

INTEGRATING NUTRITION INTO OCCUPATIONAL CHEMICAL SAFETY STANDARDS

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PART A: THE RELATIONSHIP BETWEEN CHEMICAL EXPOSURE AND NUTRITION

THE GROWING PROBLEM OF WORKPLACE CHEMICAL EXPOSURE

Workplace exposure to hazardous chemicals is a persistent and growing challenge for occupational safety and health (OSH) worldwide. Economic expansion, industrial diversification, and technological innovation have substantially increased the number and variety of chemical substances used across work processes. As a result, chemical exposure is no longer confined to a limited number of high-risk industries, such as chemical manufacturing or mining, but is now common across many everyday working environments (**Fig 3**).

Within OSH frameworks, chemicals include a wide range of substances, such as elements, compounds, mixtures, and nanomaterials. These substances may be natural or synthetic and differ in their properties, uses, and interactions with the human body. Common examples include metals (and metal dusts), solvents, pesticides, plastics, fumes, dusts, vapours, and chemical by-products. In many settings, workers are exposed not because chemicals are the main output of their work, but because they are used as inputs, cleaning agents, fuels, preservatives, or maintenance materials.

Managing chemical hazards has traditionally fallen within the occupational safety and health (OSH) framework, using a “hierarchy of controls” approach. This means protecting workers through a layered set of strategies from eliminating or substituting hazardous chemicals, to engineering and administrative controls, and finally personal protective equipment (PPE). While these measures reduce exposure, none of them fully protect the body from chemicals.

Globally, the ILO estimates that **approximately 1 billion workers** are exposed to hazardous substances, such as pollutants, dusts, vapors, and gases, each year.¹

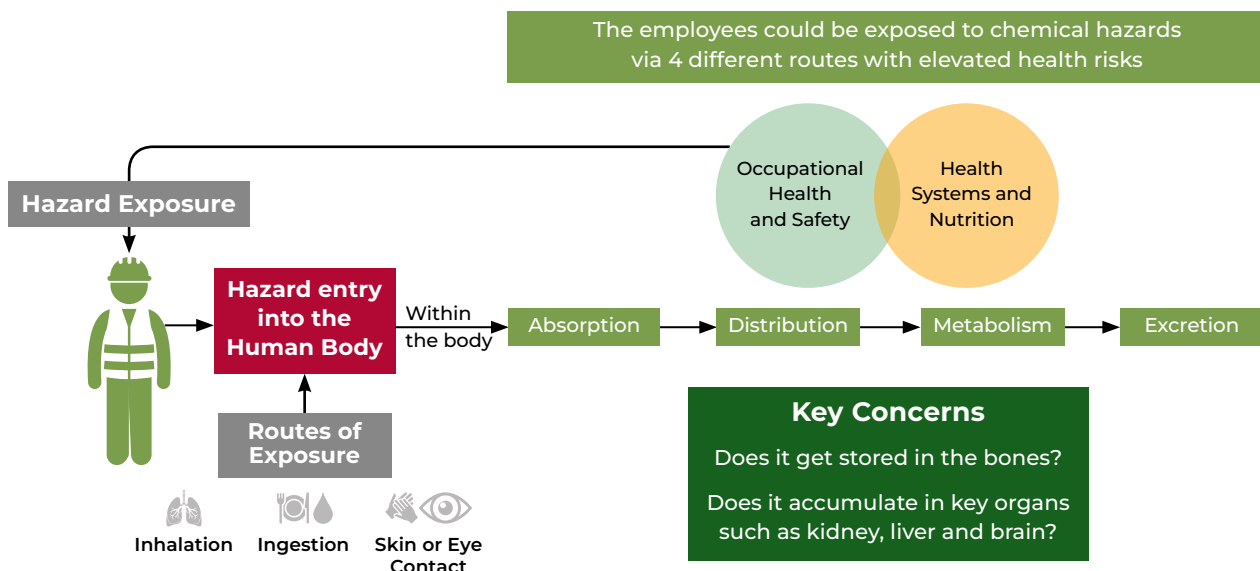


Routes of exposure

In occupational settings, chemical exposure can either occur through a single incidence or repeatedly during work activities. Chemicals enter the body primarily through inhalation, ingestion of contaminated food or water, and contact with the skin or eyes (**Fig 1**).

The body activates immediate defense mechanisms, such as coughing, inflammation, nausea, and detoxification processes, to limit absorption and eliminate foreign substances. However, when exposure is frequent, prolonged, or involves chemicals that readily penetrate biological barriers, these defenses may be insufficient. Chemicals can then circulate through the bloodstream and reach various organs, with health effects depending on their properties, concentration, and duration of exposure.

Figure 1: Hazard entry and interaction with human body systems



Health consequences of occupational chemical exposure

Exposure to hazardous chemicals can cause both acute and long-term health effects. Acute effects include irritation of the skin, eyes, or respiratory tract, allergic reactions, dizziness, nausea, injuries, and even death. The greatest burden on worker health, apart from occupational injuries or fatalities, however, results from repeated or prolonged exposure to lower levels of hazardous substances.

