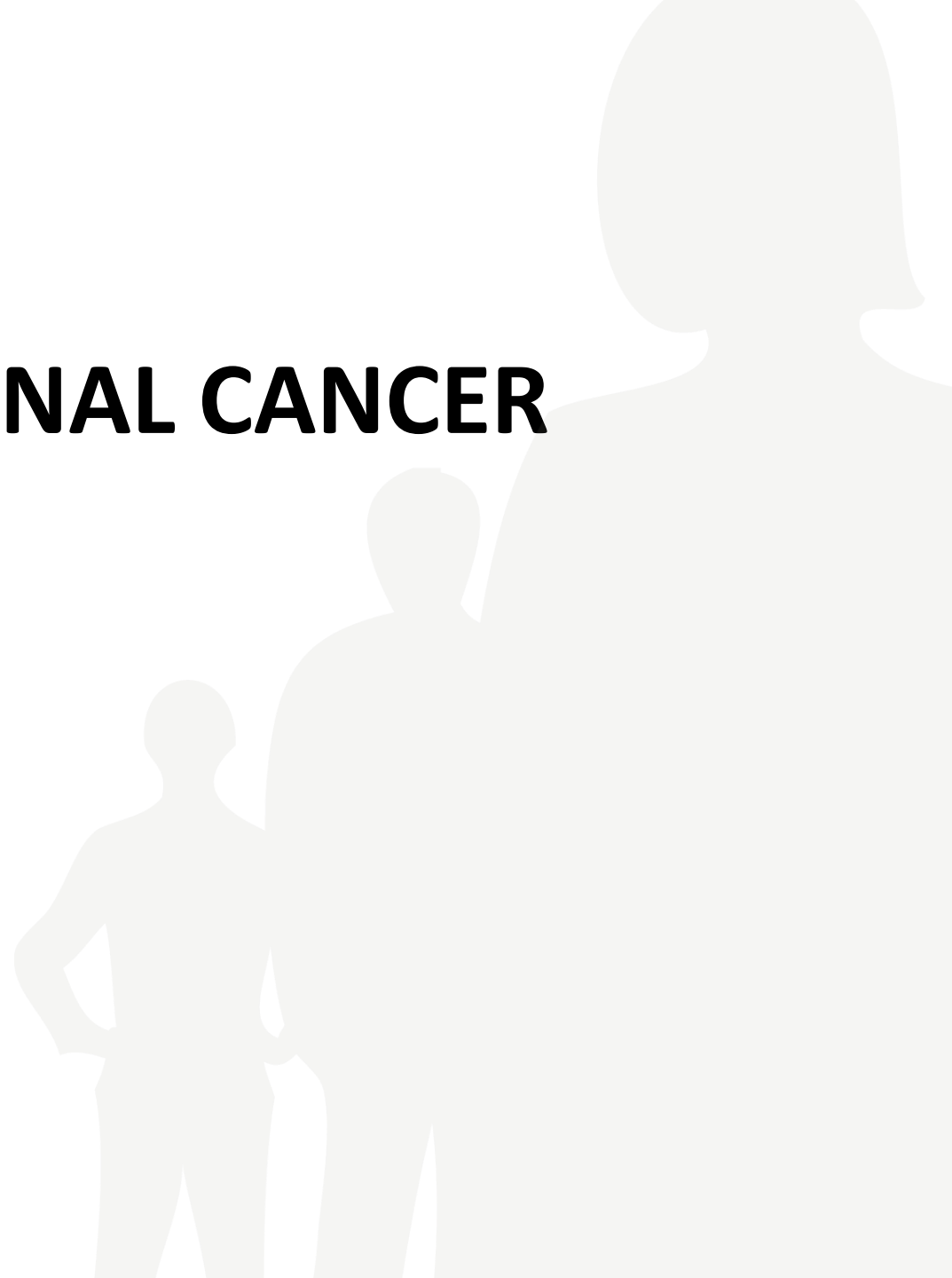




OCCUPATIONAL CANCER

Marija Bubas





Occupational diseases

Occupational diseases - included in the designated list of diseases at work where compensation is legally defined.

