# Occupational and environmental health

## Introduction

**Prof David Vernez** | Chef de département

unisanté

**Centre universitaire de médecine générale et santé publique · Lausanne**

**Département Santé Travail - Environnement**
Rte de la Corniche 2
CH-1066 Epalinges-Lausanne
Tél. +41 21 314 74 51
www.unisante.ch

# Unisanté

## Dpt. of Occupational and environmental health (DSTE)

www.unisante.ch

- About 900 employees
- Regroups the cantonal public health and community health institutions

DSTE

- Applied research, pre- and post-graduate education
- Specialized consultations
- Services to companies
- Hygienists, toxicologists, biologists, chemists, environmental engineers, ergonomists, medical psychologists...

# Course outline

## Overiew of health risks by categories

- Chemical substances
- Physical agents
- Physico-chemicals
- Biological

## Specific topics

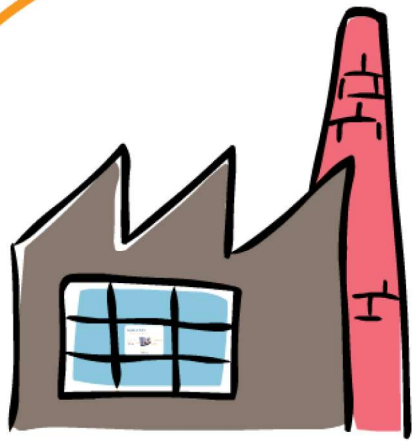
- Climate change and health
- Health interventions
- indoor Air Quality (IAQ)

# What will I learn or be able to do ?

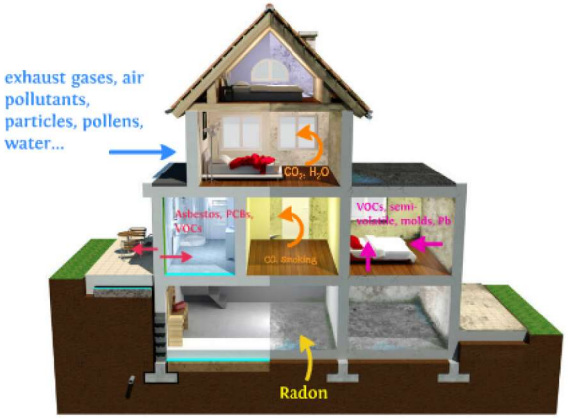
- To understand the **health impacts** of some environmental determinants
- To be able to identify **hazardous situations** associated with environmental pollutants
- To be familiar with how occupational and environmental **risk are quantified** and managed