Over time, cumulative exposure can affect multiple body systems, including the respiratory, cardiovascular, hormonal, reproductive, and immune systems, as well as organs such as the liver, kidneys, and brain. These effects contribute to the development and progression of occupational diseases and non-communicable diseases (NCDs), such as cardiovascular disease, chronic respiratory conditions, cancer, metabolic disorders, and neurodegenerative diseases.^{2,3} The risks are further amplified when chemical exposure occurs alongside other workplace stressors, including heavy physical labour, heat, poor ventilation, or long working hours.

Because many of these conditions develop gradually, the link between workplace chemical exposure and disease is often not immediately visible. Nonetheless, occupational chemical hazards make a substantial contribution to global morbidity and premature mortality.

Joint estimates from the ILO and the World Health Organization (WHO): occupational risk factors were responsible for 1.9 million deaths globally in 2016, 81% per cent of which were due to chronic diseases linked to chemical hazard exposure (Fig 2)



Figure 2: Occupational risk pairs (WHO/ILO joint estimates 2000–2016)

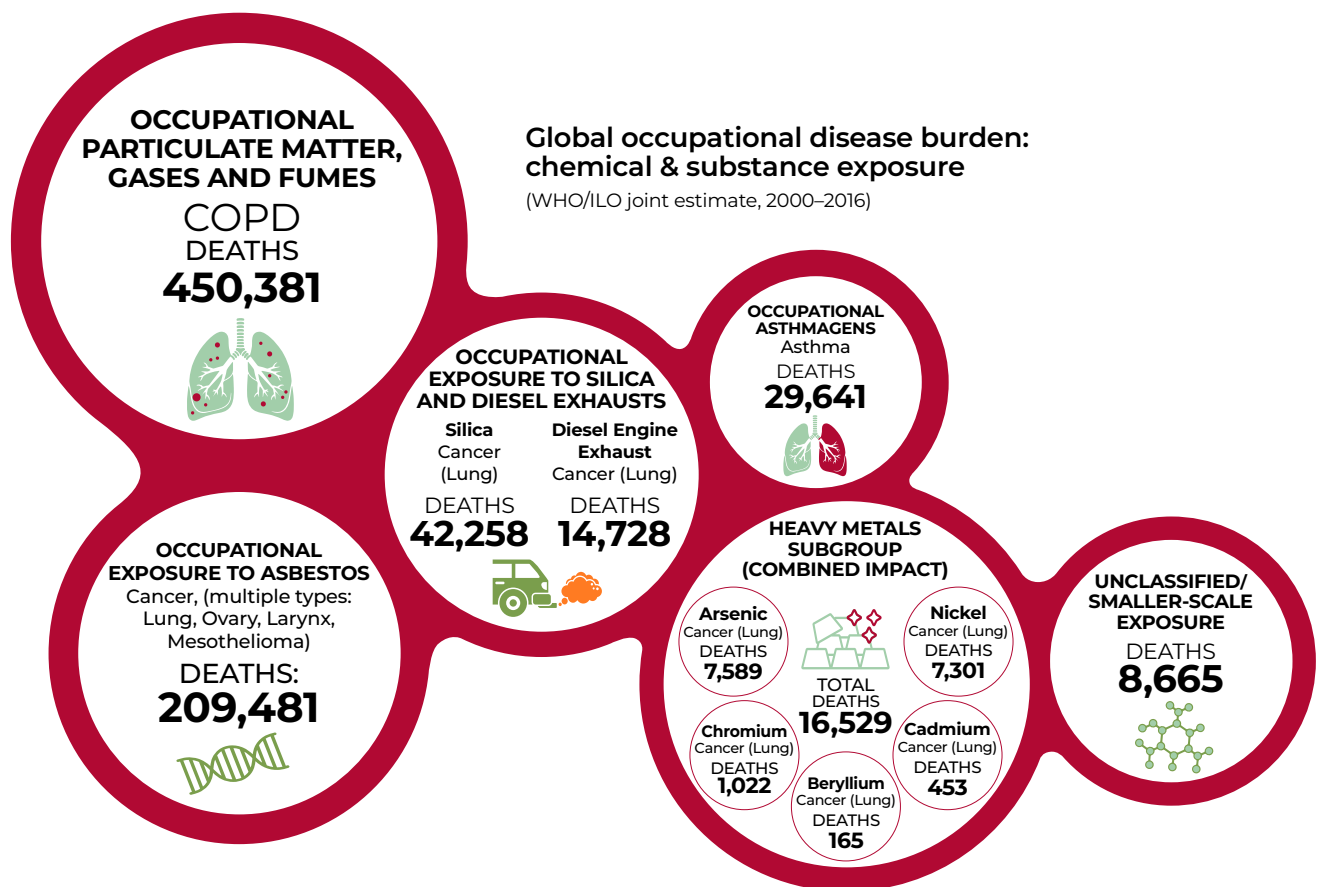
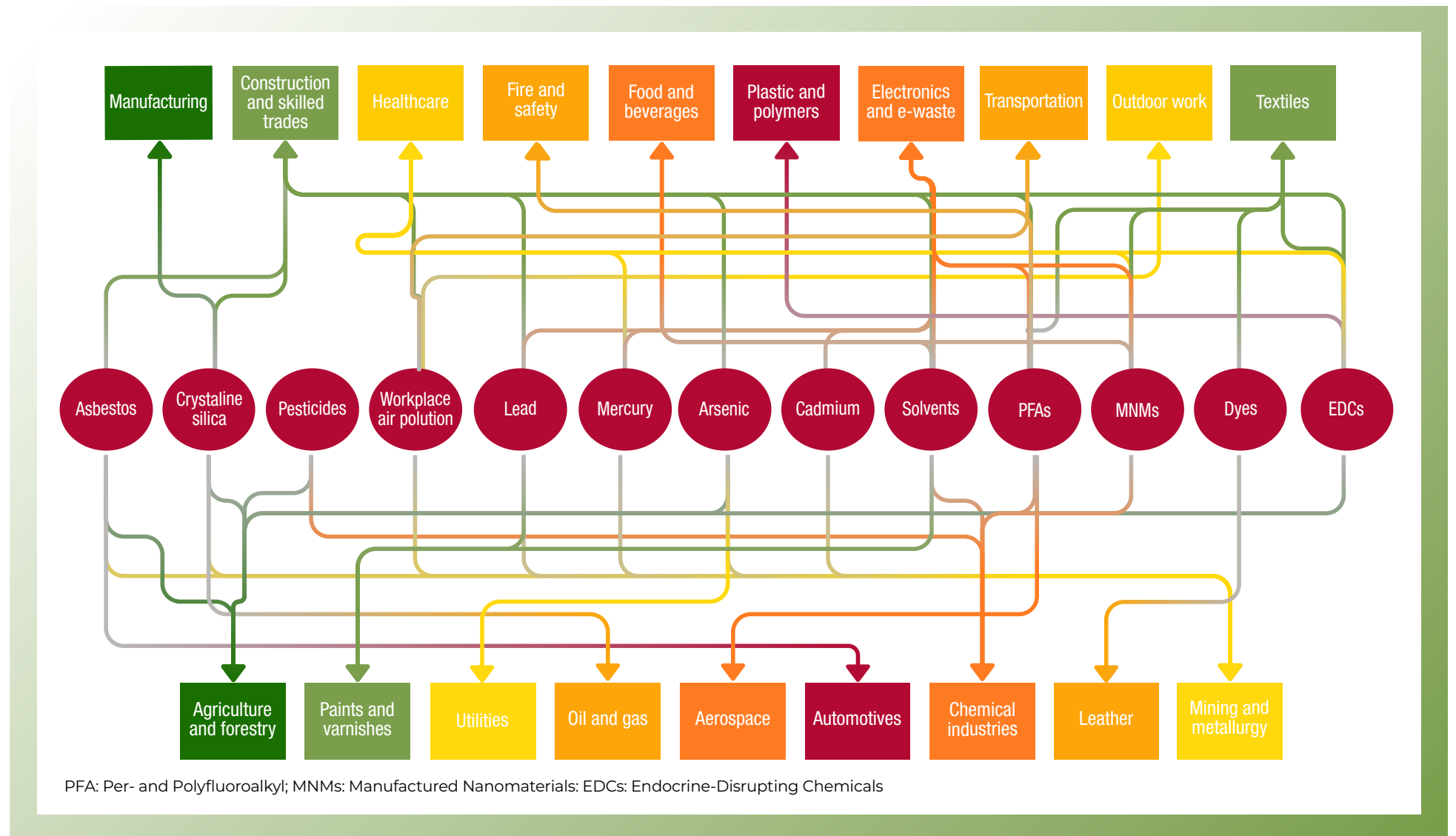


Figure 3: Work sectors impacted by chemical hazards



WHY NUTRITION MATTERS

The health effects of chemical exposure depend not only on the hazard itself, but also on the body's capacity to defend, adapt, and recover. This varies between individuals and is strongly shaped by nutritional status, making nutrition a foundational determinant of occupational health risk.

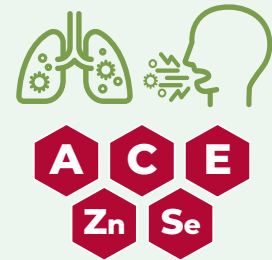
Adequate nutrition supports immune function, metabolic regulation, tissue repair, and detoxification processes. Sufficient energy, protein, essential minerals, micronutrients, and antioxidants are required for the body to maintain physiological stability and respond effectively to harmful substances. When these nutritional needs are met, workers are better equipped to withstand and recover from ongoing occupational exposures.