Around the world, 12.7 million people are diagnosed with cancer every year, and the number is expected to increase¹

Cancer is the leading cause of death in developed countries and the second leading cause of death in developing countries.

¹Ahrens, A., Braun, A., von Gleich, A., Heitmann, K. & Lißner, L. Hazardous chemicals in products and processes: Substitution and beyond, Innovation and Sustainability Series, Physica-Verlag, Heidelberg, Berlin, 2006.



History

How it all started

Percivall Pott - first to describe occupational cancer, caused by soot, in chimney sweeps

Hermann Joseph Muller discovered a clear connection between X-rays and lethal mutations (Muller, 1926).

Up to the 1970s - majority of human carcinogenic factors found primarily in the occupational environment. first identified include chemicals such as: arsenic, asbestos, benzene, chromium, nickel, radon and vinyl chloride (Siemiatycki et al., 2004).

IARC monographs - occupational factors still in vast numbers classified as 'probable' and 'possible' human carcinogens (Blair, Marrett & Freeman, 2011).

Muller, H., 'The problem of genetic modification', Fifth International Congress of Genetics in Berlin, 1926.

Siemiatycki, J., Richardson, L., Straif, K., Latreille, B., Lakhani, R., Campbell, S., Rousseau, M-C. & Boffetta, P., 'Listing occupational carcinogens', Environmental Health Perspectives, 112(15), 2004.

Blair, A., Marrett, L. & Freeman, L.B., 'Occupational cancer in developed countries', Environmental Health, 10, Supplement 1, 2011.



Workplace exposures

Cancers that occur as a result of exposures in the workplace are preventable, if exposures to known or suspected carcinogens can be reduced.

3-6% of all cancers worldwide are caused by exposures to carcinogens in the workplace (Driscoll et al. 2005; Rushton et al. 2012)

Worldwide, this translates to between 381,000 and 762,000 new cancers each year caused by occupational exposure

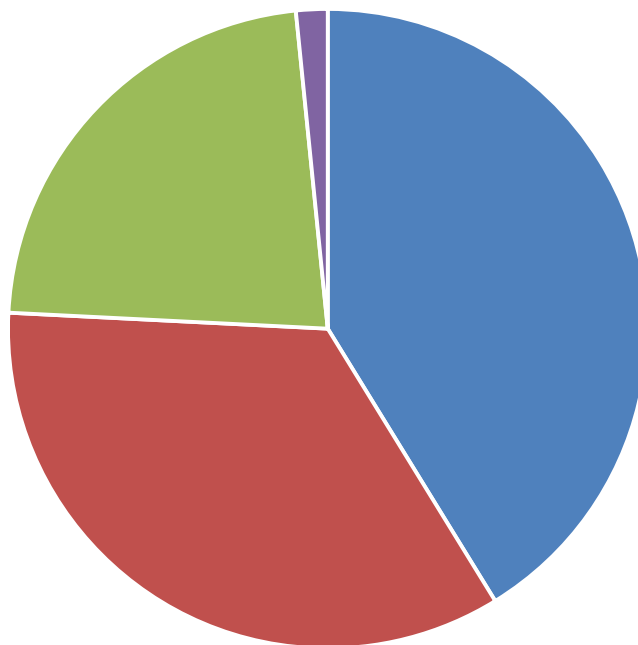
Driscoll, T., Nelson, D., Steenland, K., Leigh, J., Concha-Barrientos, M., Fingerhut, M. & Prüss-Üstün, A., 'The global burden of diseases due to occupational carcinogens', *Am J Indust Med* 48, 2005, pp. 419–31.

Rushton, L., Hutchings, S., Brown, T., 'The burden of cancer at work: estimation as the first step to prevention', *Occup Environ Med* 65, 2008, pp. 789–800.



