Work-related injuries and diseases, and COVID-19

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Developed countries have done well over recent years in reducing occupational injuries caused by accidents, despite their increasingly complex environment (Hämäläinen, Takala and Saarela 2006; Hämäläinen, Saarela and Takala 2009; Hämäläinen, Takala and Tan 2017). Work-related diseases are more complicated to measure as no global statistics are available, although estimates by the International Labour Organization (ILO) show an increasing trend. Globally, when populations in various regions gradually extend their life expectancy and work-life expectancy, many short-term workplace problems will be gradually reduced. Poverty reduction cuts back short-term consequences but these are replaced by more long-term and long-latency diseases and disorders. This can be easily seen in emerging economies such as those in the South-East Asian and Western Pacific regions (Takala et al. 2014; Takala et al. 2017).

In many developed countries, and increasingly in developing countries, the health component of workplace safety and health is rapidly increasing in importance compared to the safety component. This relatively higher importance placed on health at work is mainly due to improvements in safety and the reduction in the number of workers in traditionally hazardous industries.

In developed countries, another major component in reducing accidents has been the shift in economic structures. Hazardous and labour-intensive workplaces, such as those in manufacturing sectors, have decreased in developed countries since much of such work takes place in other locations, in particular in rapidly developing countries in Asia, for example. In developed countries more than two-thirds of all workers are often already working in service occupations. The rapidly evolving processes of mechanization, automation and pre-fabrication also means that many jobs are becoming less exposed to the risk of injury. Improvements in reducing occupational injuries in the developed countries have been made possible partly through better prevention activities and partly through the trend of transferring much industrial activity to poorer parts of the world.

This transfer to developing countries carries its own associated risks, such as the negative impacts on the health and safety of workers in these countries, where injuries are increasing and so are the long-latency diseases and disorders. Technology transfer is technically not overly complicated, but changing unsafe and hazardous work methods and learning best practices has not followed the technical transfers. Unskilled workforces have been left to learn everything from scratch, so that health and safety risks and negative outcomes have continued to increase rapidly.

Major work-related risks include: occupational carcinogens; circulatory diseases caused, for example, by stress, night work, high levels of carbon monoxide and noise; other non-communicable diseases caused by inhaled vapours, dusts and fumes; physically demanding or repetitive jobs leading to musculoskeletal disorders; and communicable diseases caused by pathogens at work leading to malaria and other communicable and tropical diseases – and more recently COVID-19, the disease caused by the novel coronavirus SARS-CoV-2.

We are living in unprecedented times across the globe, where every country is experiencing the tragic and far-reaching impacts of the pandemic due to the SARS-CoV-2 virus and COVID-19. This situation and its impacts are anticipated to continue for many months and even years to come, and to affect many sectors.

There are probably very few workers worldwide who can say that they have not been affected by COVID-19. At international, regional and local levels, and across all sectors, organizations have mobilized their resources and skills to develop and share all they can about COVID-19 for the benefit of their workers, their families and their communities. These include policies, legislation updates, technical guidance documents, training materials, official statements, risk assessment tools, standard operating procedures, action frameworks and return-to-work guidelines, among many others.

The global pandemic has placed additional responsibilities and workloads on all practitioners involved in health services in general, and also on occupational health and medicine professionals who are required to ensure the safe return of workers to their respective workplaces and livelihoods, as the global economy restarts in a phased approach following the lockdowns in many countries.

Globally, the 1.7 billion workers in the various service occupations are considered as risk populations. If infected, workers in some occupations may play an important role as vectors of infection; examples include workers in the health sector, other service occupations, food industries, and many more. Several occupational activities have exposed workers to the SARS-CoV-2 virus particularly in sectors with high rates of human-to-human contact or contact with animals.

Workplaces in economic sectors such as animal husbandry, food processing and food markets, health services, various social services such as care of the elderly, community services such as waste handling and many others are possible sources and origins of potential epidemics. Workplaces should therefore be considered important arenas for early detection of epidemic risk and for early actions in primary prevention and management. This requires effective regulation for inspection and advice on good preventative practices.

The ongoing global crisis of chronic diseases and the failure of public health to curtail the upsurge in highly preventable risk factors have left populations vulnerable to acute health emergencies such as COVID-19. Furthermore, a majority of the working population is exposed to “new and emerging” work risks related to long-term health effects, such as psychosocial factors.

This article reviews the latest global and country numbers of occupational accidents and work-related illnesses and related economic costs in selected countries and regions, and recommends action to be taken by various stakeholders.

Objectives

Our objectives in this article are to:

- Create a better understanding of the short- and long-term health risks caused by work and of the expected serious consequences to working populations and to economies.
- Based on recent estimates, compare data from available reliable sources to understand, by means of commonly used indicators, the magnitude of occupational problems and disorders. Analysis of existing estimates from different countries and regions, and differences between countries and estimates, can provide a roadmap for setting priorities and informing policies.
- Identify the main targets for the elimination and reduction of exposures to negative workplace factors causing long-term serious outcomes and deaths related to work.
- Provide facts and evidence for priority action and emphasizing the role of governments, workers and employers and their organizations related to workplace safety and health policies, strategies, regulatory measures, enforcement, engagement, and the building of a mind-set and culture of "zero harm" at work.

Methodology, and sources of data on the burden of injuries and illnesses at work

The authors reviewed employment figures, mortality rates, data on the occupational burden of diseases and injuries, reported accidents, surveys on self-reported occupational illnesses and injuries, attributable fractions (AF_{work}: these quantify the contribution of a risk factor to a disease or a death in a population) and economic cost estimates of work-related injuries and ill-health, and the most recent information on occupational health and safety issues published in scientific papers, documents, and electronic data sources of international and regional organizations, in particular the ILO, the World Health Organization (WHO), the European Union (EU), and the Association of Southeast Asian Nations (ASEAN), as well as institutions, agencies and public websites. Data collection systems for these sources still vary so their comparability has limitations.

The ILO has calculated global estimates of occupational injuries and diseases for the last 20 years and the methods used and respective results have progressed with time. The estimates are based on two distinct processes, one for occupational injuries (accidents) and the other for work-related diseases. The ILO's statistics contain collected data from its Member States for injuries, WHO data on diseases, and scientific documentation on work-relatedness used as baselines for calculating the number of deaths and estimating the magnitude of disability, both temporary and permanent.