Protective shield of nutrition

Certain nutrients are specifically helpful to protect the body against the harmful effects of occupational chemical exposure.

For example, antioxidants such as vitamins A, C, and E, together with minerals including zinc and selenium, support immune and detoxification pathways and help maintain the integrity of tissues commonly exposed at work, particularly the respiratory system.⁴

These nutrients are found in diets that are rich in fruits, vegetables, nuts, and other minimally processed foods and these types of diets therefore help to moderate health risks from ongoing chemical exposure.



Interaction between nutrition and chemical toxicity

Poor nutritional status increases vulnerability to the health effects of chemical exposure. Insufficient energy intake, particularly among workers performing heavy physical labour or working in hot environments, forces the body to rely on internal energy and protein reserves, weakening immune responses and slowing tissue repair.

Moreover, it has been shown that certain nutritional deficiencies (e.g., as protein, calcium, iron, and zinc) are associated with increased absorption and toxicity of certain heavy metals, such as lead and cadmium, and with impaired detoxification enzyme function.^{5,7,8,9,10}

A 2024 global assessment found that two-thirds of the population is deficient in essential elements such as iodine, vitamin E, iron, and calcium, while **50–60 percent** are deficient in the vitamins B and C.¹¹

**50–60%
deficiency**



At the same time, diets high in fat can promote the accumulation of hazardous substances in body tissues and intensify inflammatory responses.¹² Critically, this relationship also runs in the other direction. Exposure to certain chemicals can itself disrupt nutritional health. Some chemicals interfere with how the body absorbs and uses nutrients, or increase the

body's nutritional requirements. For instance, exposure to pesticides (organophosphates) disrupts how the body processes carbohydrates, increasing the risk of diabetes.^{13,14} Lead exposure can inhibit the absorption of calcium, affecting bones and muscles, and also interfere with iron levels, leading to anaemia.¹⁵

Nutrition and chemical exposure are thus deeply interconnected: what you eat shapes how your body handles chemical exposure, while those same chemicals can undermine the body's nutritional status and capacity to defend, adapt, and recover from exposure.

This two-way relationship between nutrition and chemical exposure might result in prolonged oxidative stress and inflammation in the body, which are key drivers of noncommunicable diseases such as diabetes, respiratory diseases, cancer, and cardiovascular disease.¹⁶

WHO estimates indicate that approximately **70%** of the global occupational disease burden is attributable to NCDs.⁵



WORKERS AT INCREASED RISK

Certain groups face compounded vulnerability, in which demanding working conditions, cumulative chemical exposure, and nutritional deficiencies interact to elevate health risks.

Workers in physically demanding roles have higher energy and nutrient requirements. When these demands coincide with chemical exposure and insufficient nutrition, immune function and resilience are diminished, leaving workers less able to tolerate or recover from hazardous exposures. Heat stress, which is increasing with climate change, intensifies this risk further by raising fluid and nutrient losses and accelerating chemical absorption through the skin and lungs.^{17,18}

Older workers may experience reduced metabolic efficiency, impaired nutrient utilisation, longer exposure histories, and a higher prevalence of chronic conditions. Other work-related factors, such as shift work, extended hours, and limited recovery time, may further disrupt the physiological regulation, and structural workplace conditions shape these risks as much as individual biology or behaviour. Limited access to protective equipment, sanitation, health services, and nutritious food increases vulnerability substantially, particularly in informal or precarious employment and in low- and middle-income settings.

INVESTING IN WORKPLACE NUTRITION

Because workplace chemical exposures cannot always be fully eliminated, strengthening workers' biological capacity to cope with these hazards through, for example, nutrition is an essential component of prevention. Therefore, integrating nutrition into the hierarchy of control offers an additional layer of protection for the workers.

With approximately 3.6 billion people in the global workforce, workplaces offer an effective platform for nutrition-aligned interventions at scale. Programmes that promote access to healthy food at work, nutrition education, nutrition-focused health checks, and breastfeeding support have demonstrated benefits for both workers and employers, including improved health and nutritional status, reduced absenteeism, higher productivity, and greater job satisfaction.²⁰

For workers routinely exposed to hazardous chemicals, integrating nutrition into occupational health strategies provides a practical, evidence-based approach to reducing long-term health risks and supporting healthy, productive working lives (Fig 4).