# Domain

## Concepts of living environment and health determinant



Professional environment




Home environment

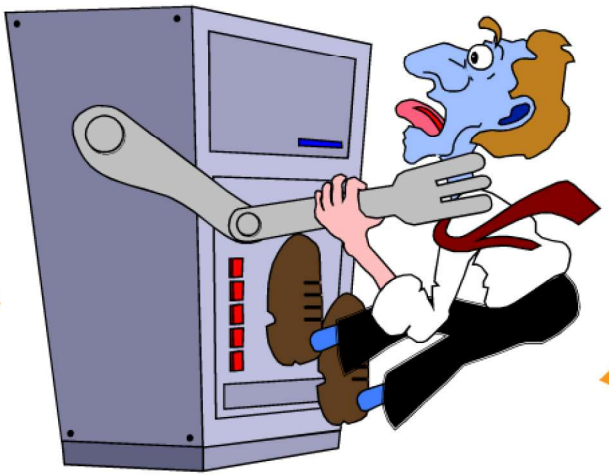
Outdoor environment

# Occupational health and HSE

The main disciplines of occupational health

Occupational hygiene and safety

Environment and work tools

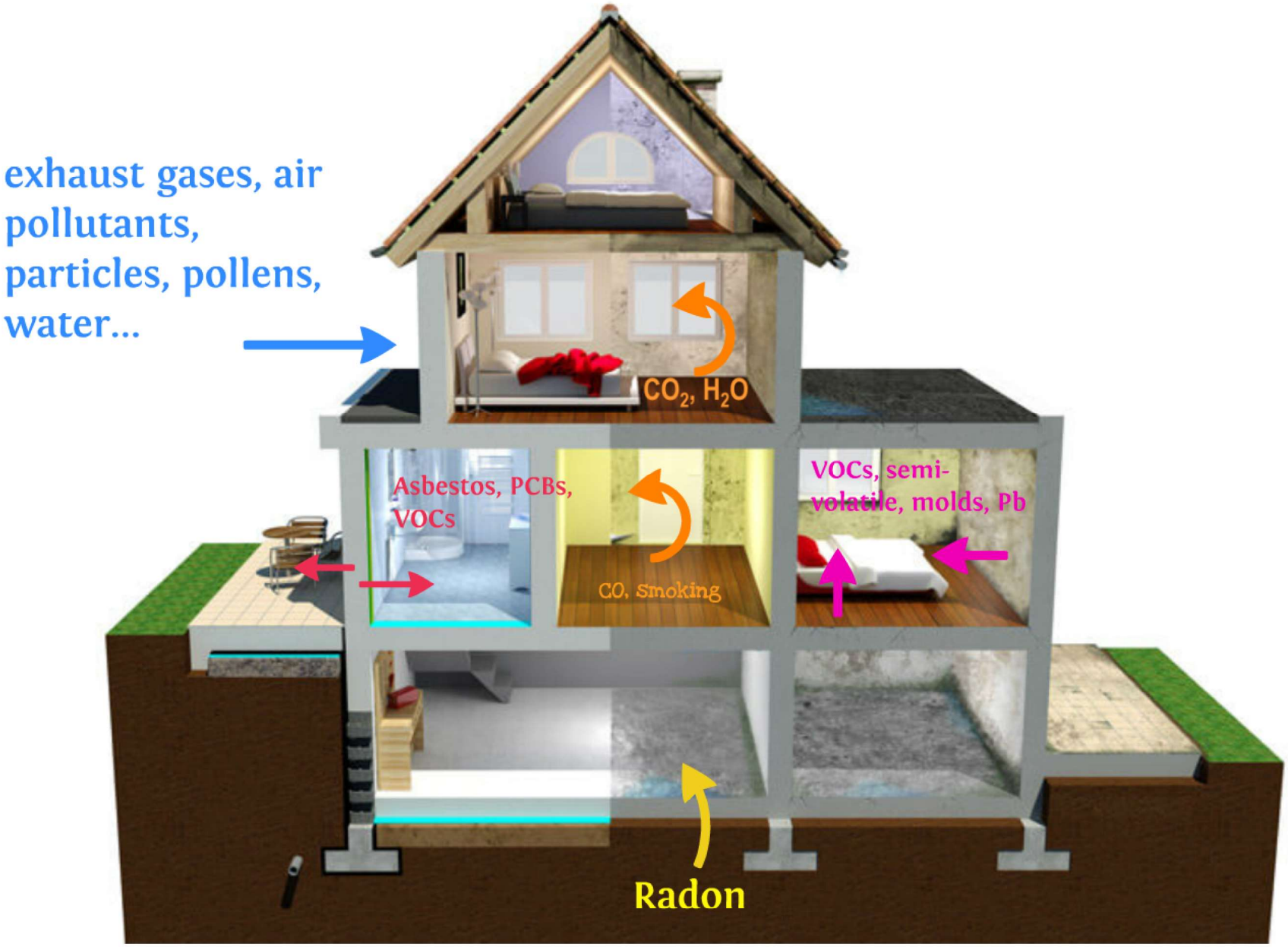


Occupational Medicine

Worker

Ergonomic

Environment - human interface


exhaust gases, air pollutants, particles, pollens, water...
$CO_2$, $H_2O$
Asbestos, PCBs, VOCs
CO, smoking
VOCs, semi-volatile, molds, Pb
Radon

# Introduction: general background

Historical

Framework

Stakes

460-380 av JC

## Hippocrate

Lead poisoning of miners and metalworkers.

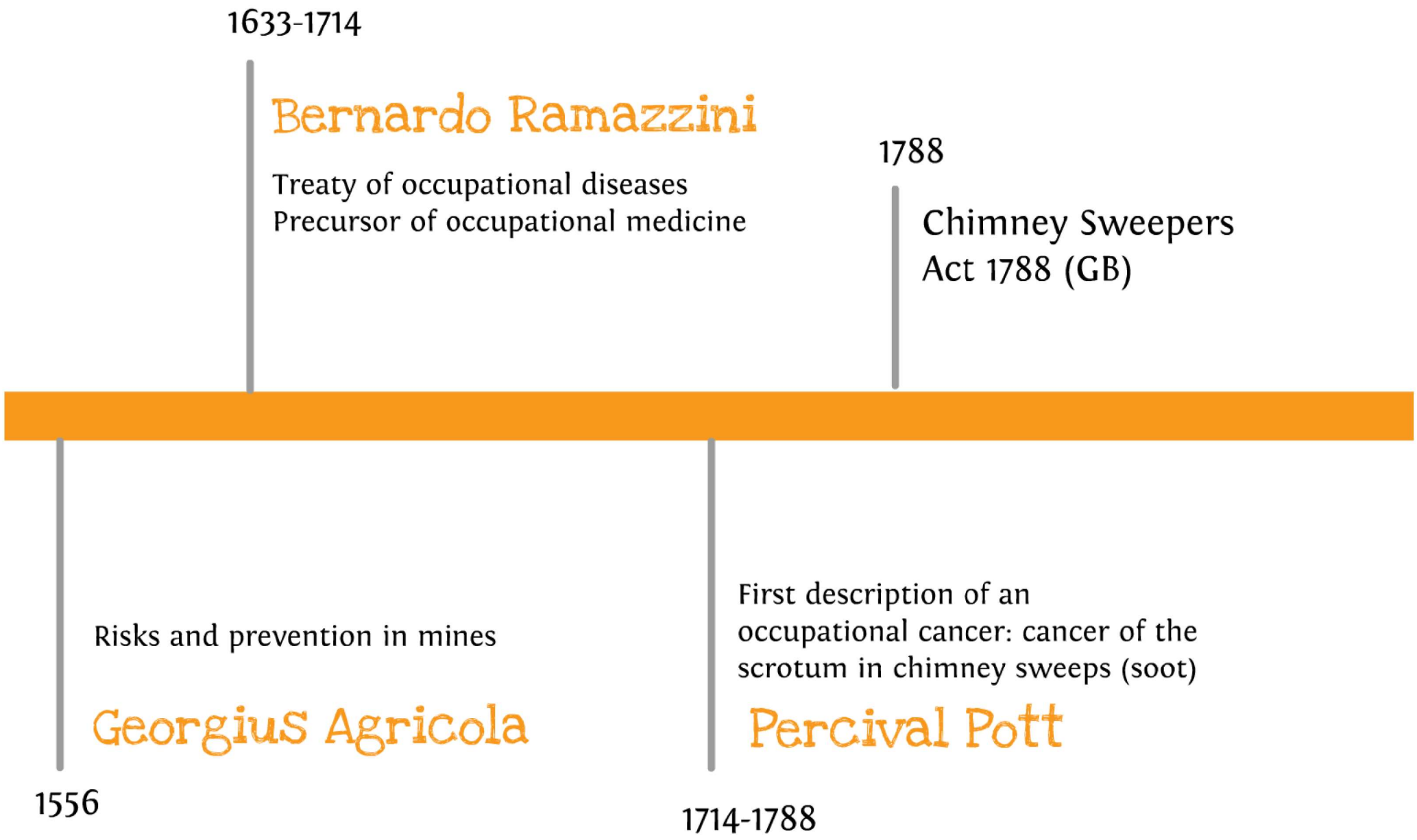
Air quality in the environment.

