

TOTAL WHO/ILO Joint Estimates of the Work-related Burden of Disease and Injury, 2000–2016

QUESTIONS AND ANSWERS

For WHO and ILO web

1. What are the WHO/ILO Joint Estimates of the Work-related Burden of Disease and Injury (WHO/ILO Joint Estimates)?

The WHO/ILO Joint Estimates are the official estimates of WHO and ILO on the burden of disease attributable to occupational risk factors.^{1,2} They are produced at national, regional and global level and disaggregated by sex and age group and provide the most comprehensive set of official estimates of work-related burden of disease produced to date.

Until very recently, WHO and the ILO have produced separate estimates on work-related burden of disease, with the use of different methodologies yielding different results. Member States have asked that the two United Nations Specialized Agencies harmonize their estimates, and UN reform has compelled UN organizations to build synergies as One UN.

In 2016, WHO and the ILO agreed to develop a joint estimation methodology and produce the WHO/ILO Joint Estimates. In 2019, the two Organizations further strengthened their partnership by signing a Collaboration Agreement to produce the WHO/ILO Joint Estimates regularly. In the same year, WHO and ILO proposed to the UN Statistical Commission that an indicator be added to the SDG indicator system on mortality from diseases attributable to occupational risk factors, produced from the WHO/ILO Joint Estimates.³ In 2021, the Organizations published the first set of WHO/ILO Joint Estimates, capturing 19 occupational risk factors and 31 health outcomes.^{1,2}

2. How large is the work-related burden of disease?

The World Health Organization (WHO) and the International Labour Organization (ILO) estimate that 1.9 million people died from occupational risk factors globally in the year 2016.^{1,2} Of these work-related deaths, diseases accounted for 81%, while injuries comprised 19%. These are WHO/ILO Joint Estimates of the Work-related Burden of Disease and Injury (WHO/ILO Joint Estimates).

Globally in 2016, risk factors at the workplace caused the loss of 90 million disability-adjusted life years (DALYs). One DALYs is one year of life lost to disease, disability or premature death, summing years lived with disease or disability and those lost to premature death. Of the 90 million work-related DALYs lost, disease and injuries accounted for 71% and 30%, respectively (difference due to rounding).

Loss of life and health is often referred to as “burden of disease”, the umbrella term for the combined burdens of communicable diseases, non-communicable diseases and injuries. The WHO/ILO Joint Estimates currently comprise selected non-communicable disease and injuries.^{1,2} They can be sourced from the *Global Monitoring Report*¹ and our [website](#) with a visualizing and downloading [application](#).

3. What are the key occupational risk factors?

The occupational risk factor with the largest number of attributable deaths is exposure to long working hours (≥ 55 hours per week); it was responsible for 745 000 deaths globally in 2016. The second and third deadliest occupational risk factors are occupational particulate matter, gases and fumes (450 000 deaths) and occupational injuries (363 000 deaths).

The occupational risk factor responsible for the largest number of DALYs is occupational injuries (26.4 million), followed by exposure to long working hours (23.3 million) and occupational ergonomic factors (12.3 million).

4. What are the health outcomes with the largest work-related burden of disease?

Worldwide in 2016, the health outcome with the largest work-related burden of deaths was chronic obstructive pulmonary disease (450 000 deaths), followed by stroke (398 000 deaths) and ischaemic heart disease (347 000 deaths). These respiratory and cardiovascular diseases alone therefore contributed two thirds of the total work-related burden of deaths.

Stroke was the leading health outcome for work-related DALYs (12.6 million), followed by back and neck pain (12.3 million) and chronic obstructive pulmonary disease (10.9 million).

5. Which regions are most impacted?

On average across the globe, 34.3 deaths occurred per 100 000 working-age population (i.e. age ≥ 15 years) in 2016. The Region of South-East Asia and the Western Pacific Region had rates above the global rate: 45.0 and 37.5 deaths per 100 000 working-age population, respectively. In relative terms, the death rates for South-East Asia and the Western Pacific were 30% and 10% higher than the global rate.