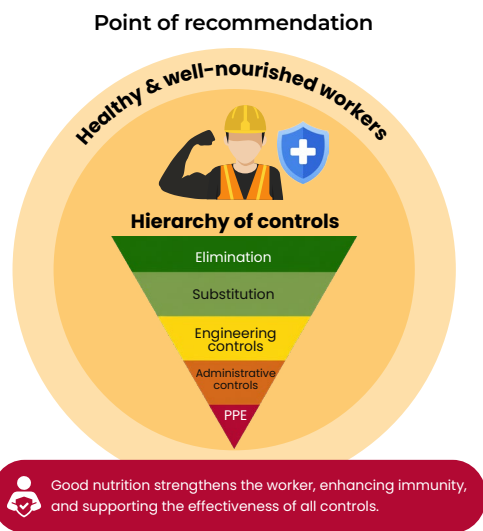


Figure 4: Expanding role of chemicals and adverse outcomes (Global Chemical OUTLOOK II, UNEP, 2019)

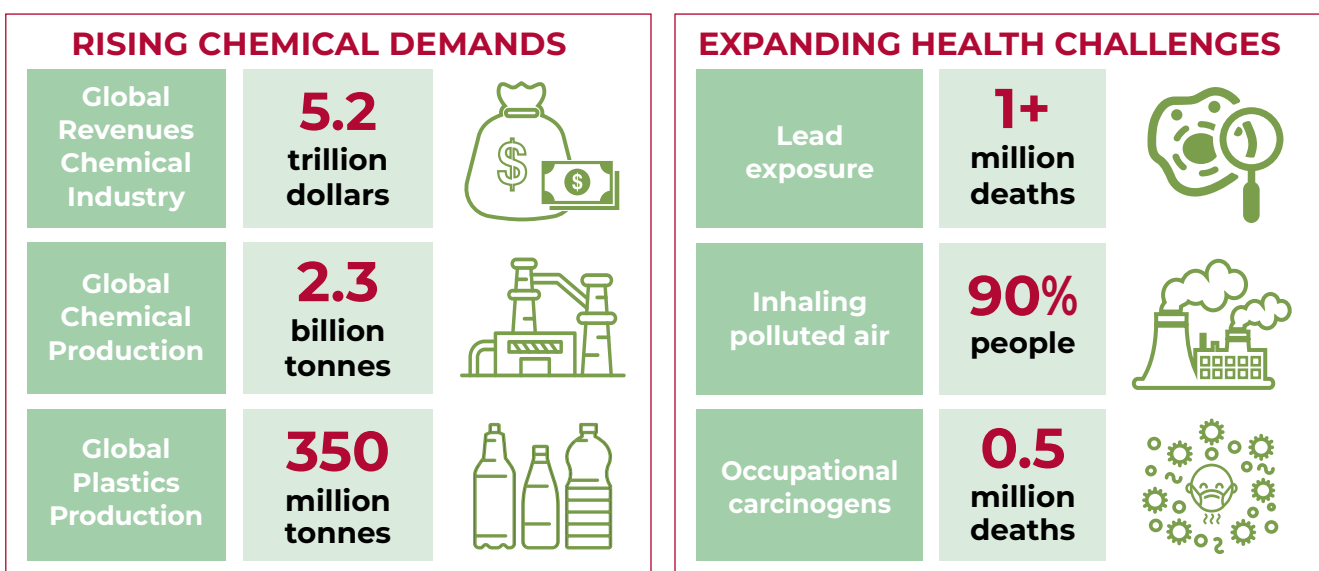
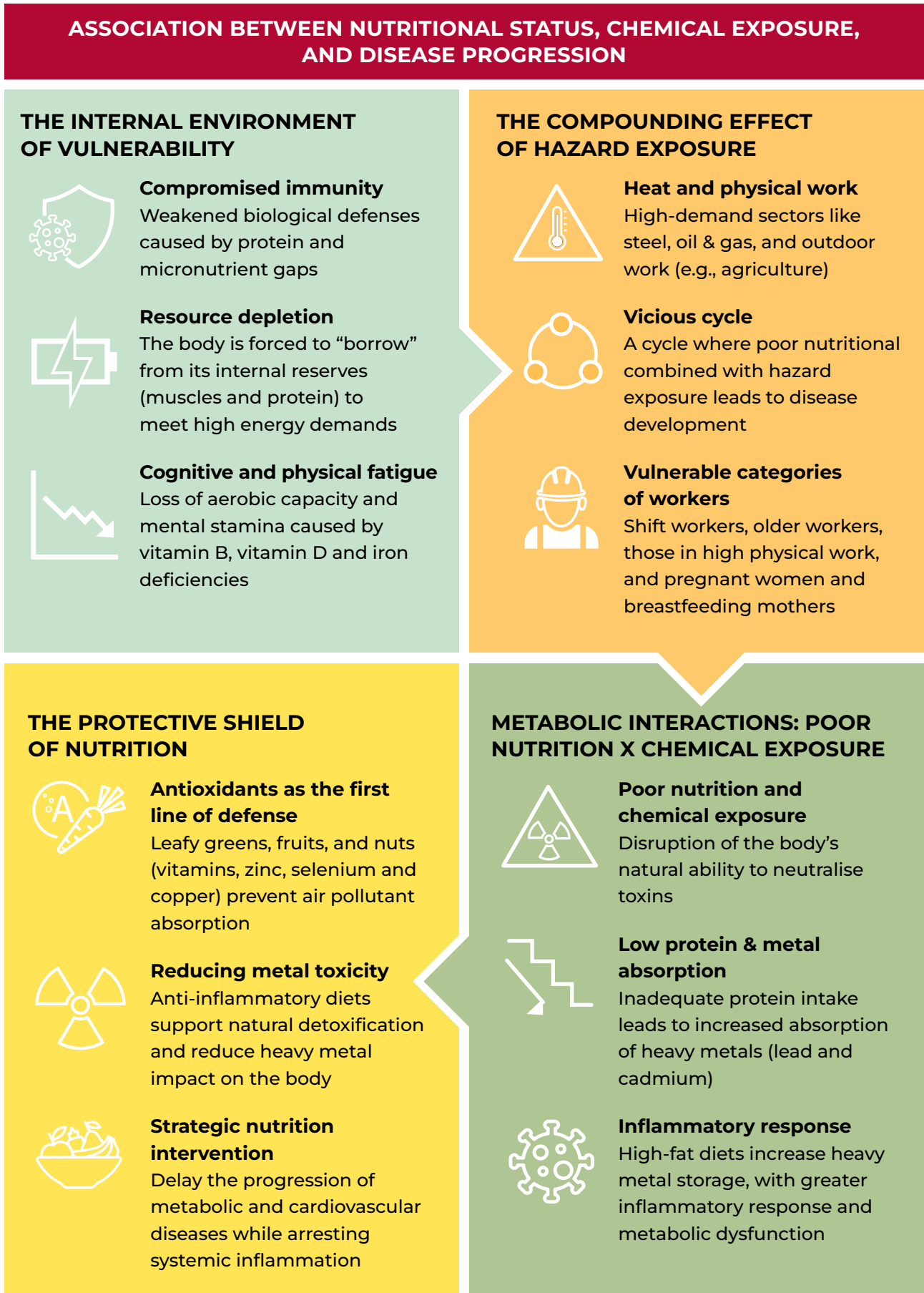