23-79 ap JC

## Pline l'ancien

De historica naturalis
(sheepskin bladder to protect against lead fumes)

# genesis of environmental and occupational health


1633-1714
Bernardo Ramazzini
Treaty of occupational diseases
Precursor of occupational medicine
1788
Chimney Sweepers
Act 1788 (GB)
Risks and prevention in mines
Georgius Agricola
1556
First description of an
occupational cancer: cancer of the
scrotum in chimney sweeps (soot)
Percival Pott
1714-1788

1822

## Philibert Patissier

Treaty of the diseases of the craftsmen and those which result from the various professions, according to Ramazzini
First modern vision of occupational hygiene.

1869-1970

## Alice Hamilton

Investigated the effects of working conditions and chemical substances on the health of miners (Hg, Pb, organic solvents, Ra).
Established the first precise causalities between exposure and effect.
Created a research team at the University of Harward under the name of Industrial Hygiene.

1962

## Rachel Carson

The silent spring
a pioneer in the concept of environmental health.

# Definitions

Occupational Health is the promotion and maintenance of the highest degree of **physical, mental and social well-being** of workers in all occupations by preventing departures from health, controlling risks and the adaptation of work to people, and people to their jobs.

WHO/ILO 1950

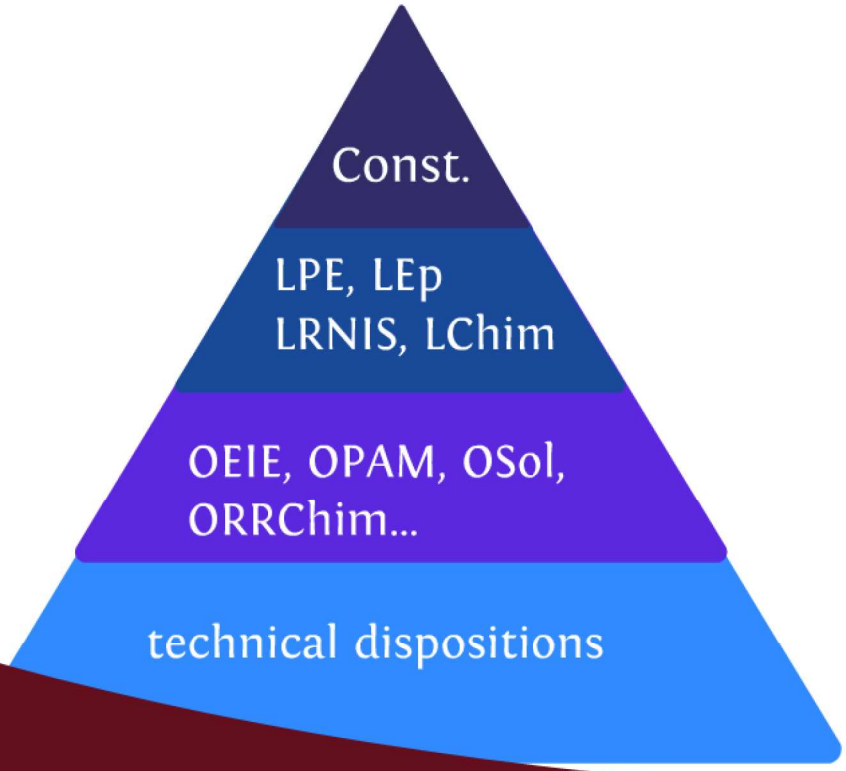
Those aspects of the human health and disease that are determined by **factors in the environment**. It also refers to the theory and practice of assessing and controlling factors in the environment that can potentially affect health.

WHO 1989

# Environmental health

## Health-related legislation

LPE: protection of humans, animals and plants. Conservation of resources and biodiversity.




FOEN (environment) soil, water, air, natural hazards, environmental and health protection

FOPH (health): health and accident insurance, chemicals, medicines, health promotion, radiation protection, etc.