Pre-COVID-19, it was estimated that globally 2.78 million workers died annually from causes related to work (Hämäläinen, Takala and Tan 2017). Of these, work-related diseases accounted for 2.4 million (86.3 per cent) of deaths, while 380,000 deaths (13.7 per cent)

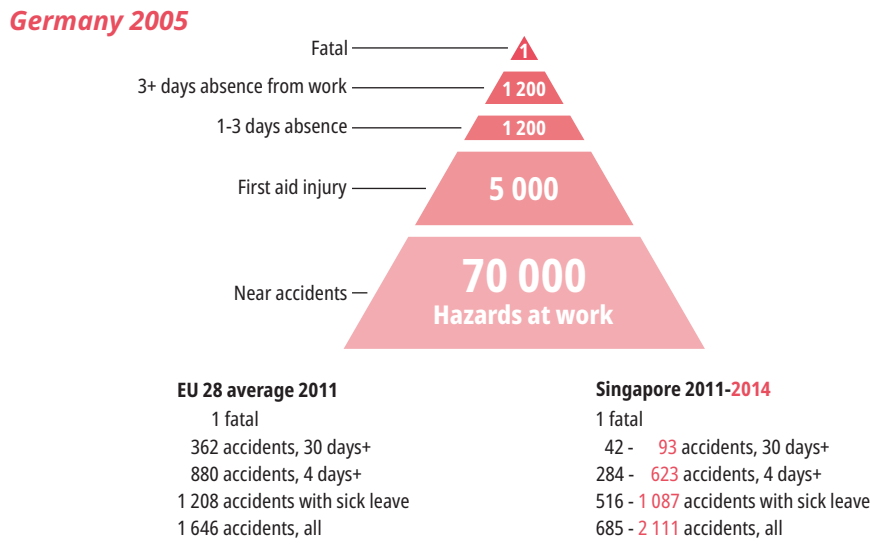
occurred as a result of occupational accidents. The global economic impact of the failure to adequately invest in occupational safety and health was "roughly equal to the total GDP of the poorest 130 countries in the world", said ILO Director-General Guy Ryder (ILO 2017). In addition, some 3.74 million non-fatal accidents took place and 123 million disability adjusted life years (DALYs) were lost due to work-related injuries, diseases and disorders every year (Hämäläinen, Takala and Tan 2017). DALYs are calculated by adding together the years of life lost (YLL) due to premature mortality and the years lived with disability (YLD). Total health loss (measured in DALYs) is a consolidated indicator of the global burden of disease (GBD). Based on these calculations, the economic loss due to all diseases, disorders and injuries at work was 4.94 per cent of GDP in 2020 (IHME/GDB Risk Factors Collaborators 2020).

Injuries caused by accidents

While it is difficult to compare national data related to occupational injuries (due to differences in legal and compensation criteria), the comparison between the numbers of *fatal* injuries (accidents) is easier and the data can be relatively comparable when the recording criteria, denominators and economic structures are well documented. Fatal injuries are expressed per 100,000 employed population in national statistics, or per one million working hours (accident frequency rate), which may be converted to 100,000 full-time employed (accident incidence rate).

However, while fatal occupational injuries are better recorded, non-fatal cases – serious, permanent and less serious cases are seriously under-reported in most countries and it is these cases that create a much heavier burden on workers and economies than estimated earlier (Betti et al. 2020). Fatal cases are just the tip of the pyramid (figure 1). A similar pyramid can be drawn for diseases at work.

Figure 1. Non-fatal accidents at work for every fatal accident work, 2014



Source: Takala et al. 2014.

Table 1 shows the approximate outcomes related to the comparative analysis. The recorded reference numbers and rates in the table from the year 2014 (ILOSTAT and EUROSTAT) will be valid also for well-populated ILO Member States globally. In small countries the random character of fatal accidents in any year could be balanced by taking average values for several years, as for the reference values of ILOSTAT and EUROSTAT. The estimates released by ILO Director-General Guy Ryder (ILO 2017, from Hämäläinen, Takala and Tan 2017) had already used an adjustment of the non-fatal cases and these were already better than raw reporting data but still seriously underestimated. The best reporting countries appear to be Finland and Germany,

The results of a new under-reporting study on EU countries show clearly higher numbers; these are practically more than doubling the raw reported numbers, from 2.4 million to 6.9 million of non-fatal accidents in the EU-28, causing more than three days of absence from work. Against every fatal accident the adjusted numbers show one fatal case per 2,050 non-fatal cases (Betti et al. 2020). As seen from the ILOSTAT numbers, the applicability of the method is global.

Table 1. Comparative analysis of fatal and non-fatal accidents in the EU-28

Country	Total employment	Occupational injuries in 2014 reported to ILO Fatal	Occupational injuries in 2014 reported to ILO Non-Fatal	Accidents at work in 2014 reported to Eurostat Fatal	Accidents at work in 2014 reported to Eurostat Non-Fatal	Global estimates of occupational accidents (at least four days absence) Lower limit (eq. j) (0.14) ILO 2014	Global estimates of occupational accidents (at least four days absence) Upper limit (eq. j) (0.08) ILO 2014	Global estimates of occupational accidents (at least four days absence) Selected ILO 2014	Non-fatal accidents based on the EU-28 under-reporting study, all sectors, annual aerage of years 2015-17
EU-28	218 336 000			3 379	2 414 073	2 413 571	4 051 944	3 548 302	6 936 092
Austria	4 113 700			119	52 968	85 000	132 222	108 611	221 047
Belgium	4 544 500			45	46 704	32 143	50 000	46 704	121 935
Bulgaria	2 981 400	115	2 289	110	1 772	78 571	137 500	108 036	175 403
Croatia	1 565 700	36	13 785	22	8 999	15 714	27 500	21 607	65 206
Czech Repubic	4 974 300		45 058	101	36 622	72 143	126 250	99 196	217 135
Cyprus	3627 00	5	1613	4	1 359	2 857	4 444	4 563	7 173
Denmark	2 714 100			28	31 770	20 000	31 111	31 770	58 685
Estonia	624 800	16	4619	13	5 393	9 286	16 250	12 768	33 255
Finland	2 447 200			28	42 162	20 000	31 111	42 162	41 773
France	26 396 400			517	467 869	369 286	574 444	471 865	776 729
Germany	39 871 300	639	955 280	471	704 819	336 429	523 333	704 869	862 016
Greece	3 356 200			25	3 152	17 857	27 778	22 817	60 641
Hungary	4 100 800	78	19 583	74	15 918	52 857	92 500	72 679	162 362
Ireland	1 913 900			45	13 103	32 143	56 250	44 196	88 028
Italy	22 278 900	396	305 246	459	251 769	327 857	573 750	388 929	983 300
Latvia	884 600			39	1 409	27 857	48 750	38 304	55 425
Lithuania	1 319 000	60	3 232	51	2 599	36 429	63 750	50 089	79 551
Luxembourg	245 600			10	6 154	7 143	12 500	9 821	29 343
Malta	181 700			4	2 273	2 857	5 000	3 929	8 477
Netherlands	8 236 100			39	56 377	27 857	48 750	56 377	232 132
Poland	15 861 500			225	59 414	160 714	281 250	220 982	532 730
Portugal	4 499 500			148	111 134	105 714	185 000	145 357	286 253
Romania	8 613 700	224	3 351	253	3 101	180 714	316 250	248 482	494 258
Slovakia	2 363 100			39	7 365	27 857	48 750	38 304	93 244
Slovenia	916 700	25	12 914	20	10 016	14 286	25 000	24 554	34 559
Spain	17 344 200	246	423 106	247	287 809	176 429	308 750	287 809	624 018
Sweden	4 772 100	41	30 319	36	21 343	25 714	45 000	40 268	74 986
Unitd Kingdom	30 672 300			207	160 700	147 857	258 750	203 304	516 428

Sources: Based on ILOSTAT and EUROSTAT data adjusted by the EU-28 under-reporting study (Betti et al. 2020). ILO data are classified by WHO regions (alphabetical in two groups). Year 2014 is used as the latest available international reference.