Figure 5: Nutrition and chemical interactions within the human body



PART B: GLOBAL AND NATIONAL NORMATIVE EVIDENCE ON WORKPLACE NUTRITION

ILO INSTRUMENTS

The WHO, ILO, and other stakeholders have issued guidelines and frameworks defining employee well-being, health promotion, and workplace facilities. These emphasize a safe work environment and programs that support worker health, including nutrition and food services.

- Welfare of workers was highlighted in the following: **Recommendations No. 97, Protection of Workers' Health; No. 102, Welfare Facilities**; and, partly, in **No. 120, Hygiene (Commerce and Offices)**.
- The **1944 Philadelphia Declaration**, Article 3 outlined the ILO's obligation to promote national programs focused on, among others, (g) adequate protection for the life and health of workers in all occupations and (i) the provision of adequate nutrition, housing, and facilities for recreation and culture.
- The 1956, **ILO Recommendation 102 on Workers' Welfare Facilities** extensively discusses the scope of feeding facilities giving details on the following aspects:
 - i) desirability of canteens especially considering demand, prospective use, the non – availability of appropriate facilities for meals (Art 4)
 - ii) canteens set up under national laws and regulations for more than a specified minimum number of workers (Art 5)
 - iii) canteen responsibility given to works committees under law (Art 6)
 - iv) types of of meal provided (including for medical prescription, special menus for workers in unhealthy occupations, shift appropriate meals), and standards of nutrition – nutritional value, planned menus, and balanced diets as under Art.9 (f, g) (Chapter III, Feeding facilities, R102).
- **The 1955 Report on Welfare Facilities for Workers**, presented at the ILO International Labour Conference (38th session), compiled many existing national efforts in canteens, messrooms, snack bars, and other food provisions (ILO, 1955). The report recognized diverse forms of food provision at work and their varying mandates under national laws or governance mechanisms.
- A **Committee of Experts on Welfare Facilities for Industrial Workers** met in 1963 and submitted its report in 1964, recognizing the need for the nutrition aspect to evolve with further advances in learning (*"Over more recent years, however, social changes, progress in research into various aspects of the nutritional needs of workers in different countries and under different working conditions, and technological changes in the work patterns in industries call for particular attention to certain aspects of employee food service programmes"*).
- The 1998 **ILO Code of Practice on Safety and Health in Forestry Work (ILO, 1998)** recognized adequate nutrition and hydration as essential occupational health and safety measures for physically demanding work. It links insufficient nutrition directly to adverse health outcomes and reduced productivity, framing nutrition as both a health and performance issue.
- In 2005, the ILO published a global review of workplace solutions for nutritional aspects, including the influence of nutrition on NCDs, titled **'Food at Work: Workplace Solutions for Malnutrition, Obesity, and Chronic Diseases'**.²¹
- The **2006 Maritime Labour Convention (MLC, 2006)** has stipulated regulations and guidelines for member states to ensure that ships under their purview provide free, adequate, quality (balanced and nutritious) food and drinking water to seafarers for the period of engagement (Regulation, Standard 3.2, and Guideline 3.2.1 for inspection, education, research & publication).
- The **2012 revised edition of ILO's SOLVE programme**, designed by ILO's SafeWork programme to integrate workplace health promotion into OSH policies, included special emphasis on nutrition at work, recognizing it as a critical modifiable risk factor for NCDs.