# Environmental pollutants

## Airborne pollutants (IARC 2015)

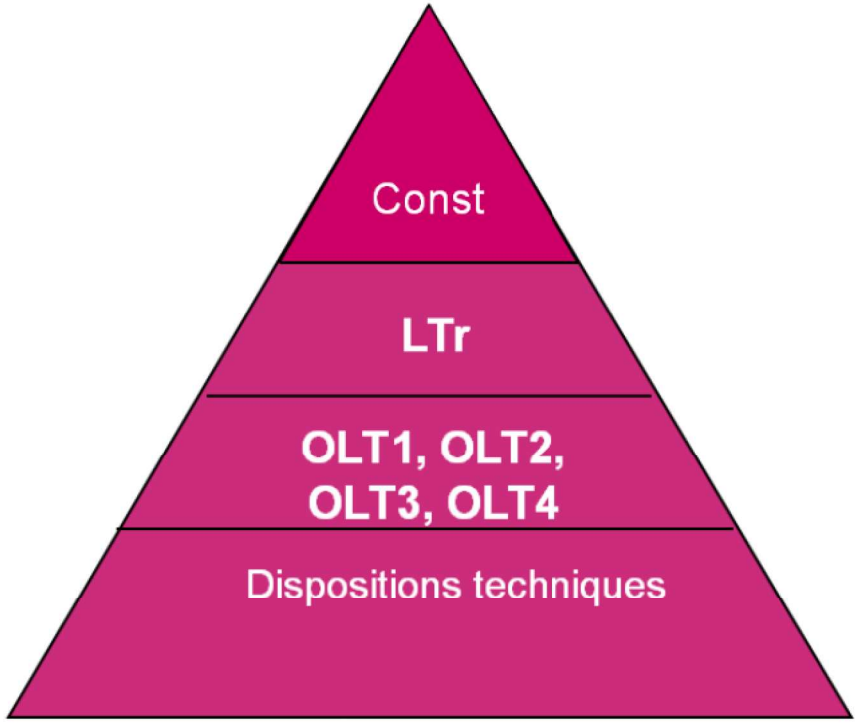
- presence of one or more substances
- [ ] or duration above background levels
- likely to produce adverse effects in humans
- also naturally occurring

| Pollutant/pollutant class | Examples |
|---|---|
| Photochemical oxidants | Ozone |
| Sulfur dioxide ($SO_2$) | $SO_2$ |
| Carbon monoxide (CO) | CO |
| Nitrogen oxides ($NO_x$) | $NO_2$ |
| Hazardous air pollutants (HAPs) | Benzene, 1,3-butadiene, formaldehyde, acids |
| Mercury (Hg) | $Hg^0$, methyl mercury |
| Lead (Pb) | Pb |
| PM, including $PM_{2.5}$, $PM_{10}$, inhalable PM, TSP | Inorganic ions (e.g. sulfate); metal oxides; carbonaceous material, including organic carbon (OC) and elemental carbon (EC) |
| Organic carbon (OC) | Hopanes, steranes, polycyclic aromatic hydrocarbons, levoglucosan (hundreds of species present, not all identified or quantified) |

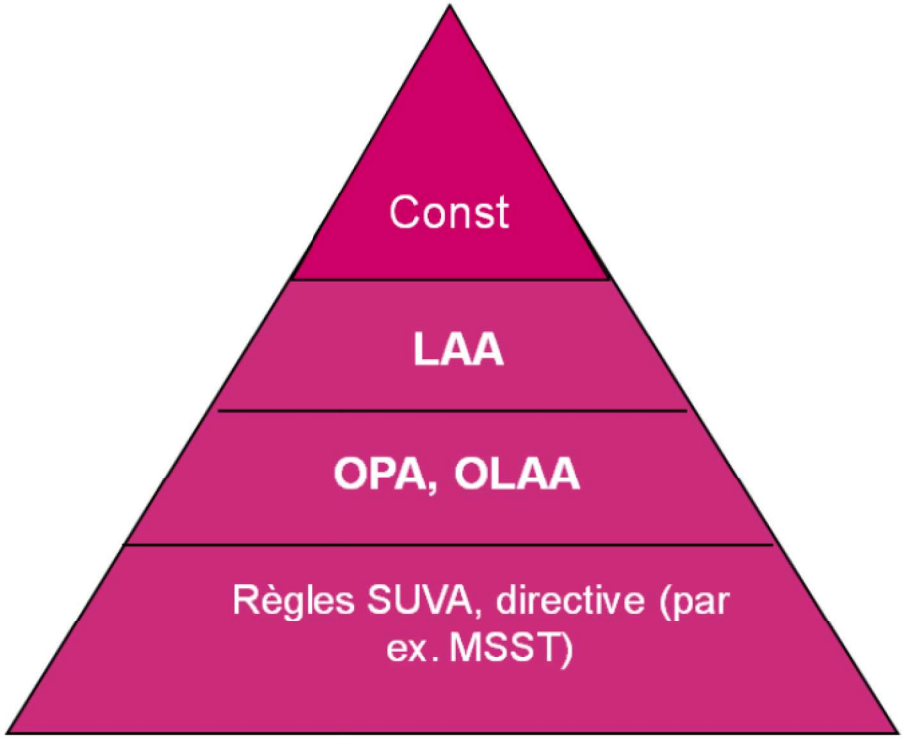
# Occupational health - Legal framework in Switzerland