Work-related diseases and disorders

Work-related diseases are even less properly recorded, notified, reported and compensated than work-related accidents. The ILO's List of Occupational Diseases (ILO 2010) is an important tool to guide its Member States.

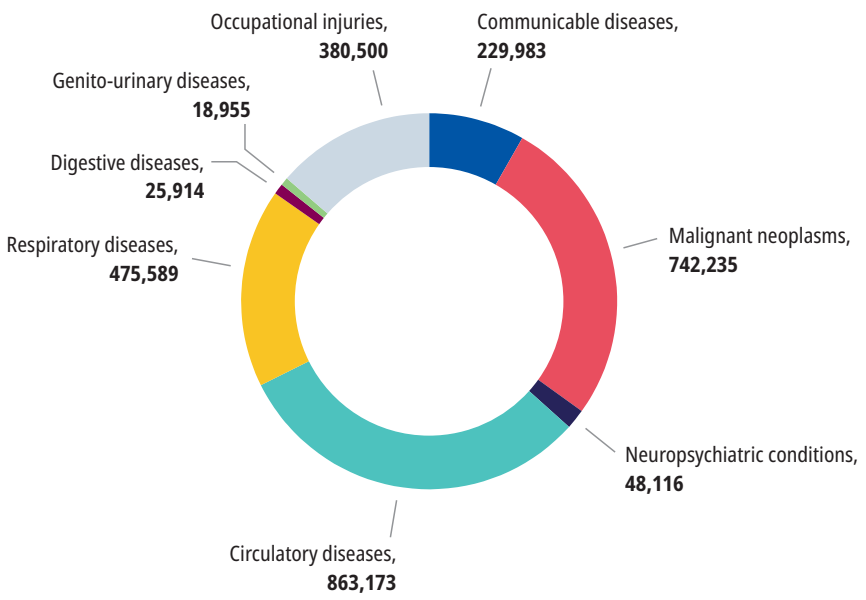
While the countries that report most occupational injuries are Finland and Germany, the number of occupational diseases per 100,000 workers is highest in Denmark and Sweden. Poor reporting is not an indicator of decent and safe work. Due to widely differing practices in terms of occupational diseases and their compensation and reporting systems (where applicable), the term *"work-related diseases"* is used here in preference. While one country may report a wide selection of diseases as occupational, another may have exactly the same problems at a high level but does not report them. When using the term *"work-related diseases"* we refer to diseases that are both identified and reported – based on the country's list of compensable *occupational diseases* – as well as similar diseases that are not reported. Although the magnitude and number of *work-related diseases* may not necessarily be found in statistical reports, epidemiological methods can be used to estimate them accurately enough.

Globally, of the 2.4 million deaths caused by work-related diseases in the 2017 estimates, the top illnesses responsible for the majority of deaths from work-related diseases were cardiovascular (circulatory) diseases and cancers, at 31 and 26 per cent respectively. These were followed by occupational injuries caused by accidents (14 per cent) and infectious diseases (9 per cent). Occupational cancers accounted for 742,235 deaths in the 2017 estimates (figure 2), compared with 489,000 deaths reported by the corresponding GBD 2015 study (see IHME/GDB Risk Factors Collaborators 2020). The main reason for the difference in the number of deaths is that the GBD 2015 study covered selected International Agency for Research on Cancer (IARC) Group 1 agents only (i.e. confirmed carcinogens), while the 2017 estimates covered IARC Group 1 and 2A agents (confirmed and probable carcinogens) (IARC and WHO 2020). There is a slow but gradually increasing trend in the coverage of IARC agents, where probable carcinogens are moved into the confirmed carcinogens list when sufficient scientific evidence is gathered. For example, diesel exhaust was added only relatively recently (2012) to the IARC list of Group 1 agents, although the exposures to diesel exhaust and the related cancers have been evident for decades.

Industrialized countries (WHO High Income Region) had a higher burden from cancers, at 52 per cent, and a much smaller attribution from accidents and infectious conditions, each at 2.3 per cent (figure 3). This indicates that average life expectancy in high-income economies (typically the highest share of cancers, and work-related cancers, particularly) will increase with increasing life expectancy. The African Region of WHO had the highest relative share of work-related communicable diseases. The Western Pacific Region estimates are dominated by China, and the South-East Asian estimates are dominated by India. The European Union estimate for occupational cancer deaths was 107,600.

The corresponding number of the GBD 2015 study was 75,279 deaths based on selected carcinogens, and the latest GBD 2019 study indicated 101,633 deaths in the EU-28 (IHME/GBD Risk Factor Collaborators 2020). These do not cover ultraviolet and ionising radiation, specific work processes, shift work or sedentary work. Taking the omitted components into account, these results match well with or exceed the 2017 estimates. Data for ILO Member States that report, recognize and compensate occupational diseases and injuries are reasonable but this is, unfortunately, not a common practice. Therefore, estimates for all ILO Member States and regions have been made on all health- and safety-related diseases, disorders and injuries (Takala et al. 2017; Hämäläinen, Takala and Tan 2017). Work-related communicable diseases were responsible for 230,000 deaths a year; tuberculosis, silico-tuberculosis, pneumococcal diseases, malaria and tropical diseases, and virus-related influenzas etc. were already included in the past ILO global estimates. The ongoing COVID-19 pandemic is further aggravating the morbidity and mortality risks to workers. However, the latest data show that the work-related mortality fraction for COVID-19 at work is relatively low (see note to figure 2). Using the latest knowledge from Italy (Marinaccio, Guerra and Iavicoli 2020) related to attributable fraction for work ($AF_{work)}$ and mortality from Finland (Finnish Institute for Health and Welfare 2021) for populations ranging in age from 15 to 65 years, the AF_{work} was calculated to be 3.0 per cent (table 2). However, the Italian experience is that the *infection* AF_{work} rate is considerably higher at around 19.4 per cent.

