

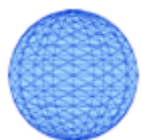
WHO's work on estimating disease burden from chemicals

Department of Public Health and Environment



**World Health
Organization**

Recent work on reviewing health impacts from chemicals at global population level



ENVIRONMENTAL HEALTH

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Knowns and unknowns on burden of disease due to chemicals:
a systematic review

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<http://www.ehjournal.net/content/10/1/9>

Combination of:

- Systematic review of available data on burden of disease from chemicals
- WHO database on disease burden from environmental risks



A. Review of available evidence

- Evidence is available on
 - Specific chemicals and health impacts
 - Exposure in various setting, biomonitoring
 - Contaminated sites database
 - Local health impacts from various exposures
- WHO activities in the area of population health impacts:
 - Review of population health impacts at level of large regions
 - Use of rigorous and peer reviewed methods
 - Mapping of assessed against non-assessed chemicals



B. Mapping of exposure to chemicals

- Example:

Exposure media	Sources of exposure and pathways	Chemicals
Food	Consumption of food contaminated with chemicals at toxic levels through agricultural practices, industrial processes, environmental contamination, and natural toxins.	Pesticides, methylmercury, lead, cadmium, dioxins, aflatoxin.
Non-food consumer products	Exposure by ingestion, inhalation or dermal exposure to toxic chemicals contained in toys, jewellery and decoration items, textiles, or food containers, consumer chemical products	Lead, mercury, cadmium, phthalates, formaldehyde, dyes, fungicides or pesticides.
Soil	Ingestion (particularly for children) or inhalation of soil contaminated through industrial processes, agricultural processes or inadequate household and industrial waste management.	Heavy metals, pesticides, and persistent organic pollutants.



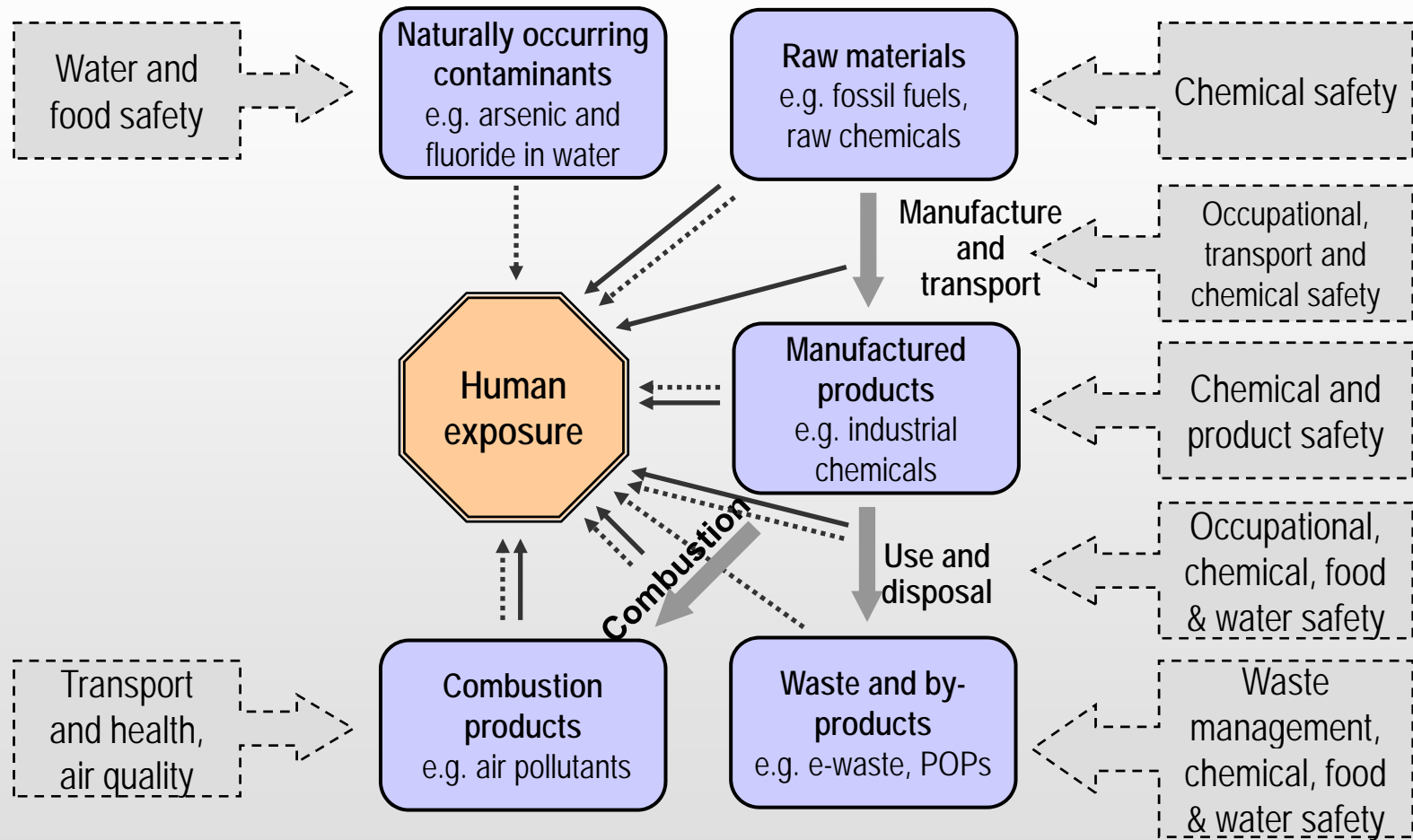
C. Mapping of disease groups to chemicals