6. Are men more affected than women?

Men carry a larger work-related burden of disease than women. Compared to the death rate for both sexes (34.3 deaths per 100 000 working-age population), men had a higher rate of death at 51.4 deaths per 100 000 working-age population. For women, the rate was 17.2 deaths per 100 000 working-age population.

7. Which age groups are most affected?

The death rates for people aged 55 years and over were higher than the rate for all age groups (34.3 deaths per 100 000 working-age population). The death rate peaked at 212.6 deaths per 100 000 working-age population in the age group 85-89 years. This was 7.2 times higher than the rate for all age groups. Some of the health outcomes take years to develop and be diagnosed after exposure to a risk factor occurs, so some of the burden in the older age groups will be due to exposures much earlier in working life.

8. How can work-related burden of disease be prevented?

Governments, in consultation with workers and employers, can act to prevent work-related burden of disease.⁴ Governments need to ensure universal coverage with occupational health services⁵ and

people-centred primary health care to reach disadvantaged workers, such as migrants and workers in the informal economy.⁶ Additionally, social protection floors can protect disadvantaged workers. Earlier in September 2021, WHO with partner agencies put forward 20 actions that decision-makers and local actors can take to protect and promote health in the workplace, as part of a larger compendium of 500 actions to create healthier populations through healthy environments.⁷

Employers can ensure provision of occupational and workers' health and safety risk assessments and that workers have access to occupational health services. A collection of International Labour Standards on Occupational safety and health can be found in the NORMLEX information system.⁸ Through regular occupational and workers' health and safety assessments, workers' exposure to occupational risk factors can be monitored and relevant health screening can be used to provide early detection of occupational disease (e.g. testing for exposure to occupational risk factors or screening for work-related or occupational diseases). Workers or their representatives and employers can ensure healthy and decent working conditions through bilateral and collective bargaining agreements.

For each occupational risk factor, there are also specific measures that can be taken to prevent their work-related burden of disease. For many of the physical occupational risk factors, the Hierarchy of Controls⁹ should be followed: ideally, risk factors should be eliminated or less hazardous substitutions used. If this is not possible, engineering controls can be introduced to isolate workers from the hazards, or administrative controls to change the way people work. Finally, if exposure cannot be reduced by other methods, workers can be protected with Personal Protective Equipment.

Intersectoral action is required, at least between the health and labour sectors.

9. What is the global Comparative Risk Assessment and how do the WHO/ILO Joint Estimates contribute to the CRA?

The global Comparative Risk Assessment (CRA) and its framework were developed by WHO with partners in the 1990s.¹⁰ It quantifies burden of disease at population level caused by various risk factors in a comparative and internally consistent way. It always applies the same definitions and framework; uses a similar method for combining exposure and risk information; and uses the same method for expressing results (often deaths and DALYs). The CRA links burden by disease and by risk factor.

Our report for the WHO/ILO Joint Estimates is WHO's most comprehensive CRA for occupational risk factors. It is the first joint CRA of WHO with ILO. This joint CRA comprises WHO/ILO Joint Estimates covering 19 risk factors and 31 health outcomes. It estimated attributable burden of disease, i.e. current burden from past exposure to occupational risk factors. It uses reported cases of occupational disease and injury to inform the estimates where applicable. Application of the CRA framework makes estimates of health loss comparable between risk factors and health outcomes.

10. What is a disability-adjusted life year (DALY)?

The DALY is a measure of overall disease burden, expressed as the number of years lost due to ill-health, disability or early death. DALYs combines years of life lost (YLL) due to premature mortality and years lived in disability/disease (YLD).

11. What is the scope of the WHO/ILO Joint Estimates?

The WHO/ILO Joint Estimates include 19 risk factors and 31 health outcomes. These are combined in 41 relevant occupational risk factor and health outcome pairs (Table 1). These are the selected occupational risk factor and health outcome pairs that WHO and ILO assessed to be based on sufficient evidence of harmfulness. The WHO/ILO Joint Estimates will be extended progressively to include further pairs of occupational risk factor and health outcome.