“ The aim is not to enable the worker to obtain enough indifferent food to keep him going till the end of the day; it is to provide him with a pleasant and nutritious meal in relaxing surroundings. If this aim can be attained, the canteen will justify itself not only by contributing to the comfort and satisfaction of the worker, but also by contributing to his productivity and the output of the undertaking in which he works. ILO (1955) ”

NATIONAL LAWS AND POLICIES

Workplace nutrition elements have been noted in myriad national legislations and policy documents. Some notable examples are referenced below to illustrate the diversity and range of perspectives involved. These do not include references to sanitation and food safety, dining rooms and other eating spaces, safe drinking water, and other related provisions.

- **India, Bangladesh, and Pakistan**, as part of their **Factory/Labour legislations**, have stipulated specific provisions for at-work cafeterias at public and private companies (especially manufacturing firms) for a specified number of workers employed. Further, **Rule 89 of the Bangladesh Labour Rules, 2015**, requires the canteen to supply nutritious food.
- Under the **Artículo 316 del Código Sustantivo del Trabajo de Colombia, 1951**, petroleum companies involved in oil & gas exploration and production must provide healthy and sufficient food or a salary sufficient to purchase the same at regional prices.
- **Nigeria's 1971 Labor Act** includes the term 'Labor Health Areas' (Section 66, Labor Act, 1971), or remote or isolated areas with poor medical and health systems, water supplies, and communications. Under Section 67, the employer must make adequate arrangements to meet housing and hygiene requirements, establish medical centers, conduct regular medical examinations for workers, and ensure employees have access to food, water, and fuel.
- Article 232, **Poland's Labour Code, 1997** enshrines the concept of preventative food and drink for strenuous work, mandating employers to ensure that employees working under particularly strenuous conditions have free of charge meals and drinks, as appropriate and if necessary for preventative reasons.
- Article 78, **Manpower Act 2003 of Indonesia** mandates employers to provide food and drink amounting to at least 1400 calories to women workers on the night shift.
- In **2004, Venezuela** passed the **Food Law for Workers**, mandating employers (with ≥ 20 workers) to provide employee benefits as a balanced meal (or, alternatively, food vouchers/ cards) to workers for improved health, productivity, and prevention of occupational diseases. There are penal provisions for non-compliance and for cash payment in lieu of nutrition. Similar provisions are noted in other countries, such as **Brazil's Programa de Alimentação do Trabalhador (PAT)**, which remained voluntary and relied on employer incentives.
- Under **Kenya's Employment Act, 2007**, Part V Rights and Duties in Employment, Section 33(1) states that wherever there's an agreement between employer and employee regarding food provision at the time of entry into work, the employer shall ensure that an employee is properly fed and supplied with sufficient and proper cooking utensils and means of cooking, at the employer's expense.
- Singapore, as part of its **Employment of Foreign Manpower Act 1990**, introduced the **Employment of Foreign Manpower (Work Passes) Regulations 2012**, with a dedicated Fourth Schedule on Conditions and regulatory conditions of work permit. Article 1 of the schedule mandates employers to take responsibility for the upkeep and maintenance of the foreign employee in Singapore, including providing adequate food and medical treatment.
- In 2020, the **Government of New Zealand**, Ministry of Health, published its Healthy Food and Drink Guidance for Organizations.
- Article 182, the **Kazakhstan Labour Code, 2023**, details the rights and duties of the employer with respect to safety and labour protection, including in 182(2) (4), the range of actions for individual and collective protection as per the norms extended by the authorized state body for labour. These norms

include necessary sanitary and hygienic conditions, issuance and repair of special clothes and footwear, provisions for preventive treatment, detergents and disinfectants, a medical first-aid kit, milk or equivalent foods, and (or) specialized products for dietetic (curative and preventive) nutrition. Similar provisions are noted in Ukraine's Labour Code (Article 166).

- In 2025, **Vietnam** altered the existing cap on cash provision against meal allowances for workers to state that the quantum of cash allowances (wherever applicable) shall be a part of Collective Bargaining Agreements (**Section 3, 2019 Labour Code**).
- In a Collective Bargaining Agreement study, limited mention of nutrition (such as meals at work, vouchers), nutrition education, and in health monitoring were noted. Examples were from countries/sectors such as from Indonesia/textile, from France/mining, Denmark/shipping, and USA/Healthcare.

