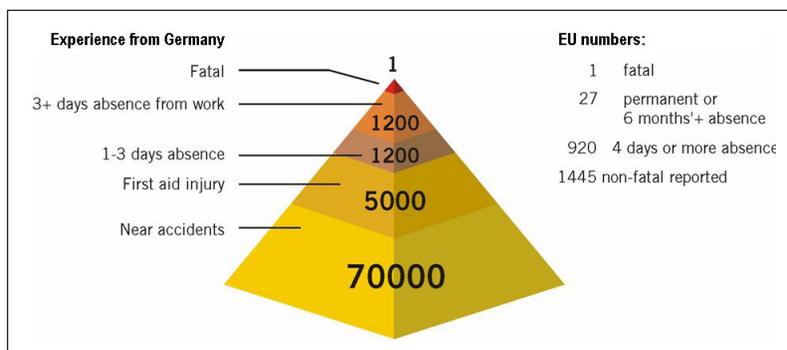
<sup>a</sup> Covering 87% of workforce (Antti Karjalainen/Eurostat, personal communication, 20 May 2008).

**Table 2.** European estimates of deaths attributed to work [EU's 27 member state countries (EU-27), European Free Trade Area/ European Economic Area, candidate and pre-accession countries]

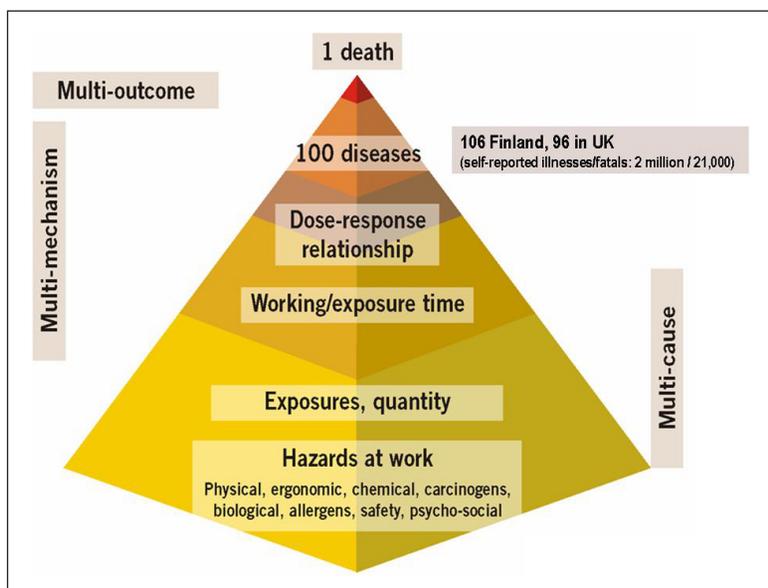
Country	Economically active population	Total employment	Gross domestic product GDP (US\$ in millions 2003)	Gross national income (GNI) (US\$ in millions 2003)	Fatal accidents re-reported to the ILO (2003)	Accidents causing at least 3 days' absence, reported to the ILO (2003)	Fatal accidents (2003, ILO)	Accidents causing at least 4 days' absence: average (2003)	Fatal work-related diseases	Work-related mortality	Deaths caused by dangerous substances
Albania	1 347 281	926 000	5 720	5 517	..	..	91	85 375	823	914	276
Austria	3 967 300	3 798 400	253 265	215 372	103	..	227	213 419	2 820	3 047	1 318
Belgium	4 070 353	4 070 400	304 910	267 227	..	..	84	78 974	2 893	2 977	1 353
Bosnia and Herzegovina	1 026 000	..	7 088	6 386	..	..	128	120 017	627	755	210
Bulgaria	3 283 200	2 834 000	19 893	16 639	114	4 762	288	270 674	2 006	2 294	898
Croatia	1 793 296	1 536 400	28 812	23 839	47	22 995	58	54 352	1 275	1 332	427
Cyprus	341 100	327 100	13 172	..	8	2 078	10	9 251	242	252	113
Czech Republic	5 132 500	4 733 000	90 423	68 711	199	83 019	245	230 128	3 648	3 893	1 706
Denmark	2 850 018	2 692 500	212 360	181 825	..	..	51	47 949	2 026	2 077	947
Estonia	660 500	594 300	9 077	6 699	31	3 199	38	35 849	683	721	309
Finland	2 620 000	2 385 000	162 089	140 755	43	56 268	49	46 068	1 862	1 911	871
France	27 125 000	24 630 900	1 762 623	1 523 025	661	721 227	782	735 214	19 279	20 061	9 014
Germany	40 195 000	36 172 000	2 406 627	2 084 631	..	..	901	847 094	28 568	29 469	13 358
Greece	4 506 899	4 103 900	173 550	146 563	..	..	68	63 932	3 203	3 271	1 498
Hungary	4 166 400	3 921 900	82 781	64 028	133	25 612	164	153 804	4 507	4 670	1 950
Iceland	162 000	156 700	10 580	8 813	4	1 304	5	4 626	115	120	39
Ireland	1 875 500	1 836 000	152 420	106 417	65	20 900	80	75 167	1 333	1 413	623
Italy	23 900 000	22 133 000	1 471 123	1 242 978	916	545 446	991	931 709	16 987	17 978	7 943
Latvia	1 125 900	1 006 900	11 063	9 441	41	1 322	50	47 413	1 157	1 207	527
Liechtenstein	29 000	..	1 378	..	..	..	..	..	21	21	7
Lithuania	1 641 900	1 438 000	18 397	15 509	117	2 595	144	135 301	1 652	1 796	769
Luxembourg	195 144	293 400	27 090	19 683	16	19 368	7	6 581	139	146	65
Macedonia	860 976	545 108	4 643	4 058	..	..	60	55 951	526	586	176
Malta	159 638	147 042	4 768	..	12	4 746	15	13 877	113	128	53
Netherlands	8 370 000	7 935 000	513 708	426 641	..	..	104	97 778	5 949	6 053	2 782
Norway	2 373 000	2 269 000	220 796	197 658	49	23 767	60	56 665	1 687	1 747	565
Poland	16 948 000	13 617 000	209 540	201 389	515	80 307	633	595 557	10 357	10 990	4 637
Portugal	5 469 997	5 127 700	146 903	123 664	..	..	346	325 299	3 888	4 234	1 818
Romania	9 914 263	9 222 500	57 329	51 194	418	5 552	1 016	955 493	6 059	7 075	2 712
Serbia and Montenegro	3 900 000	..	20 698	15 512	..	..	..	..	2 383	2 383	798
Slovakia	2 629 000	2 164 600	32 665	26 483	94	17 349	116	108 704	1 607	1 722	719
Slovenia	958 000	896 000	27 791	23 230	40	41 295	49	46 257	681	730	318
Spain	19 538 100	17 295 900	842 188	698 208	722	872 610	722	678 803	13 887	14 609	6 493
Sweden	4 450 000	4 234 000	302 255	258 319	..	..	56	52 650	3 163	3 219	1 479
Switzerland	4 133 063	4 167 000	322 026	292 892	46	85 059	57	53 195	2 938	2 994	984
Turkey	23 641 000	21 147 000	239 822	197 220	..	..	2 099	1 973 423	14 447	16 546	4 837
United Kingdom	29 234 812	27 820 800	1 799 680	1 680 300	174	164 767	224	210 598	20 778	21 002	9 716
EU 27 Total	225 328 524	205 431 242	11 107 690	9 598 931	4 422	2 672 422	7 460	7 013 545	159 485	166 945	73 989
Total Europe-38	263 246 859	235 252 450	11 963 533	10 345 309	4 568	2 805 547	9 926	9 331 774	183 503	193 429	82 031