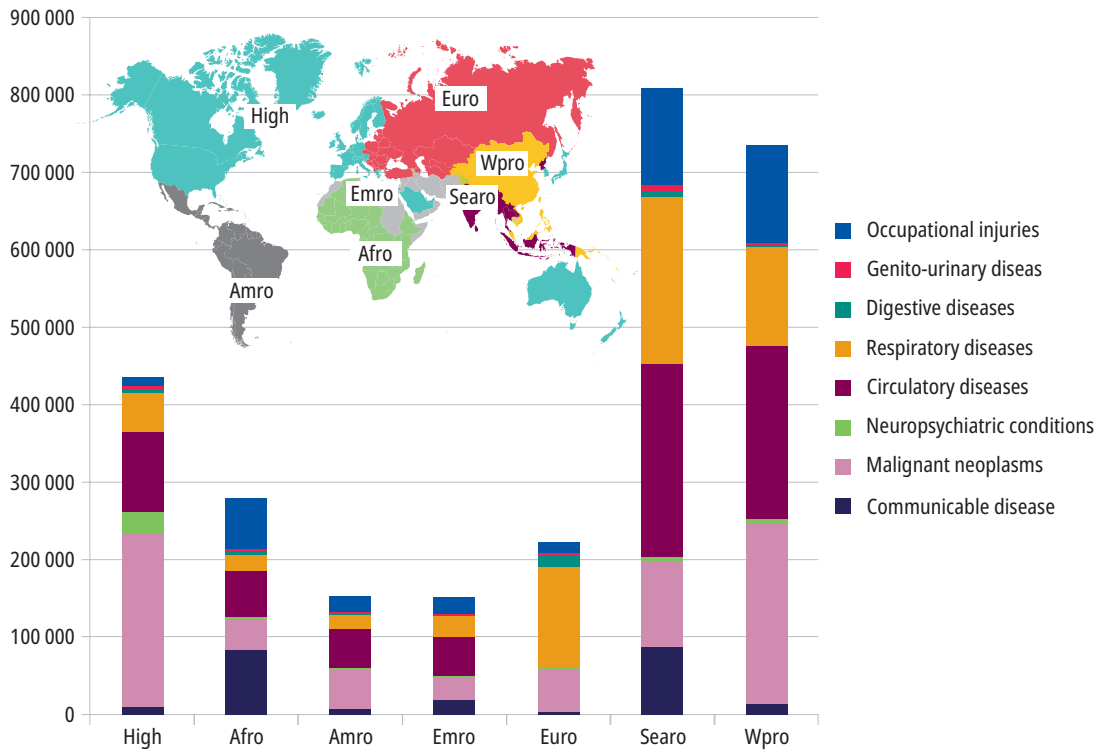
▶ Figure 2. Estimated global work-related mortality, by cause, 2017



Note: COVID-19 deaths at work in 2020 are estimated at 60,000, in comparison with the total number of 2,844, 465 work-related deaths shown in figure 2. Of these deaths, only a limited number were considered as recognized and compensated occupational disease.

Sources: Takala et al. 2017; Hämäläinen, Takala and Tan 2017.

Figure 3. Work-related mortality, by WHO region, 2017



Note: 'High' refers to high-income areas.
Source: Takala et al. 2017.

Table 2. Work-relatedness (AF_{work} rate) of selected diseases and disorders, 2020–21 (percentages)

Type of disease	Percentage
Communicable	4.8 (male)–32.5 (female)
COVID-19 working age/death[1]	*3.0 male/female*
of which working age 15-65/disease[2]	*30*
of which attributable to work (AF_{work})[3]	*19.4*
Cancer/death	13.8
Neuropsychiatric/death	6.6
Circulatory/death	14.4
Respiratory/death	
COPD	18
Asthma	21
Other respiratory diseases	1
Digestive diseases/death	2.3
Genito-urinary diseases/death	3.0
Musculoskeletal/disorders	37
Mental health/disorders (Stress, night work, psychosocial)	10-30

Notes: [1]The median age of all COVID-19 deaths is 84 years (Finnish Institute of Health and Welfare 2021).
[2]From Marinaccio, Guerra and Iavicoli 2020. [3]AF_{work}: Attributable fraction, or percentage of disease caused by work.

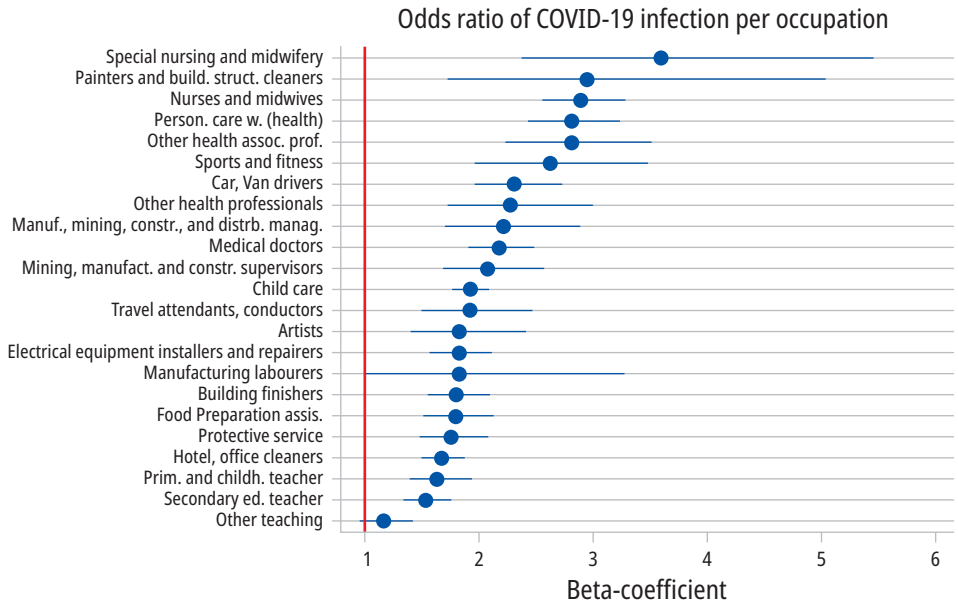
The COVID-19 infection rates – not mortality – estimated at 19.4 per cent in 2020 can be used to estimate the total number of *work-related* infection cases in that year. The WHO gave a total number of 82.4 million cases – a number likely to be much higher if never-tested disease cases were better known. As a result, 19.4 per cent of 82.4 million equals 15.99 million work-related COVID-19 non-fatal infections. While not necessarily considered as compensable occupational disease by ILO Member States, the work-related value and economic loss add considerably to the losses of work-related deaths. As of 24 February 2021 there were 111,593,583 total confirmed COVID-19 cases with 173,594 new cases that day, and 2,495,020 fatalities (WHO 2021). The real burden is clearly much higher.

Figure 4 shows the main differences between various occupations and jobs at risk of exposure to SARS-CoV-2, in Finland. The common belief that health staff are a seriously affected group holds true, but at the same time a fair number of jobs in other sectors are also at risk of exposure to the infection.

Simply put, an odds ratio (OR) is a measure of association between an exposure (in this instance, exposure to the SARS-CoV-2 virus) and an outcome (in this instance, acquiring the COVID-19 infection or disease). The OR represents the odds (or likelihood) that an outcome will occur given a particular exposure, compared to the odds of the outcome occurring in the absence of that exposure. More specifically, OR > 1 means greater odds of an association between the exposure and outcome; OR = 1 means there is no association between exposure and outcome; and OR < 1 means there is a lower odds of association between the exposure and outcome.

Hence, in figure 4, the respective ORs indicate, for example, that special nursing staff have a 3.6 times higher risk of acquiring the infection, while painters and cleaners of buildings have 3.0 times the risk of developing COVID-19, when compared to the reference population of non-working people. It is also important to bear in mind that exposure to new variants of the SARS-CoV-2 virus, like the UK variant, may lead to a 1.3–1.7 times higher risk of developing COVID-19, when compared to the “normal” (original) virus.