## A dual system

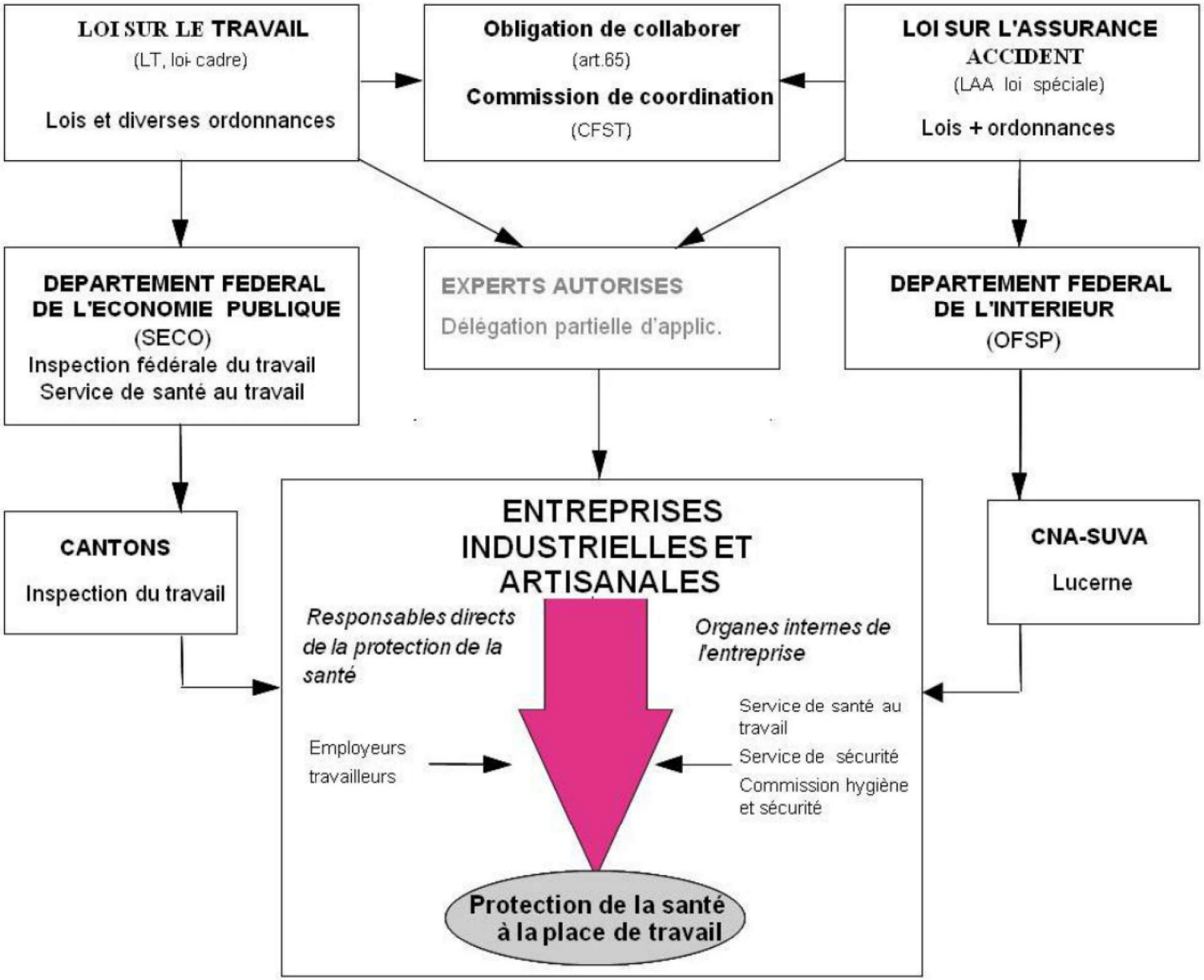
Health protection, working hours and rest periods, approval of plans




Accident insurance, accident prevention and occupational diseases



# Legal framework in Switzerland



# Occupational Health Domains


recognized specialists in occupational health and safety

All sources of health degradation (chronic and acute) must be considered

# Occupational Health Domain

## LTr (Labour law)

- Health protection, working hours and rest periods, approval of plans, special protective measures

*"The employer is obliged to take, in order to prevent occupational accidents and diseases, all measures which experience has shown to be necessary, which the state of the art allows to be applied and which are suitable for the given conditions."Art. 82 LAA*

## LAA (Insurance law)

- Accident insurance, prevention of occupational accidents and diseases, scope and organization of insurance

## Other legislations

Participation Act, Product Safety, Chemicals Act....

# Labour law

LTr • Federal Law on Labour in Industry, Trade and Commerce (Labour Law) of 13 March 1964 (SR 822.11)

OLT 1 General Ordinance

OLT 2 Special provisions for certain categories of workers

OLT 3 Health protection, hygiene

OLT 4 Construction and development of enterprises subject to the planning approval procedure

OLT 5 Protection of young workers

# Occupational Health Domain

## Directive CFST 6508 concerning the call for specialists

- Applicable to all enterprises
- Except companies with fewer than 5 workers and subject to a premium rate of up to 5‰
  355'000 entreprises

- Defines the company's obligations in terms of safety organization and the use of specialists.
  Safety engineers/officiers, hygienists, occupational physicians

- Obligations according to the size of the company and the presence of specific hazards
  Solvents or chemicals in large quantities
  Special or industrial waste
  Work with harmful substances according to the exposure limit values at the workplace...