Work related mortality by cause

Main causes of death from work-related diseases, 2013

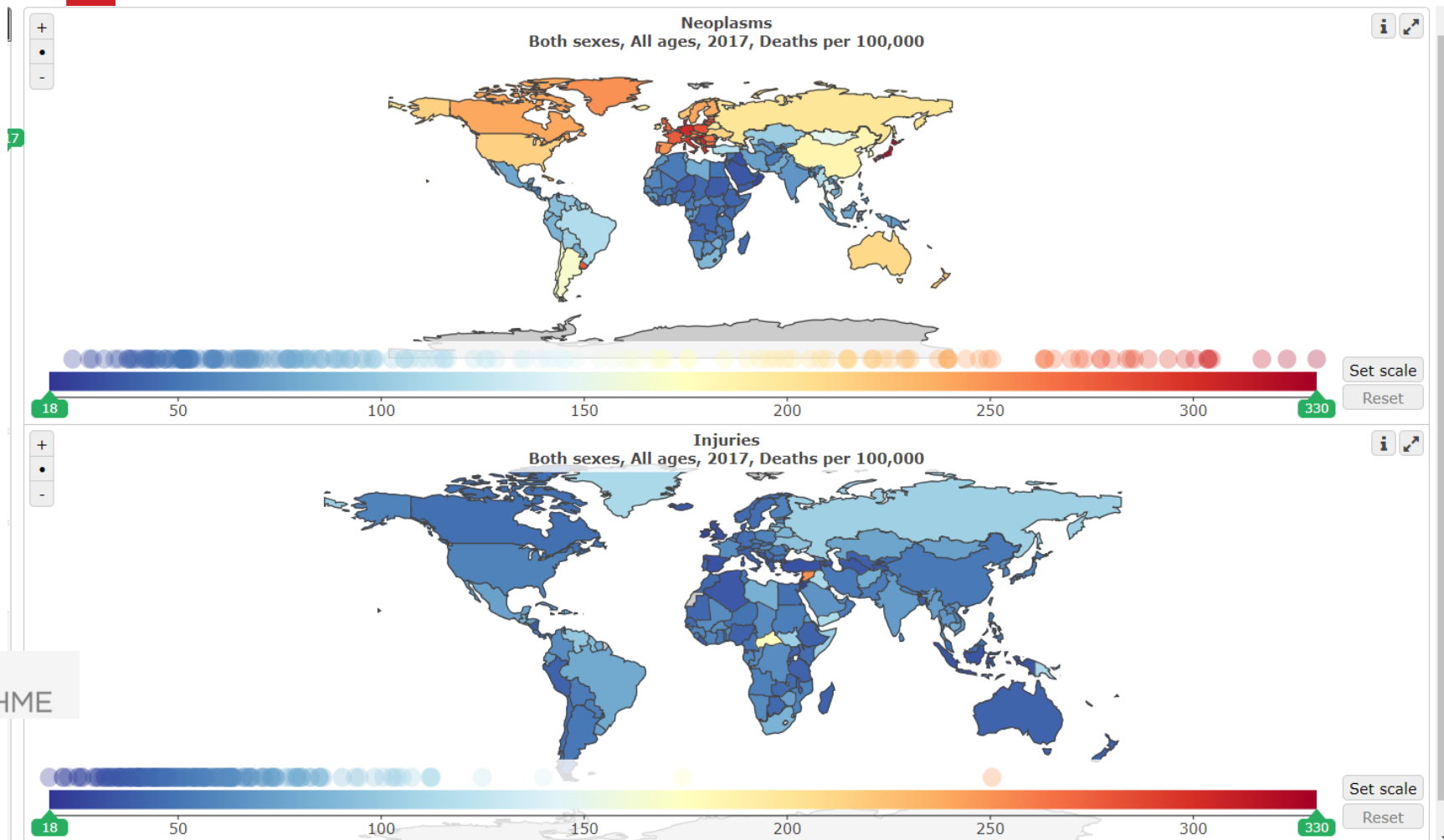


■ Circulatory diseases ■ Work related cancers ■ Respiratory diseases ■ Occupational injuries