Figure 4. Finland: COVID-19 infections per occupation, expressed as odds ratios



The odds ratio of COVID-19 in Finland with 95% confidence interval, adjusted for age, sex, origin, and home municipality. Non-employed people (20-64 year) is the reference category (OR=1, vertical red line). National infectious Diseases Registry from year 2020, weeks 1-47

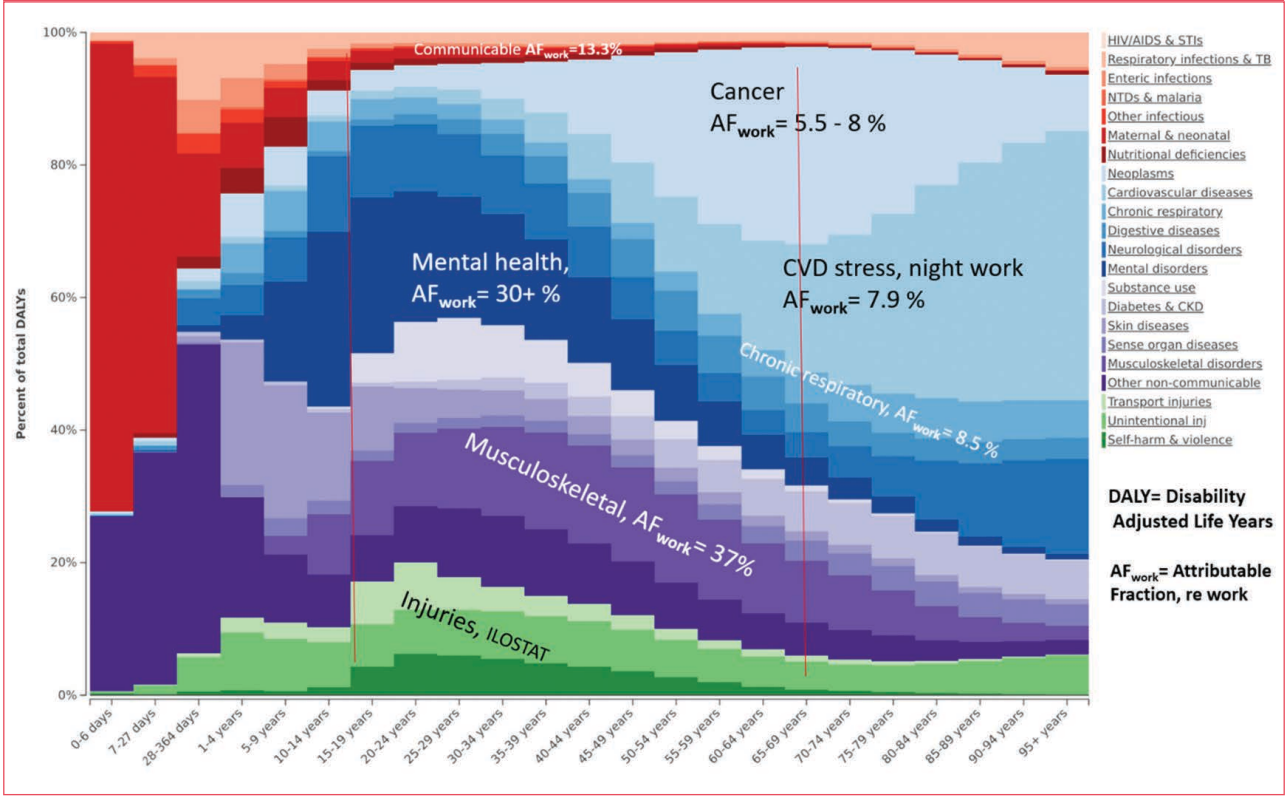
Note: The data presented cover all people between the ages of 20 and 64 living in Finland, in a sample size of just over three million.

Source: Helsinki GSE 2021.

Cost estimates and the social value of occupational safety and health

The economic costs of poor occupational safety and health measures can be estimated at both workplace and national levels. The economic impact of injuries and diseases at work includes direct costs to stakeholders, victims, employers and society, as well as production losses. Figure 5 shows the share of diseases and injuries related to age. The figure is from the Institute of Health Metrics and Evaluation (IHME) covering all causes, and the added estimated attributable fraction (AF_{work}) by the present authors shows the share of the work-related component of each disease. COVID-19 is not included in this figure, which dates from 2019. Red lines indicate working age.

Figure 5. Disability Adjusted Life Years (DALYs), major disease and disorder groups, European Union, by age, and estimated AF_{work}, 2019 (COVID-19 not included)