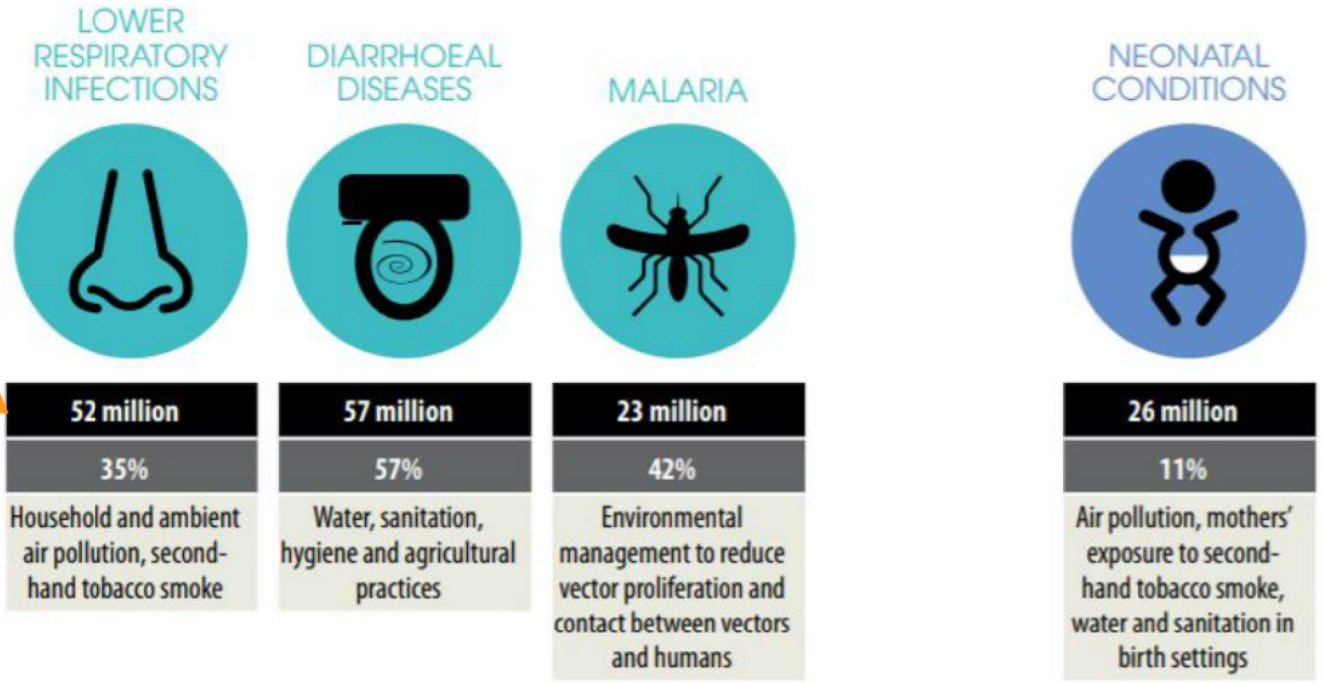
# Environmental pollutants

## Health impacts

24% of all death are related to the environment (WHO)

Disability-adjusted life years (DALYs)

Proportion attributable to the environment



| CANCERS | UNIPOLAR DEPRESSIVE DISORDER | CARDIO-VASCULAR DISEASES | CHRONIC OBSTRUCTIVE PULMONARY DISEASE | ASTHMA | MUSKULO-SKELETAL DISEASES |
|---|---|---|---|---|---|
|  |  |  |  |  |  |
| **49 million** | **8 million** | **119 million** | **32 million** | **11 million** | **23 million** |
| **20%** | **11%** | **31%** | **35%** | **44%** | **22%** |
| Air pollution, management of chemicals, radiation and workers' protection | Occupational stress, work-life imbalance | Household and ambient air pollution, second-hand tobacco smoke, chemicals | Household air pollution, workers' protection | Air pollution, second-hand tobacco smoke, indoor mould and dampness, occupational asthmagens | Occupational stressors, poor work postures, prolonged sitting, carrying water and solid fuels for household needs |

# Pollutants and occupational risks

## Traditionals

Chemicals
Gases, vapors
Mists, aerosols
Physical agents
Noise, vibrations
Temperature, humidity
Radiation
Accidents, safety
Ergonomics of workstations

## Emerging

Work organization
Psychosocial factors
Repetitive movements
Biological agents
Physical effort
Night work and flexibility
etc.