**Figure 1.** Major causes of death by age group in the EU-25 in 2001  
 Source: European Commission, The social situation in the European Union 2005-2006. Available at: [http://ec.europa.eu/employment\\_social/social\\_situation/docs/ssr2005\\_2006\\_en.pdf](http://ec.europa.eu/employment_social/social_situation/docs/ssr2005_2006_en.pdf). Later data available from the following source: Eurostat: Statistics in Focus – Causes of death in the EU, Population and Social Conditions, October 2006. Available at: [http://epp.eurostat.ec.europa.eu/cache/ITY\\_OFFPUB/KS-NK-06-010/EN/KS-NK-06-010-EN.PDF](http://epp.eurostat.ec.europa.eu/cache/ITY_OFFPUB/KS-NK-06-010/EN/KS-NK-06-010-EN.PDF)



**Figure 2.** The relationship between fatalities and other outcomes of work injuries and illnesses (12).



**Figure 3.** Links between hazards, exposures, and work-related negative outcomes/diseases

fatality. The accident pyramid illustrates the issue (11). A similar trend can be identified for work-related diseases (see figure 3) (12).

What is crucial is the fact that these figures are statistical and one cannot easily identify and eliminate the worst outcomes first. It appears that in fairly rare occasions, when all circumstances are negative and barriers fail, a fatal outcome is evident. Prevention must thus include gradual quantitative and qualitative reduction of exposures to all potential hazards. Clearly some hazards are worse than others, which provides data for priority-setting (13, 14).