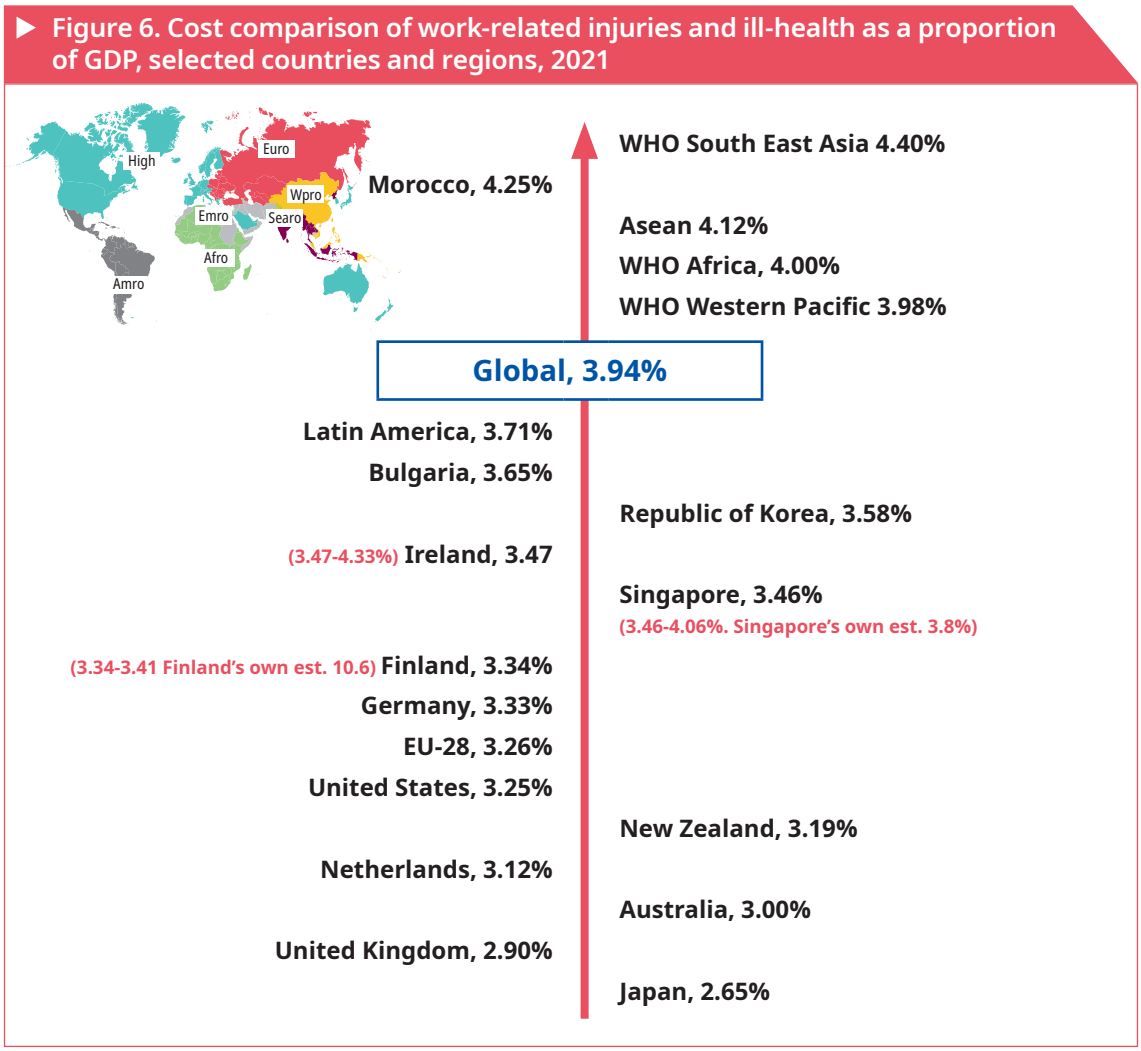


Source: IHME 2019, with added estimated attributable fraction (AF_{work}) by the present authors.

Based on the quantification of the number of injuries and diseases at work one can establish the number of years of life lost (YLL) and years lived with disability (YLD) caused by work; adding together YLL and YLD results in the measure known as DALYs.

Costs in monetary terms can be calculated for a country, region or globally (see figure 6). Cost comparison is possible, when details about DALYs caused by injuries and diseases at work are available. The annual GDP of a country or region is considered representative of the total work (or labour) input, whether in primary industries, manufacturing, or service sector. Even company profits and individual investors' incomes have been generated originally by work (Elsler, Takala and Remes 2017).

Figure 6. Cost comparison of work-related injuries and ill-health as a proportion of GDP, selected countries and regions, 2021



Source: ILO, ICOH and EU 2017.

The extent of the costs is largely defined by what factors are taken into account when calculating the estimates. Costs in percentage of GDP can be obtained by dividing the DALYs value for a specific country or region (in years) by the maximum hypothetical number of years that could have been saved if nobody died, or had temporary or permanent disability. This is obtained through the number of years worked by those employed, that is, the full employment number.

The annual economic loss is then calculated as:

$$\text{Annual costs as \% of GDP}_{\text{country}} = \text{(work-related) DALYs}_{\text{country}} / \text{Total work years}_{\text{country}}$$

Monetary loss can be calculated by multiplying the obtained percentage by the GDP in monetary terms of the reference country or region, for the same year.

Using the DALYs method as an indicator of wider work-related harm is practically the only way to compare economic costs with the available global information in all countries. Including just the fatal cases would only provide the tip of the iceberg, and would exclude factors that are known to cause major absences from work, such as musculoskeletal

diseases, psychosocial risks, and a huge number of non-fatal occupational injuries caused by occupational accidents. In combination, these factors create major losses of social value to women and men at work, and massive losses in terms of economic costs to workers, employers and the society as a whole (Elsler, Takala and Remes 2017).

A common way of counting the economic costs (as a percentage) does not cover any indirect costs, intangible costs or the "value of statistical life". When considering the total cost more carefully, by including data from several sources (if available), the total costs are likely to be considerably higher. For example, the above-mentioned method when applied to Finland produced costs of 3.34 per cent of GDP in 2015, or 7.68 * US$$10^9$. The more detailed calculation that covered all related costs for Finland by the Ministry of Social Affairs and Health (Rissanen and Kaseva 2014) amounted to a total cost which was three times higher: €24.45–24.95 10^9, or 10.6 per cent of annual GDP.

Further detailed comparable calculations have been made by the European Union (EU-OSHA 2018). And there are still more expenses to be taken into account.

In most developed countries the legal retirement age is around 63–68 years, but according to the Organization for Economic Co-operation and Development (OECD), *the real materialized retirement age* can be much lower; for instance, in Finland it is 61.5 years. However, in other countries with a comparable economy to Finland's, such as Iceland, Japan, Republic of Korea, and Norway, the retirement age is much higher; in Iceland, for instance, it is 70.5 years (Sauré and Zoabi 2012). Such differences in effective retirement ages affect substantially the calculated numbers of working years which can be lost by work-related injuries, diseases and disorders.

The GDP difference – if the whole workforce worked for nine more years – would roughly increase GDP by 25 per cent. The jobs and occupations that have the lowest real retirement age are in those such as construction scaffolding, where workers retire at the age of 50. It is clear that poor working conditions and premature retirement are strongly associated. Aligned with legislation, people cannot be forced to work until the age of 70 if they have already lost their health and ability to work by the age of 50.

Many other aspects could be taken into account: monetary measures, or value of life, narrowly or widely as a social value, or as a social loss if life or health are lost due to work. The value of nature or climate does not have a price tag. The social value of life and health at work and beyond work can be only partly measured by market prices.

Experiences of COVID-19 and lessons learned

What is important to note is that work-related problems and losses are not caused by unavoidable situations, such as pandemics or natural disasters. Even effects of natural disasters can be eliminated, or their impact minimized, by proper preparedness and management. For example, lightning from the sky can be prevented at work by lightning rods, and by measuring the rising voltage tension in construction sites and stopping work

when risk levels increase. Global pandemics may be seen as unpredictable risks, but over time several nations have shown the world that by taking drastic measures it was possible to avoid a high number of casualties and other negative impacts; unfortunately, many more nations have not been prepared. Boxes 1, 2 and 3 describe the experiences of three countries: Italy, the Republic of Korea, and South Africa respectively. The lessons from the COVID-19 pandemic have already emphasized the need for better prediction, and improved preparedness (including research, human resources, hospital and material preparedness and updating of regulations for crisis management). Box 4 lists some of the lessons learned. The roles, resources, capacities and collaboration of international organizations, including WHO and ILO, must also be strengthened, and so this article concludes with recommendations for international and national organizations as well as for other stakeholders.

Box 1 Experiences of COVID-19: Italy

According to the Italian legislation on workers' compensation, cases of infectious and parasitic diseases are included in the category of accidents at work because the virulent cause is equated to the violent one.

Between 21 February 2020 (first case reported in Italy) and 31 December 2020, the Italian Workers' Compensation Authority (INAIL) received 131,090 reports of accidents at work from COVID-19, representing 23.7 per cent of accident reports received since the beginning of the year and 6.2 per cent of the total COVID-19 cases reported by the National Health Institute (ISS) in the same period.

Women registered the highest proportion of cases (69.6 per cent). Out of the total number of claims, 42.2 per cent are among the 50–64 age group, followed by the 35–49 age group (37.0 per cent), under 34 years (19.0 per cent) and over 64 years (1.8 per cent).