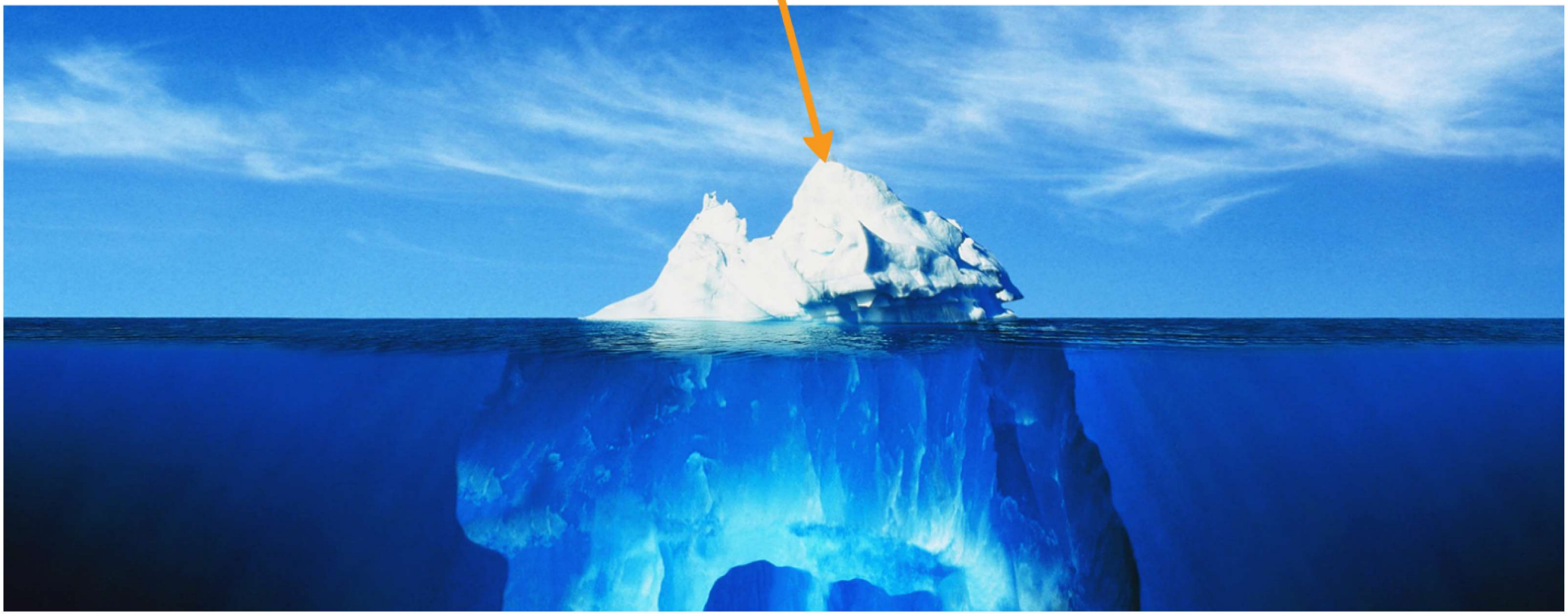
# Impact, the official figures (2019)

4.5 Mio salaried workers in Switzerland (>8h week)

Occupational accidents costs: 1.7 Mia

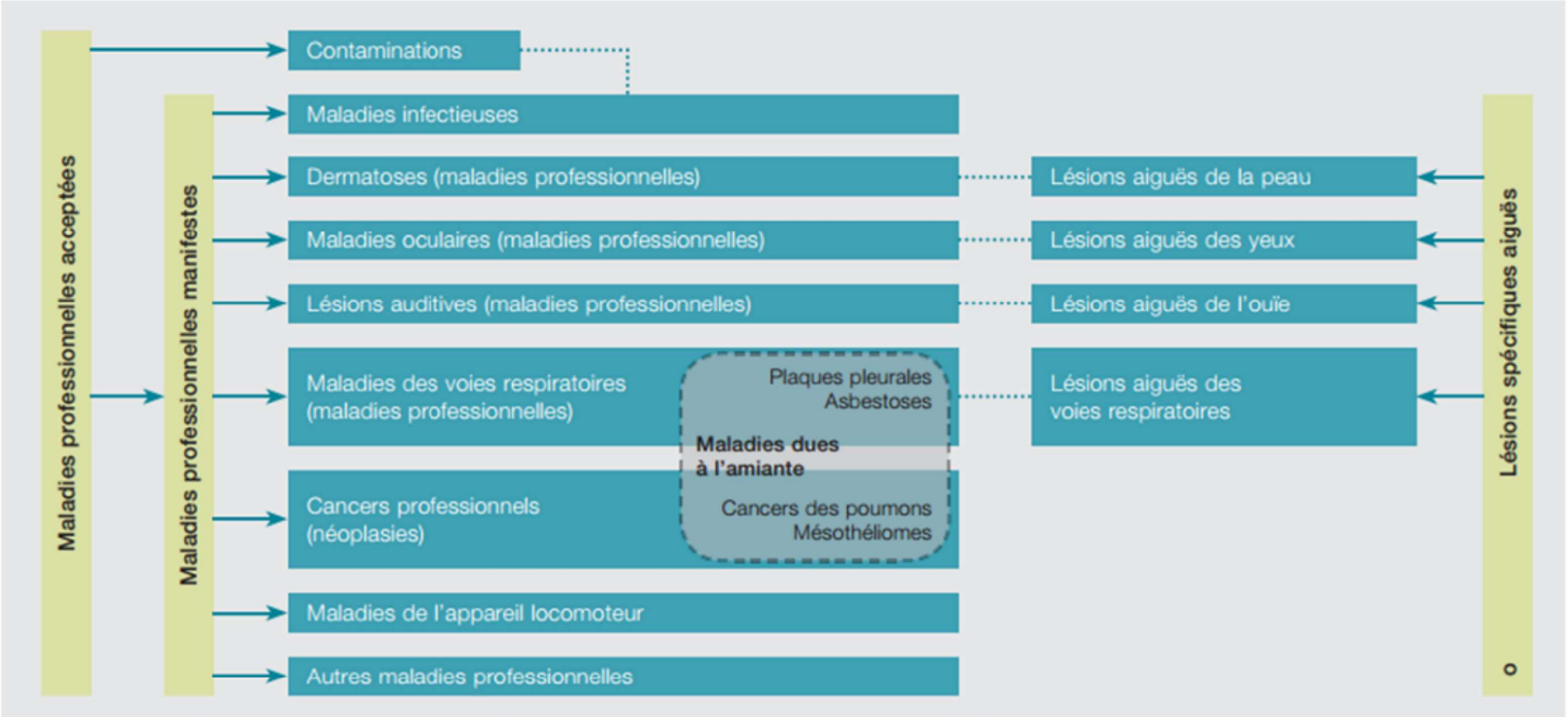
264'000 accidents leading to work interruption
3'312 diseases
524 deaths