### Significant risks and trends in Europe

A report from the European Agency for Safety and Health at Work (EU-OSHA) identified the ten main emerging physical risks in the EU: (i) lack of physical activity; (ii) combined exposure to musculoskeletal disorder and psychosocial risk factors; (iii) complexity of new technologies and human-machine interfaces; (iv) multi-factorial risks; (v) insufficient protection of high-risk groups against long-standing ergonomic risks; (vi) thermal discomfort; (vii) general increase in exposure to ultraviolet radiation; (viii) combined exposure to vibration, (ix) awkward postures; and (x) heavy physical work (15).

### Biological risks

In another report on biological risks (16), EU-OSHA identified those emerging risks that are most likely to affect workers in the EU. Farmers, healthcare workers, or people in growing industries, such as waste treatment, were found to be particularly vulnerable. Communicable diseases such as severe acute respiratory syndrome (SARS), avian flu, or dengue are of increasing concern. Despite existing European law, knowledge is still limited and in many workplaces biological risks are poorly assessed and prevented. The report emphasized the importance of taking a global and multidisciplinary approach, involving input from occupational safety and health, public health, environmental protection, and food safety experts.

Globally, an estimated 320 000 workers die every year from communicable diseases caused by viral, bacterial, insect and animal-related biological hazards (6). Although most of these affect developing countries, some 5000 fatalities occur in the EU. Women are more likely to be affected than men, as they work more often in occupations that involve biological hazards and exposure. Given the speed and volume of international traffic and trade, these substances may spread around the globe within a few hours and start a new pandemic.

### Psychosocial risks

Working environments are significantly changing with the introduction of new technologies, materials, and work processes. Changes in the work design, organization, and management can produce new risk areas that result in increased stress levels for workers and may finally lead to a serious deterioration of mental and physical health.

An EU-OSHA report on expert forecasts related to psychosocial risks (17) shows that the main risks are related to new forms of employment contracts and precarious work, job insecurity, work intensification, high emotional demands, violence at work, and a poor work-life balance.

Work-related stress is one of the biggest occupational safety and health challenges facing Europe – affecting an estimated 22% of EU workers in 2005 – and the number of people suffering from stress-related conditions caused or made worse by work is likely to increase. Studies suggest that 50–60% of all lost working days are related to stress. In 2002, the annual economic cost of work-related stress in the EU's 15 original member states (EU-15) was estimated to be 20 000 million.

### Gender issues and working conditions

Another major change in the European labor market is the growing presence of women (see <http://osha.europa.eu/en/publications/reports/6805688/view>). According to a Eurostat report, women comprise 44% of employees in the EU-27, only one third of which hold managerial positions. In all countries, for which data are available, annual average gross earnings for women were lower than for men.

The safety and health risks of women at work tend to be underestimated and neglected. The incompatibility of working time with family life, the “double shift” that still affects women disproportionately, and the fact that there is more emphasis on accidents at work than on occupational health (which focuses attention on male-dominated sectors and occupations) are some of the new challenges which must be faced.

The EU strategy on health and safety at work has gender mainstreaming as an objective, and, to support this, EU-OSHA has carried out studies examining gender differences in workplace illnesses and accidents, gaps in knowledge and the implications of improving risk prevention, management, and evaluation (see organisations and strategies at <http://osha.europa.eu/en/organisations>).

### Migrant workers and working conditions

There are an increasing number of migrant workers in the EU (18). Currently, 5% of the total EU population

are working migrants (19 million), 13 million of whom are not from the EU. They are more vulnerable due to risks related to precarious work, communication problems, harassment, and discrimination.

It is estimated that in the nine largest economies of the former EU-15, between 4.4–5.5 million immigrants work in the “informal economy”, although precise data about undeclared employment is still not available. There are serious health concerns for undeclared workers as they often do not have access to occupational healthcare services and lack the legal protection mechanisms normally available for employees in dangerous occupations. Migrant workers face additional health and safety risks due to their relatively short period of work in the host countries and their limited knowledge of the health and safety systems in place. Some of them have also reported being subject to harassment more frequently than their native counterparts. Coupled with more unfavorable working conditions, higher rates of stress and burnout are one visible consequence.

### Chemical risks

Some 100 000 different dangerous substances are registered on the EU market. Dangerous substances are found in many work environments. The chemical industry is the third largest manufacturing industry, employing 1.7 million people directly, with 3 million spin-off jobs. However, exposure to dangerous substances also occurs in workplaces outside the chemical industry, for example, in farms, motor vehicle repair shops, hairdressers, and in many other workplaces.