Healthcare services were the most affected sector (68.8 per cent of claims), followed by the public administration service (9.1 per cent of claims); the latter includes the territorial health services. Percentages of less than 5 per cent were recorded for security services, cleaning services, manufacturing sector, hotel and catering services, wholesale and retail trade, transport, and storage and other services.

In the same period of time, INAIL received also 423 reports of fatal accidents from COVID-19, which is about one-third of the deaths reported since the beginning of the year with an incidence of 0.6 per cent of the total COVID-19 fatalities at national level reported by the ISS.

Unlike non-fatal injuries, fatal cases were more frequent among men (83.2 per cent); the average age is 59 years (56 for women, 59 for men), notably lower than the average age of COVID-19 fatalities in the general population (82 years calculated by the ISS). The healthcare sector was the most affected, with about one-third of the total cases. High rates of fatalities were also registered among administrative employees (10.9 per cent) and road haulage workers (5.8 per cent); rates below 2.5 per cent were registered for sales clerks, craftsmen, security services, skilled construction and maintenance workers, catering services employees

There are some relevant differences between the first wave of the pandemic in Italy (March through May) and the second wave (October through December).

Unlike the claims as a whole, with a much higher claims rate in the second wave, the first wave had a much higher impact for fatal cases: 79.0 per cent is, in fact, the share of total deaths in the period March to May against 18.0 per cent in October to December.

Box 2 **Experiences of COVID-19: Republic of Korea**

After being the first country outside of China to experience the COVID-19 outbreak, the Republic of Korea quickly implemented the planned action it had learned from the bad experience of the Middle East Respiratory Syndrome (MERS) outbreak in 2015. The MERS outbreak turned out to be a chaotic situation for Korean society, and far more challenging than the country could ever have imagined (Republic of Korea, Ministry of Health, n.d.).

During the MERS outbreak, the Republic of Korea failed to isolate confirmed or suspected cases, even in hospitals, and could not track close contacts of MERS patients, due to the Personal Information Protection Act. Healthcare workers were not well trained for managing highly contagious diseases and personal protective equipment (PPE) was either unavailable, or not prepared or equipped properly at home or in workplaces. These issues have been rectified, modified, and improved during the last five years. Virtual training for managing a newly emerging contagious disease has been carried out regularly at hospitals, as a legal obligation. In addition to social distancing, pro-active testing and tracing, and wearing a mask, many other actions have been implemented in the workplace. No visitors are allowed to enter workplaces without testing body temperature and registering their contact details. Workplaces have been "reshaped" via the introduction of modified work schedules, working from home practices (where applicable), online meetings, and closure of multi-use rooms. Based on the experience of MERS, workers started wearing masks voluntarily, long before this practice became a mandatory requirement.

As of 5 April 2020, the proportion of healthcare workers among all cases of COVID-19 was only 1 per cent, while that in MERS was 21 per cent (Kang 2020). As of 15 May 2020, 15.7 per cent of all COVID-19 cases had occurred at workplaces, including healthcare facilities. These statistics have not changed significantly since April and May 2020 (Kim 2020). By implementing these efforts and precautions from the beginning of the COVID-19 outbreak, the Republic of Korea has been able to continue business at workplaces without the need for a hard national lockdown, although there have been some restrictions in normal business life.

Box 3 **Experiences of COVID-19: South Africa**

On the African continent, South Africa (along with Algeria and Egypt) was considered to be at the highest risk of the novel coronavirus (SARS-CoV-2) being imported and spreading, with a moderate to high capacity to respond to an outbreak (Gilbert et al. 2020).

From the outset of the COVID-19 pandemic, the socio-economic realities in South Africa limited the effectiveness of virus containment measures that had been effective in countries in Europe and Asia, such as frequent hand washing, social distancing, self-isolation, quarantine, testing and lockdown (Staunton, Swanepoel and Labuschaigne 2020). South Africa is an unequal society, with only 16 per cent of the population having access to medical aid, and a healthcare system that carries an elevated burden of communicable diseases such as TB, HIV, and HIV/TB co-infection, with millions on immunosuppressant drugs.

A national lockdown was declared by the South African Government at the end of March 2020, and has continued to date, with the associated impacts on the national economy and the loss of incomes and livelihoods, further exacerbating the inequalities in the country. The pandemic has also brought into sharp focus the gaps that exist in an inadequate healthcare system and in the protection of workers, and has magnified the risks which already fall disproportionately on the most vulnerable workers: 'This virus may not discriminate those that it infects, but the effects of

Box 3 (cont.)

the virus will be most felt on already marginalised and vulnerable populations in South Africa for some time to come' (Staunton, Swanepoel and Labuschaigne 2020).

During February 2021, South Africa was at the tail-end of a second wave of COVID-19 and a third wave was anticipated a few months later, during the winter season. A vaccine rollout programme started in early February 2021 for health workers as a priority group, but was halted temporarily when preliminary results indicated that the vaccine of choice (AstraZeneca-Oxford University trial) was not sufficiently effective against the new COVID-19 variant identified in South Africa. The rollout was restarted once the Johnson & Johnson vaccine had shown effectiveness against a number of variants, including 501Y.V2.

The pandemic has been instrumental in making COVID-19 a priority occupational disease in South Africa. Policies were developed rapidly for occupational health practitioners, employers and employees, who have all had to adapt to emergency legislation, electronic means of communication and remote consultations as part of the "new normal" that has become an entrenched reality.

The official sources of COVID-19 information and guidance are the South African National Department of Health (NDOH) and the National Institute for Communicable Diseases (NICD). The NDOH also hosts a dedicated COVID-19 website with daily updates, a COVID-19 toll-free public hotline and a downloadable app, COVID Alert SA.

From the outset of the pandemic, the South African National Institute for Occupational Health (NIOH) has played a pivotal role in COVID-19-related education and training for employers, employees, and various other entities active in occupational health such as occupational medicine and occupational health nursing practitioners, and occupational hygienists. The NIOH has developed webinar training programmes with a number of COVID-19 resources which are available on its website and the Institute hosts the Occupational Health Surveillance System (OHSS) for COVID-19.

Changes were introduced in procedures for medical surveillance of employees carried out by occupational health practitioners (occupational medicine and occupational health nursing professionals), with the South African Society of Occupational Medicine (SASOM) playing a leading role in supporting and advising its members more specifically, and the occupational health disciplines more broadly.

In April 2020, SASOM endorsed the South African Thoracic Society (SATS) position statement on the conduct of lung function testing during the COVID-19 pandemic which was updated by SATS in September 2020 with recommendations for the re-introduction of pulmonary function tests. Over the past year SASOM has developed and disseminated its own peer-reviewed position statements, policies and directives on various COVID-19-related topics including medical records, occupational medical examinations, COVID-19 vaccination, COVID-19 antigen and antibody testing in the workplace, compensation for workplace-acquired COVID-19, and management of COVID-19 risk waste.

South Africa has been the hardest-hit country on the continent and as at 15 May 2021 (the beginning of the third wave), the COVID-19 statistics were as follows: 11,087,505 tests conducted (total population: approximately 60 million); 1,611,143 total positive cases identified; 1,523,243 total recoveries (confirmed negative, approximately 94 per cent recovery rate); and 55,183 total deaths.