- Example:

Disease groups	Examples of exposure	Examples of outcomes
Neuropsychiatric and developmental disorders	Lead, methylmercury, polychlorinated biphenyls (PCBs), arsenic, toluene etc.	Cognitive development, mental retardation, Parkinson disease, Attention-deficit disorder
Sense organ diseases	Carbon disulfide, mercury	Hearing loss
Cardiovascular diseases	Ultrafine particles in polluted air, lead, arsenic, cadmium, pollutant gases, solvents, pesticides, second-hand smoke	Ischaemic heart disease, cerebrovascular disease



Human exposure to chemicals throughout their life-cycle and selected programmes relevant to their prevention



Legend:



Available data on chemicals in acute poisonings

Chemicals/ Groups of chemicals	Disease outcomes (attributable fraction)	Deaths (per year)	DALYs (per year)
<i>Chemicals in acute poisonings</i>		<i>526,000 (sub-total)</i>	<i>9,666,000 (sub-total)</i>
Chemicals involved in unintentional acute poisonings	Unintentional poisonings (71%)	240,000	5,246,000
Chemicals involved in unintentional occupational poisonings	Unintentional poisonings (occupational) (8.6%)	30,000	643,000
Pesticides pesticides involved in self-inflicted injuries	Self-inflicted injuries (23%)	186,000	4,420,000



Available data on chemicals in occupation

Chemicals/ Groups of chemicals	Disease outcomes (attributable fraction)	Deaths (per year)	DALYs (per year)
<i>Chemicals in occupational exposures (longer term effects)</i>		<i>581,000 (sub-total)</i>	<i>6,763,000 (sub-total)</i>
Asbestos	Mesothelioma; lung cancer (0.3%); asbestosis	107,000	1,523,000
Occupational lung carcinogens (8 selected carcinogens)	Lung cancer (8.6%)	111,000	1,011,000
Occupational leukaemogens (benzene, ethylene oxide, ionizing rad.)	Leukaemia (2.3%)	7,400	113,000
Occupational particulates - causing COPD (dusts, fumes/gas)	COPD (13%)	375,000	3,804,000
Occupational particulates - other respiratory diseases than COPD (silica, asbestos and coal mine dust)	Asbestosis; silicosis; pneumoconiosis	29,000	1,062,000



Available data on chemicals in air pollution mixtures

Chemicals / Groups of chemicals	Disease outcomes (attributable fraction)	Deaths (per year)	DALYs (per year)
<i>Air pollutant mixtures</i>		<i>3,720,000 (sub-total)</i>	<i>60,669,000 (sub-total)</i>
Outdoor air pollutants (particulate matter, sulfur dioxide, nitrogen oxides, etc)	Lung cancer (7.9%); acute respiratory infections (1.6%); cardiopulmonary diseases (3.4%)	1,152,000	8,747,000
Outdoor air pollutants from ships (particulate matter, sulfur dioxide, nitrogen oxides, benzo[a]pyrene, etc)	Lung cancer (0.3%); cardiopulmonary diseases (0.4%)	60,000	NA
Indoor air pollutants from solid fuel combustion (carbon monoxide, sulfur oxides, benzene, etc)	Lung cancer (2.9%); acute respiratory infections (33%); COPD (33%)	1,965,000	41,009,000
Second-hand smoke (nicotine, formaldehyde, carbon monoxide, phenols, etc.)	Lower respiratory infections (6.3%); otitis (1.7%); asthma (11%); lung cancer (1.8%); ischaemic heart disease (4.5%)	603,000	10,913,000