Occupational diseases




Unidentified, non-Specific,
or multifactorial
Work-related" illnesses that are difficult to quantify: back pain, stress, general fatigue, cancer, etc. ....

# Which diseases ?




source Suva 2015

# Traditional risks

## European Working Conditions Survey (EWCS 2015)

Prevalence of european workers exposed › 25% of the time

| | 2005 | 2010 | 2015 |
|---|---|---|---|
| *Proportion of workers in EU28 exposed one-quarter of the time or more (%)* | | | |
| Vibrations from hand tools, machinery | 24 | 23 | 20 |
| Noise so loud that you would have to raise your voice to talk to people | 30 | 29 | 28 |
| High temperatures which make you perspire even when not working | 25 | 22 | 23 |
| Low temperatures whether indoors or outdoors | 22 | 23 | 21 |
| Breathing in smoke, fumes (such as welding or exhaust fumes), powder or dust (such as wood dust or mineral dust) | 19 | 17 | 15 |
| Breathing in vapours, such as solvents and thinners | 11 | 10 | 11 |
| Handling or being in skin contact with chemical products or substances | 14 | 15 | 17 |
| Tobacco smoke from other people | 20 | 11 | 9 |
| Handling or being in direct contact with materials which could be infectious, such as waste, bodily fluids, laboratory materials, etc. | 9 | 11 | 13 |
| Tiring or painful positions | 46 | 46 | 43 |
| Lifting or moving people | 8 | 9 | 10 |
| Carrying or moving heavy loads | 35 | 34 | 32 |
| Repetitive hand or arm movements | 62 | 63 | 61 |

Risks still present, little change from one year to another

# Emerging risks

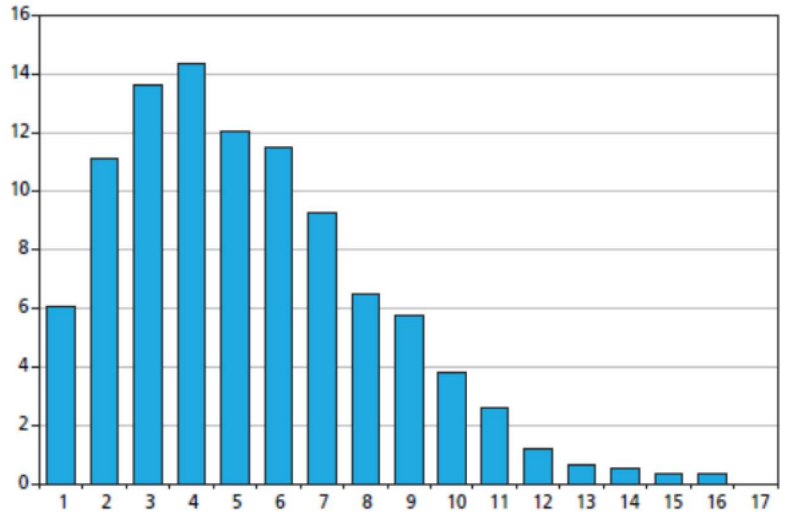
Lack of indicators
Lack of direct relationship
Non-specific diseases
Lack of knowledge


| Disease | portion attributable to work |
|---|---|
| musculoskeletal disorders (MSD) | 33 % |
| cardiovascular diseases | 5-20 % |
| of which night work | 7 % |
| psychological diseases | 10 % |
| cancers (mortality) | 4-10 % |

Hansen (1993),
Danish working environment
service (1996),
Leigh (2000)

# Perceived health impacts

› 30% of European workers declare that work affects their health




European Foundation for the Improvement of Living and Working Conditions, 2010

| Symptom | |
|---|---|
| Backache | 24.7 |
| Muscular pain | 22.8 |
| Fatigue | 22.6 |
| Stress | 22.3 |
| Headaches | 15.5 |
| Irritability | 10.5 |
| Injuries | 9.7 |
| Sleeping problems | 8.7 |
| Anxiety | 7.8 |
| Eyesight problems | 7.8 |
| Hearing problems | 7.2 |
| Skin problems | 6.6 |
| Stomach ache | 5.8 |
| Breathing difficulties | 4.8 |
| Allergies | 4.0 |
| Heart disease | 2.4 |
| Other | 1.6 |

# Health and Occupational classes

## European Working Conditions Survey (EWCS 2015)

Self rated health

# Bonnet et al., 2023

Life expectancy at the age of 35 (France) per sex and occupational class