Sources: Statistics South Africa (http://www.statssa.gov.za/?p=12744); NICD (www.nicd.ac.za); NIOH (www.nioh.ac.za); SASOM (https://sasom.org).

Box 4 **Some lessons learned from the COVID-19 pandemic**

- COVID-19 poses a threat to both public health and occupational health.
- Working in healthcare settings can be hazardous to health; however, diverse occupational groups are recognized as being at risk, not only health workers.
- Around 14 per cent of COVID-19 cases reported to the WHO are among health workers. In some countries, the proportion can be as high as 35 per cent.
- Healthcare facilities continue to be overwhelmed in many countries.
- The shortcomings in the availability and/or standards of personal protective equipment (PPE) have left large numbers of healthcare and other workers without adequate protection.
- The impact of COVID-19 extends far beyond infection.
- A major concern of many workers is the fear of job losses or loss of income.
- The work and family challenges brought on by the pandemic are unprecedented and severe.
- The COVID-19 crisis, lockdown and economic recessions have exacerbated pre-existing health inequalities.
- The prevalence and severity of the COVID-19 pandemic is magnified because of pre-existing epidemics of chronic disease – which are themselves associated with social determinants of health, such as housing and work conditions and access to quality healthcare.
- Lower socio-economic workers have less access to PPE, fewer options to work from home and a higher risk of losing their jobs.
- COVID-19 is experienced unequally, with higher rates of infection and mortality among the most disadvantaged communities: it is not a socially neutral disease.
- The COVID-19 pandemic has highlighted the critical need for very close trans- and multi-disciplinary collaboration between various professionals to inform better decision-making by organizations.
- If poorly controlled, emerging infections have the potential to cause epidemics and pandemics with a high socio-economic impact and will continue to be real threats to the world. We must remain vigilant to be ready and able to respond effectively.

Recommendations for further action

For the ILO, WHO, EU and all relevant global and regional international institutions

1. 1The older-than-60-years tradition of the quinquennial Joint ILO/WHO Committee on Occupational Health should be continued according to the guidelines decided by the United Nations General Assembly in 1950, in line with the United Nations Sustainable Development Goals (SDGs).
2. The ILO and WHO should urgently convene the 14th Session of the Joint ILO/WHO Committee on Occupational Health. This Committee should consider continuing to deal with the discussions on *all recent occupational health and safety issues* and initiate further

action internationally and nationally. The most recent Committee Session was organized many years ago in Geneva, Switzerland on 9–12 December 2003.

3. It is important to recognize COVID-19 as a priority occupational hazard. The most urgent task should be the discussion around WHO and ILO collaboration on policies and practices for the protection of workers' health and safety against the COVID-19 pandemic. The ILO and WHO should join forces for recognition of work-related COVID-19 as an occupational disease globally and ensure just compensation for workers who have contracted COVID-19 at work.
4. The ILO should launch immediate actions for the promotion of the ratification of the ILO Occupational Health Services Convention, 1985 (No. 161), to ensure effective responses in future for the protection of workers' occupational health, including actions for possible future pandemics.
5. The ILO in collaboration with the WHO should pay special attention to the protection of high-risk workers, such as health workers, social workers, police forces, emergency responders, cleaners, and workers in small-scale enterprises against occupational COVID-19 risk at work, giving the highest priority to health workers and other service workers with close face-to-face contact with clients in their daily work.
6. The ILO in collaboration with the WHO should undertake priority actions in developing *universal occupational health coverage* (UOHC), ensuring competent occupational health services for all workers of the world (private, public, formal, informal) in all economic sectors and in all types of workplaces, as decided by the 49th World Health Assembly (49.12).
7. The ILO in collaboration with the WHO should produce guidelines for the protection of workers against the SARS-CoV-2 virus at work, and good working practices in all workplaces and work environments. Special guidelines are needed for practices for the protection of vulnerable or marginalized groups of workers, such as elderly workers, informal workers, domestic workers, young workers, migrant workers, and those with chronic respiratory and cardiovascular diseases or diabetes, among others.
8. The ILO in collaboration with the WHO, in line with the United Nations SDGs and related objectives and specific targets on all SDGs and, in particular, SDG 3 *Good Health and Wellbeing* and SDG 8 Decent Work and Economic Growth should organize global, national and local action programmes related to occupational health and safety, and the coordination of such activities.
9. The promotion of ratification and implementation of ILO Conventions Nos 81, 155, 161 and 187, and other relevant instruments, need strong support from governments, workers, employers and their organizations. This includes better statistics, information and practical knowledge on prevention of occupational accidents and diseases at work, at all levels.

For international and national stakeholders: governments, inspectorates and institutions, employers and workers and their national and international organizations

10. Besides prevention and management of the COVID-19 pandemic at community level and in private, family and social life, the prevention and management of epidemics and pandemics require effective actions in the workplace. Such measures demand competence in occupational health and good knowledge on work practices, working environments and conditions of work. There must also be a recognition of the need to internationally regulate the risk of epidemics and pandemics at work and to afford competent inspectors the right to enter workplaces for risk identification at the earliest possible stages, thus emphasizing the critical contribution that can be made by implementing actions that prevent the exposure in the first place.
11. Considering the huge social value of efforts towards "zero harm" at work, and opportunities for economic gains in eliminating and reducing injuries, diseases, disorders and other harmful consequences of poor work environments, detailed and practical action should be initiated to identify priorities for related risks and their prevention, and based on such priorities, to collaboratively plan and implement these activities. In addition to effectively responding to the concurrent hazards and risks, special attention should be given to the prediction of and preparedness for potential new hazards including global pandemics and possible occupational risks from new technologies and climate change, among others.
12. Work-related epidemics may also cover much wider concepts than communicable diseases. One such example is the global and continuing use of asbestos that kills some 255,000 workers annually and causes some 50–70 per cent of all occupational cancer fatalities (Furuya et al. 2018). Below is a list of actions that have been shown to be efficient and practical measures:
    a. Establish a clear and comprehensive regulatory framework based on ILO standards and codes of practice.
    b. Maintain a capable and adequately resourced enforcement system, i.e. an occupational safety and health inspectorate.
    c. Create and maintain a gradually expanding workplace injury compensation system based on workplace level data collection, recording and notification of occupational accidents and work-related diseases.
    d. Provide proper occupational health services – at least basic services – that are in contact with workplace level prevention and treatment plans and early action to identify risks and their elimination and reduction.
    e. Establish a framework for workplace level collaboration between workers and employers, including responsible safety and health representatives of workers, and their employer and top management counterparts, and active safety and health committees.

f. Use best available information and knowledge, together with supporting bodies and expertise for enhancing workforce and public awareness, facts and scientific evidence for media use and campaigns.

g. The fundamental workers' right to know and right to be informed about hazards and risks at work should be respected, including in situations such as COVID-19.

h. Workers' compensation bodies and governments in collaboration with social partners should recognize and gradually enhance coverage of diseases and disorders that arise out of work as notified occupational diseases and injuries, including COVID-19 at work, following the ILO List of Occupational Diseases (ILO 2010).

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