Available data on selected single chemicals

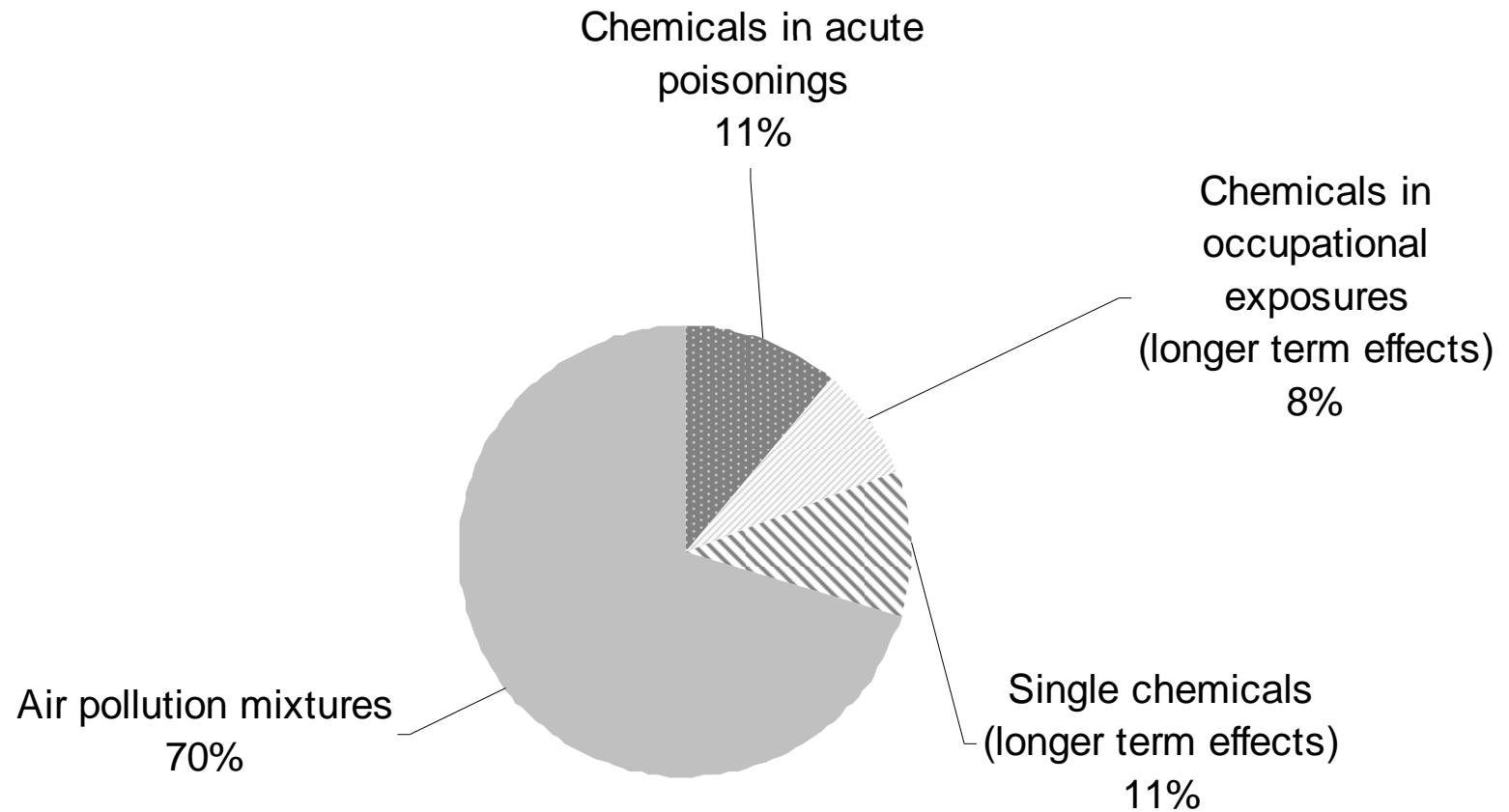
Chemicals / Groups of chemicals	Disease outcomes (attributable fraction)	Deaths (per year)	DALYs (per year)
<i>Single chemicals with mostly longer term effects</i>		<i>152,000 (sub-total)</i>	<i>9,102,000 (sub-total)</i>
Lead	Mild mental retardation; Cardiovascular diseases	143,000	8,977,000
Arsenic in drinking-water (in Bangladesh)	Diabetes mellitus (0.04%) ischemic heart disease (0,11%); lung cancer (0.25%); bladder cancer (1.2%); kidney cancer (NA); skin cancer (0.30%)	9,100	125,000