According to the fourth European Working Conditions Survey (19), approximately 15% of employees in the EU handle, or come in contact with, dangerous substances for at least one quarter of their working time. One in five workers continues to be exposed to inhalation of smoke, powder, or fumes.

Taking into account the risks involved and the fact that this is considered to be an emerging risk, EU-OSHA has identified the following three research priorities: (i) exposure to carcinogens [eg, each year there are 95 581 estimated deaths from occupational cancer in the EU-27 and 666 000 globally (6) see also [http://osha.europa.eu/en/OSH\\_world\\_day/occupational\\_cancer](http://osha.europa.eu/en/OSH_world_day/occupational_cancer)]; (ii) exposure to nanoparticles and ultrafine particles (<http://osha.europa.eu/en/sub/riskobservatory/teaser/nanotechnologies>); and (iii) validation and improvement of models for worker exposure assessment, including skin exposure (ie, measuring, modeling, and risk assessment).

### Discussion

The numbers presented in tables 1 and 2 are alarmingly high, often poorly understood, and their importance has been underestimated. One should also keep in mind that the targets or “goal posts” are gradually moving due to changes in the workplace and workforce. For example, in Europe most problems are caused by long-term exposures but accidents seem to continue killing and injuring a large number of workers. Better country level exposure data for these and other hazards

**Table 3.** Selected key work-related negative outcomes and preventable factors behind them. (ETS = environmental tobacco smoke)

Work-related cancer	Work-related circulatory diseases	Accidents	Infectious and parasitic diseases	Musculoskeletal disorders	Psychosocial disorders
Asbestos	Shift and night work, overwork	Lack of corporate policy, management system and worker/ employer collaborative mechanism; poor safety culture	Poor quality drinking water	Heavy lifting, loads, shapes of materials	Lack of control
Carcinogenic substances, processes, silica and other dusts	Strain from high demands, low decision-making latitude	Lack of knowledge, solutions, and good practices	Poor sanitation and sewage system	Repetitive movements	Poor work-life balance
Ionizing radiation, radioactive materials	High injury risk	Lack of guidance or poor government policies/legislation; poor enforcement of law; weak tripartite collaboration	Poor hygiene, lack of knowledge	Poor design of seats, tables, tools, processes	Poor organizational culture
Ultraviolet radiation	Chemicals	Lack of incentive-based compensation system	Poor protection against animals, insects, snakes	Low temperatures, vibration	Role ambiguity or conflict, unclear or changing priorities
ETS (passive smoking at work)	ETS (passive smoking at work)	Lack of or poor occupational health services	..	..	..
Diesel engine exhaust		Poor recording and notification systems	..	..	..

Enterprise level	National level
Setting OSH policy within the enterprise	Setting national OSH policy
Establishing organisation and responsibilities within the enterprise	Establishing and progressively developing a national OSH system
Planning and implementing the elements of an OSH management system	Formulating and implementing national OSH programmes
Evaluating and reviewing performance within the enterprise	Reviewing national OSH programmes
Taking action for continual improvement	Formulating new national OSH programmes for continual improvement

**Figure 4.** Comparison of the main elements of a management system approach at the enterprise and national levels. (OSH = occupational safety and health.) Source: International Labour Office (ILO), International Labour Conference, 93rd Session, 2005, Report IV(1), Promotional framework for occupational safety and health. Available at: <http://www.ilo.org/public/english/standards/relm/ilc/ilc93/pdf/rep-iv-1.pdf>

are needed to obtain more accurate estimates and offer a baseline for prevention. This must also be a research priority (table 3).

The present theory on the organization of safety and health and the creation of a “health and safety culture” corresponds to the ILO’s Promotional Framework Convention (20). A systems approach is necessary at all levels. An enterprise management system is the strategic component for an organization, but an action program for risk assessment and priorities is also needed. Collaboration between management and workers at the organizational (enterprise) level must equally be followed by a national level mechanism, such as a tripartite advisory council, that looks after wider issues like new legal measures and better strategic enforcement.

Management systems generally follow a continuous cycle where the P(lan), D(o), C(heck) and A(ct) process is needed (21). **Figure 4** compares two different levels of strategic thinking – at an organizational and national level.

### Concluding remarks

Occupational accidents and work-related diseases are a bigger problem than estimated earlier. Longer-term risks are gradually increasing in importance at workplaces. A toolbox comprising (i) legal measures, (ii) enforcement, (iii) knowledge and solutions, (iv) incentives, (v) awareness raising and campaigns, (vi) services available to enterprises and organizations such as occupational health services, and (vii) networking for best exchange of good practice is vital for any successful strategy for safety, health, and wellbeing at work.

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