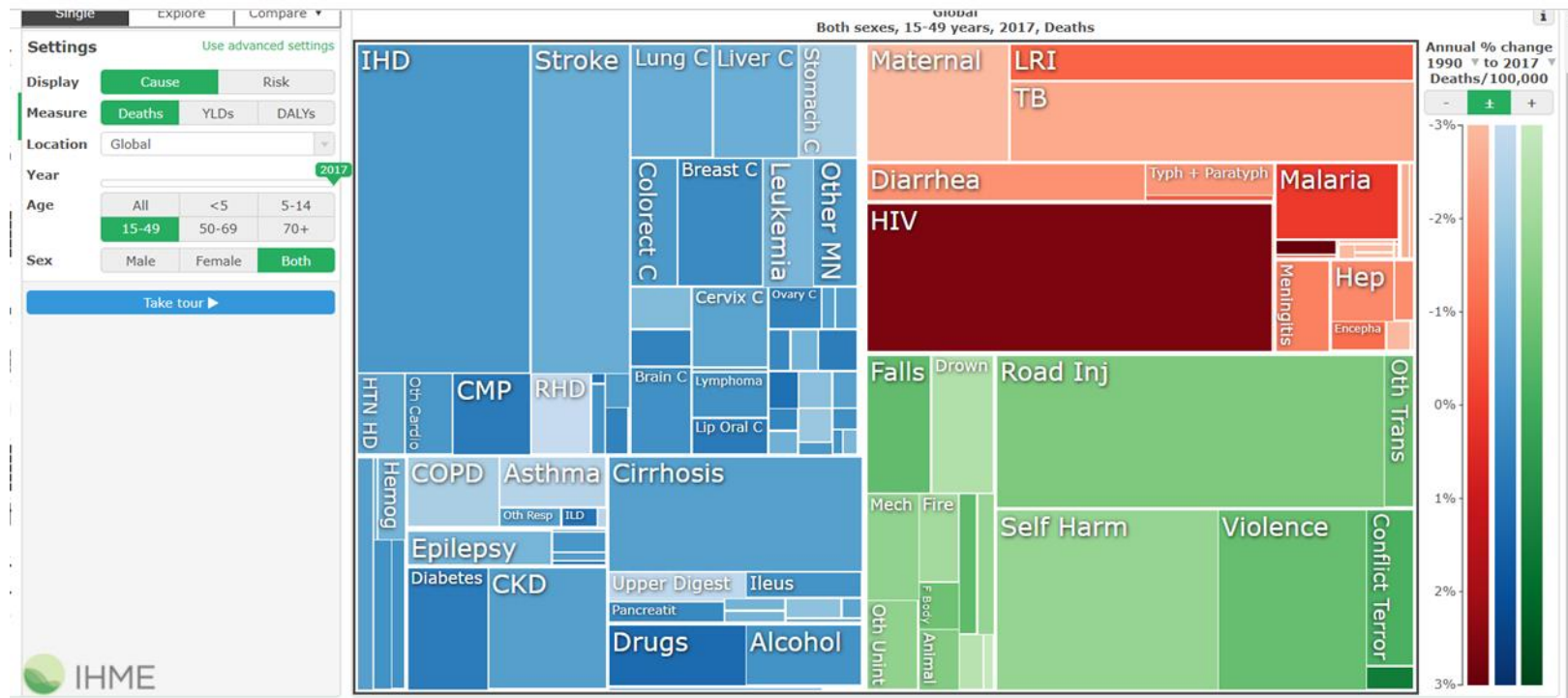




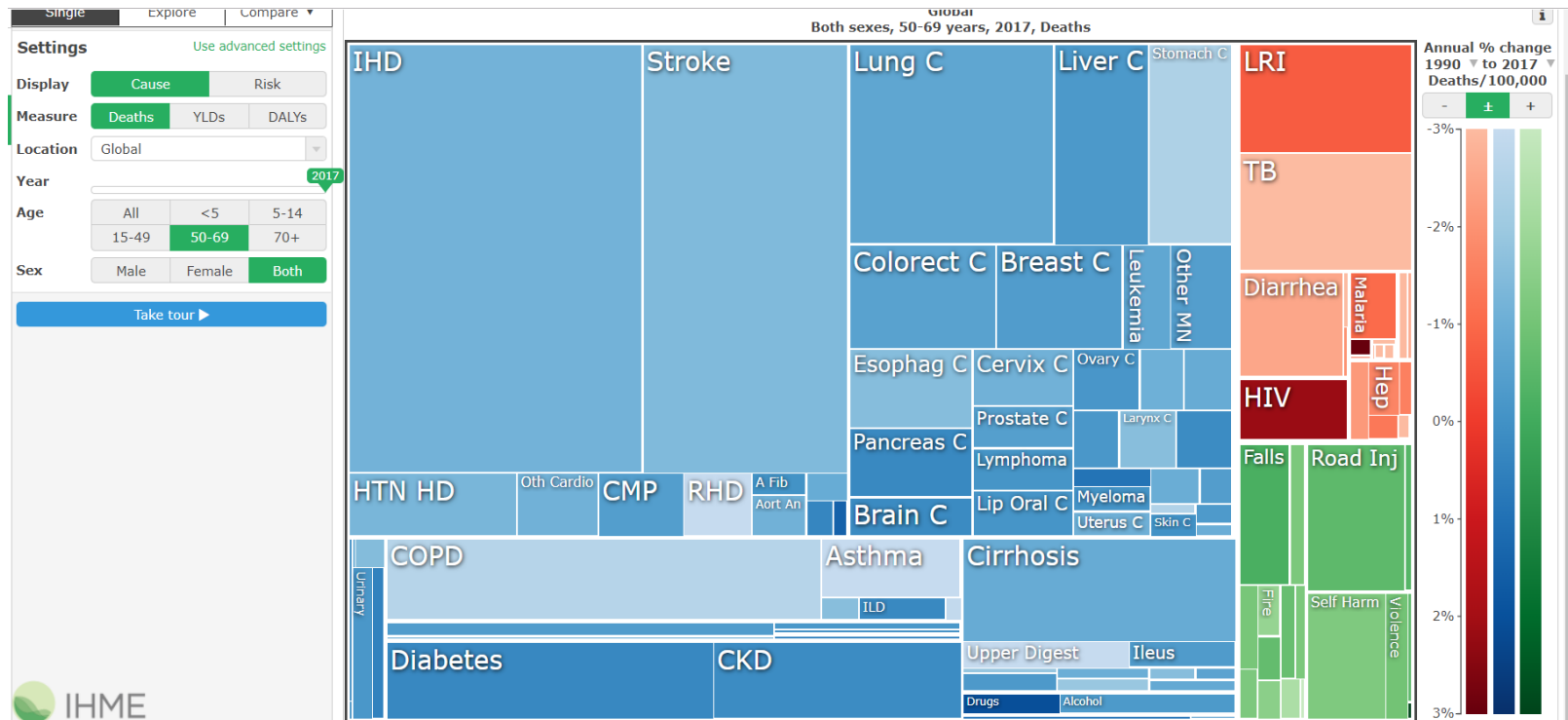
Deaths by cause, 2017



Deaths by cause, age 15-49



Deaths by cause, age 50-69





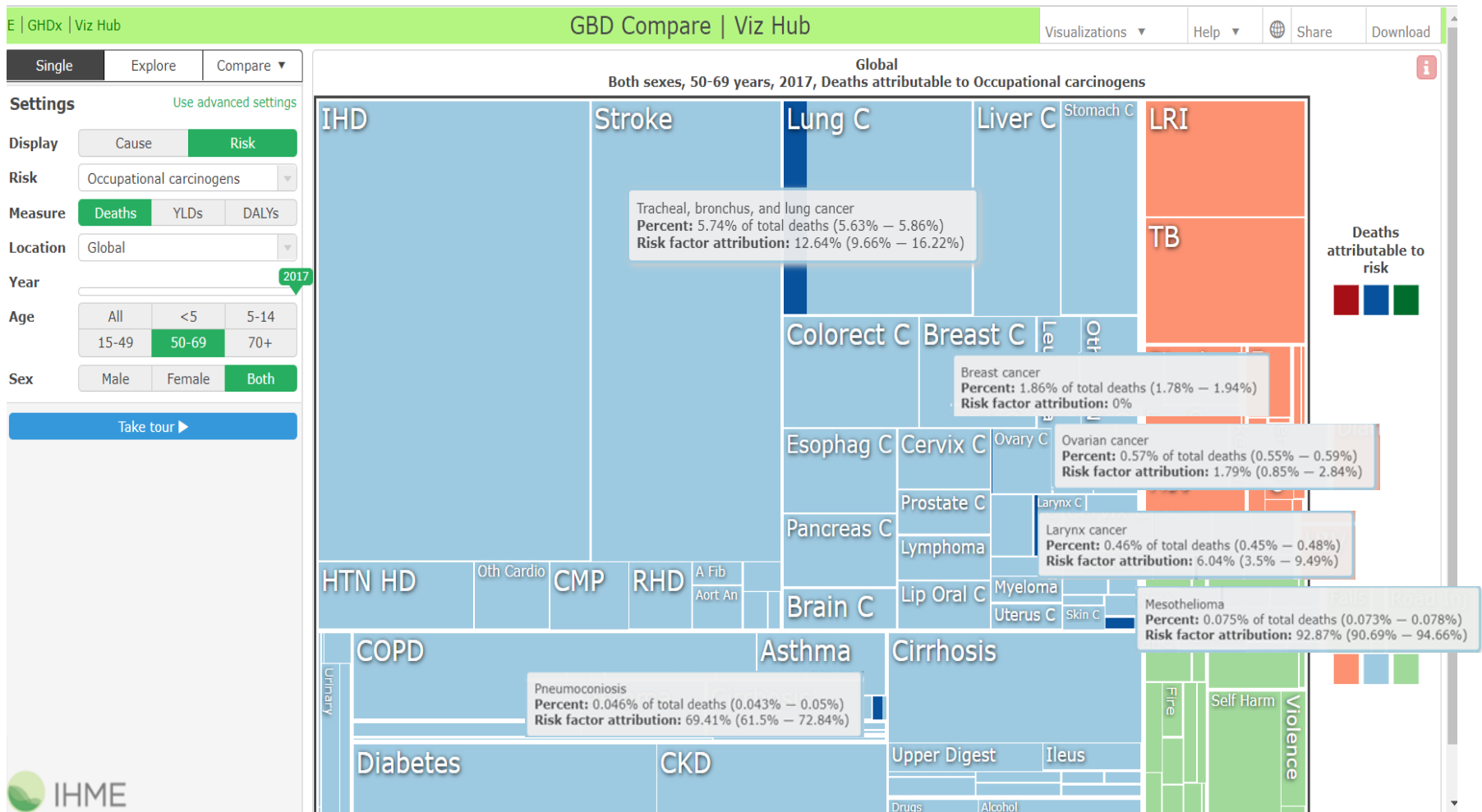
Work relatedness

Work-relatedness is a gradual component that may vary between obvious and commonly agreed to barely detectable. Often the work-relatedness is measured by the population attributable fraction (AF).

Attributable fraction as “the fraction of a disease [or injury] which would not have occurred had the exposure factor been non-existent in the population in question