Table 1: Pairs of occupational risk factor and health outcome captured by WHO/ILO Joint Estimates

	Risk factor	Health outcome
1	Occupational exposure to asbestos	Trachea, bronchus and lung cancers
2	Occupational exposure to asbestos	Ovary cancer
3	Occupational exposure to asbestos	Larynx cancer
4	Occupational exposure to asbestos	Mesothelioma
5	Occupational exposure to arsenic	Trachea, bronchus and lung cancers
6	Occupational exposure to benzene	Leukaemia
7	Occupational exposure to beryllium	Trachea, bronchus and lung cancers
8	Occupational exposure to cadmium	Trachea, bronchus and lung cancers
9	Occupational exposure to chromium	Trachea, bronchus and lung cancers
10	Occupational exposure to diesel engine exhaust	Trachea, bronchus and lung cancers
11	Occupational exposure to formaldehyde	Nasopharynx cancer
12	Occupational exposure to formaldehyde	Leukaemia
13	Occupational exposure to nickel	Trachea, bronchus and lung cancers
14	Occupational exposure to polycyclic aromatic hydrocarbons	Trachea, bronchus and lung cancers
15	Occupational exposure to silica	Trachea, bronchus and lung cancers
16	Occupational exposure to sulphuric acid	Larynx cancer
17	Occupational exposure to trichloroethylene	Kidney cancer
18	Occupational asthmagens	Asthma
19	Occupational particulate matter, gases and fumes	Chronic obstructive pulmonary disease
20	Occupational noise	Other hearing loss
21	Occupational injuries	Pedestrian road injuries
22	Occupational injuries	Cyclist road injuries
23	Occupational injuries	Motorcyclist road injuries
24	Occupational injuries	Motor vehicle road injuries
25	Occupational injuries	Other road injuries
26	Occupational injuries	Other transport injuries
27	Occupational injuries	Poisoning by carbon monoxide
28	Occupational injuries	Poisoning by other means
29	Occupational injuries	Falls
30	Occupational injuries	Fire, heat and hot substances
31	Occupational injuries	Drowning
32	Occupational injuries	Unintentional firearm injuries
33	Occupational injuries	Other exposure to mechanical forces

	Risk factor	Health outcome
34	Occupational injuries	Pulmonary aspiration and foreign body in airway
35	Occupational injuries	Foreign body in other body part
36	Occupational injuries	Non-venomous animal contact
37	Occupational injuries	Venomous animal contact
38	Occupational injuries	Other unintentional injuries
39	Occupational ergonomic factors	Back and neck pain
40	Exposure to long working hours	Stroke
41	Exposure to long working hours	Ischaemic heart disease

12. How have the estimates been calculated?

To estimate the number of deaths and DALYs attributable to an occupational risk factor and health outcome pair, it is necessary to know the population attributable fraction (PAF). A PAF quantifies the proportion of deaths or DALYs lost from a particular health outcome that is attributable to a specific risk factor, e.g. the proportion of deaths from stroke that can be attributed to exposure to long working hours. Additionally, the total number of deaths and DALYs that are estimated to occur each year for the health outcome are needed, e.g. the total number of deaths and DALYs from strokes in 2016. This is referred to the “total disease envelope”.¹¹ WHO produces these envelopes from mortality records collected by governments in countries.¹²

For 39 of the pairs of occupational risk factors and health outcomes included in this report the methodology for estimating burden of disease is established. For these, we were able to calculate PAFs from established burden of disease estimates for each risk factor and health outcome.¹³ These were applied to the total disease envelope for each year and for each disease. This resulted in estimates of the numbers of deaths and DALYs for each health outcome attributable to its respective occupational risk factor.

For the estimates related to exposure to long working hours (≥ 55 hours per week) and cardiovascular diseases,¹⁴ PAFs needed to be calculated. To do this, we required two key data sources: i) the prevalence of exposure to long working hours and ii) the risk ratio for the two cardiovascular outcomes among those exposed to long working hours compared to those not exposed to long working hours. Prevalence of exposure was modelled using data on the number of hours worked from over 2300 worldwide surveys. Risk ratios for the effect of exposure to long working hours on ischaemic heart disease and stroke were sourced from systematic reviews and meta-analyses conducted by WHO and ILO, supported by a large number of individual experts.^{15, 16} Once the PAFs were calculated, they were applied to WHO’s total disease envelopes for stroke and ischaemic heart disease.

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