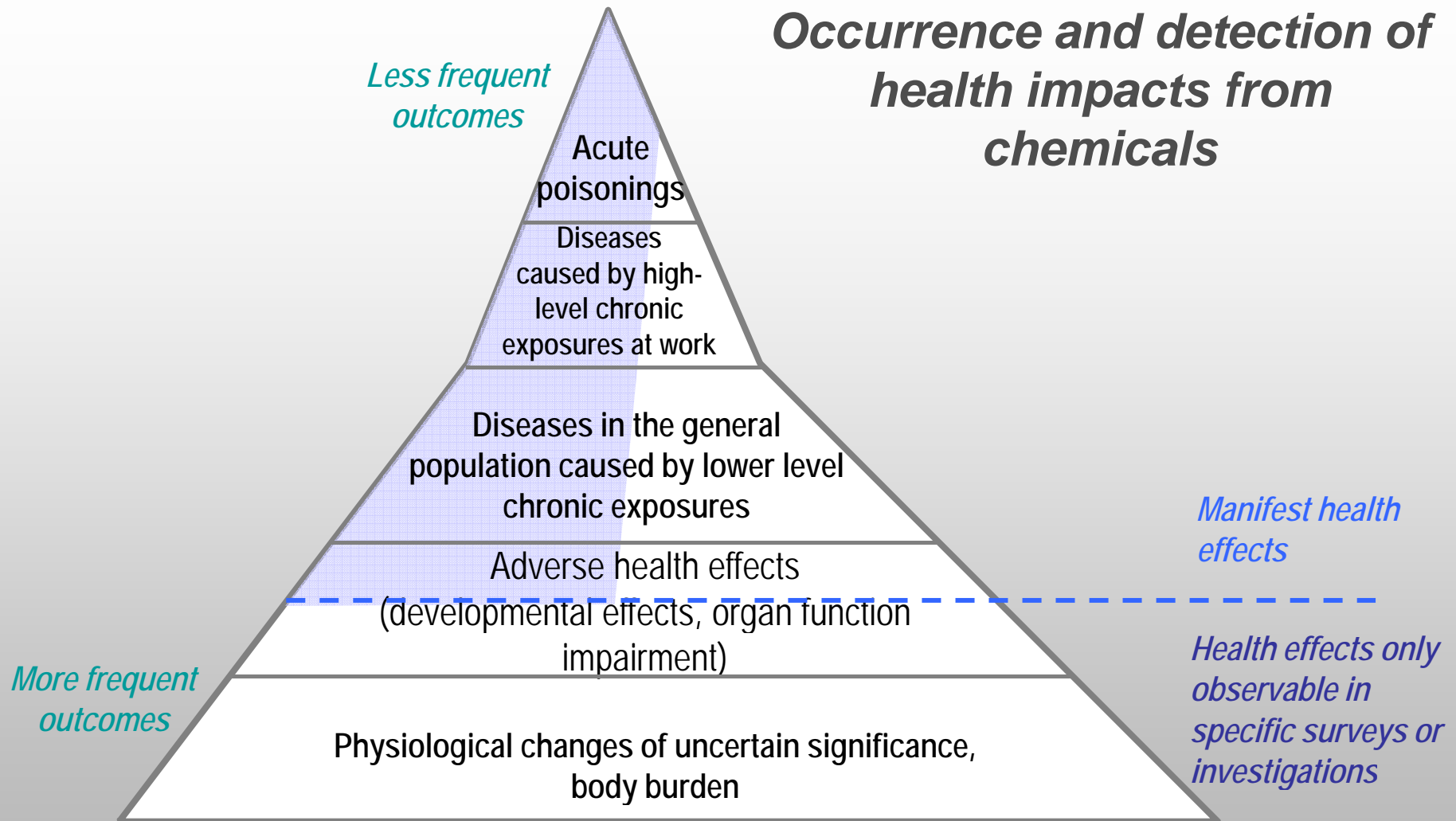
Results

- 2.0% of global deaths (1.7% of DALYs) from for industrial and agricultural chemicals, and accidental poisonings.
 - Comparable to all malaria cancers or all TB
- 8.3% of global deaths (5.7% of DALYs) when including also chemicals in air pollution and natural occurring chemicals.
 - More than all unintentional injuries
 - Total of 4.9 million deaths per year
 - 54% of disease burden (in DALYs) in children under 15 years
- The results underestimate the total burden from chemicals, as the burden from most chemicals has not yet been assessed.

Distribution of known burden of disease (in DALYs)



Occurrence and detection of health impacts from chemicals



Adapted from de Hollander et al.



Fraction of disease outcomes traced back to chemicals



Fraction of outcomes with often "unknown" aetiology

Additional activities that could be undertaken

- Analysis of trends in exposures as compared to health impacts
- Additional review of local/national health impact estimates
- Collection of additional exposure data that can be used to estimate health impacts