Work relatedness & mortality by cause





Overview of new risk factors

Chemical	Endocrine-disrupting compounds	Link between exposure to EDCs and an increase in certain cancers such as breast, endometrial, ovarian, testicular, prostate and thyroid cancers, stating that these have been increasing over the past 40–50 years Occupational exposure to pesticides, to some polychlorinated biphenyls (PCBs) and to arsenic as causes of prostate cancer.	WHO & UNEP, 2012 Alavanja et al., 2005
	Nanomaterials	The IARC reviewed the carcinogenicity of fluoro-edenite, silicon carbide (SiC) fibers and whiskers, and carbon nanotubes (CNT) in autumn 2014.	Lung cancer and exposure to Acheson process --production of SiC particles (Grosse et al., 2014) Mesothelioma and production of fluoro-edenite fibrous amphibole (Grosse et al., 2014)
Physical	Non-ionising radiation Heat shock	Increased risk of cancer, among them exposure to nonionizing radiation, particularly radiofrequency fields emitted by mobile telephones, and brain cancer Heat shock leads to deoxyribonucleic acid (DNA) damage causing cells to switch to high mutation rates for several cell generations. Heat shock may occur in occupations such as furnace and smelter operators, or industries such as casting factories and so on.	Clapp, Jacobs & Loechler, 2007 Fabre and Roman, cited in Cairns, 2011
Organizational-shift work	Circadian disruption	Night shift work may exhibit altered night-time melatonin levels and reproductive hormone profiles that could increase the risk of hormone-related diseases, including breast cancer. The specific issue of shift work/night work and cancer has not yet been specifically addressed in European legislation.	The directives on working time apply (Directive 2003/88/EC on working time, Directive 2002/15/EC on working time of persons performing mobile road transport activities and Directive 2000/79/EC on working time in civil aviation)
	Sedentary work	Boyle and colleagues conducted a population-based case-control study on long-term sedentary work—it may increase the risk of distal colon cancer and rectal cancer. A German study using data from a cancer registry revealed an increased risk of testicular cancer for technicians and related professionals and clerical support workers.	Colorectal cancer and sedentary work - Boyle et al., 2011 Testicular cancer for technicians and related professionals and clerical support workers- Yousif et al., 2013
Socio-economic status	Lifestyle and UVR	The highest risk was found in dentists, while managers also had an increased risk. The lowest risk was found in fishermen, and all unskilled workers also had a decreased risk. Surdu et al found a protective effect of occupational exposure to natural UV radiation that was unexpected, and limited to light-skinned people, suggesting adequate sun-protection use	Socioeconomic status (and thus, presumably, lifestyle) has been described as a risk factor for skin melanoma - Martinsen et al., 2008 Surdu et al., 2014



Understanding the relationship

Current understanding of the relationship between occupational exposure and cancer is far from complete (Boffetta et al., 2003).

Only a limited number of individual factors are established occupational carcinogens.

No definitive evidence is available based on exposed workers.

Still in many cases, there is considerable evidence of increased risks associated with particular industries and occupations.

Boffetta, P., Saracci, R., Kogevinas, M., Wilbourn, J., Vainio, H., 'Occupational carcinogens', ILO encyclopaedia, 2003.



Establishing and interpreting lists- complicated

Information on industrial processes and exposure - frequently poor, hindering a complete evaluation of the importance of specific carcinogenic exposure in different occupations or industries

different intensities in different occupational situations – problem even with exposure to well-known carcinogens

Changes in exposure occur over time in a given occupational situation, either because identified carcinogenic agents are substituted by other agents or (more frequently) because new industrial processes or materials are introduced

List of occupational exposures can refer only to the relatively small number of chemical exposures which has been investigated with respect to the presence of a carcinogenic risk

Generalisation to all workplaces; the presence of a carcinogen in an occupational situation does not necessarily mean that workers are exposed to it. Similarly, the absence of identified carcinogens does not exclude the presence of yet unidentified causes of cancer.

Boffetta, P., Saracci, R., Kogevinas, M., Wilbourn, J., Vainio, H., 'Occupational carcinogens', ILO encyclopaedia, 2003.



Limitations of evaluating exposures

New cancer prevention paradigm, modern work patterns and increased risk

Proportion of cancers attributable to occupational exposure, compromised with the fact that workers are also exposed to factors outside their workplaces

Modern work patterns include a frequent change of workplace - lead to changes in exposure to, e.g. ultraviolet radiation, electromagnetic fields, sedentary work, stress, etc.

Exposure -difficult to follow-up, may not be documented and/or companies may have closed down.



Important issues

Back-to-work policies

Further activities in research

Prevention strategies

Better integration between REACH and OSH legislation

Better use of different data sources

Better prevention and control measures in the workplace

Minimization of risk and the precautionary principle

New Cancer Prevention Paradigm

Health literacy

Clapp RW, Jacobs MM, Loechler EL. Environmental and occupational causes of cancer: new evidence 2005-2007. Rev Environ Health. 2008 Jan-Mar;23(1):1-37.



Instead of conclusion

Information about work-related diseases is needed for prevention!

In developed countries: working longer, increased age of retirement – longer exposures to substances and working conditions- more possibility for NCD and cancers

In developing countries: work exposures may start in infancy; due to industrialization- new conditions with a lack of relevant knowledge and skills



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