Evidence shows that workplace nutrition strategies are a core part of protecting workers' health, not just an added benefit. Since the 1950s, policies have recognized the need to support workers with health vulnerabilities and those in hazardous jobs, reflecting an understanding of different risk levels and employer responsibility. However, new and more complex workplace hazards, especially long-term chemical exposures, require updated and stronger guidelines. Integrating nutrition into occupational health policies can improve worker resilience, reduce illness, and enhance productivity, generating long-term health and economic benefits.

PART C: WORKPLACE ACTIONS AND IMPLICATIONS: KEY RECOMMENDATIONS

Globally, we are seeing the emergence of increasingly complex chemical compositions that interact with living organisms and the environment with significant adverse effects. To address these challenges, several international frameworks and industry-led initiatives have gained momentum. These include Global Framework on Chemicals and ILO Global Strategy on Occupational Safety and Health and its Plan of Action (2024–30). Other critical efforts also include Global Alliance to Eliminate Lead Paint, the UN E-waste Coalition, the Global Alliance on Highly Hazardous Pesticides, and the under discussion Global Treaty on Plastic Pollution. On the corporate/ industry front, purpose-driven programs such as Ellen MacArthur Foundation's New Plastics Economy, the Alliance to End Plastic Waste, and the Responsible Care initiative are encouraging more sustainable practices.

The following recommendations are addressed to governments, companies, and workers to support a smooth transition toward safe & healthy working environments, integrate nutrition into OSH frameworks, and protect workers from the long-term effects of chemical hazards.

FOR GOVERNMENTS

- **RATIFY INTERNATIONAL INSTRUMENTS**, including those under the Global Framework of Chemicals and International Treaties. Many Governments have already ratified ILO's Chemical Convention (No. 170), Occupational Cancer convention (No. 174), OSH Conventions (Occupational Safety and Health Convention, 1981 (No. 155), Promotional Framework for OSH Convention, 2006 (No. 187), or international treaties such as Basel Convention (1992), Rotterdam Convention (1998), Stockholm Convention (2001), Minamata Convention (2013), or the 2023 Global Framework on Chemicals and are in alignment with the ILO's construct of a safe and healthy environment.
- **ADOPT APPROPRIATE CHEMICAL CLASSIFICATION AND LABELLING STANDARDS, with a nuanced understanding of the Hierarchy of Controls for enhanced worker safety and protection.** This global architecture of International treaties ensures that most countries consider the broad impact of chemicals throughout the lifecycle, including production, handling, transport, and end disposal. Given the global nature of chemical supply chains, it is essential for all Governments to be active participants in the global architecture of chemical safety, thereby ensuring a safe and healthy work environment for workers everywhere.

- **RECOGNIZE THE NEED FOR EMPHASIS ON THE ELIMINATION AND SAFE SUBSTITUTION OF CHEMICALS AND BYPRODUCTS/ POLLUTANTS that intensively interact with living beings and the environment.** Recognize also the inherent residual risk from persistent exposure to chemical substances, which may lead to long-term damage to critical organs and non-communicable diseases.
- **MANDATE EMPLOYERS ACROSS MORE SECTORS TO ALIGN WITH NATIONAL NUTRITIONAL STANDARDS AND DIETARY GUIDELINES FOR FOOD OFFERINGS AT THE WORKPLACE.** The ILO Recommendation No. 102 (1956) initially advocated for the provision of meals for specific categories of workers, taking into account their context, culture, and medical requirements, and proposed the establishment of suitable national standards or guidelines. Nevertheless, substantial advancements in developing national dietary guidelines and recognizing the link between daily diets and non-communicable diseases (NCDs) have emerged only recently across nations.
- **REINFORCE THE SCOPE FOR CUSTOMIZED WORKPLACE NUTRITION PROGRAMMES for workers from vulnerable categories and provision of healthy foods that enhance immunity and extend a protective layer to workers who may be directly or inadvertently exposed to chemical hazards as part of their work profile.** Appropriate protein-energy balance, vitamins, and antioxidants are essential for a healthy immune system, helping filter out persistent chemicals and pollutants and preventing the development of metabolic disorders. Incentivize employers to subsidize healthy meal options available at or near the workplace. Participatory planning of menu combinations emphasizing whole and plant-based foods, complex carbohydrates, proteins, and adequate portions of fruits and vegetables can be designed based on work profiles, age, and special worker needs.
- **ENSURE TIMELY, APPROPRIATE DOCUMENTATION, REPORTING, AND MONITORING of both occupational accidents and injuries, as well as occupational diseases and noncommunicable disease progression linked to the work environment.** Improve understanding of the chemical interaction with human body systems, with mandated worker health surveillance, including nutrition-focused health checks such as blood glucose, cholesterol, blood pressure, and specific parameters related to the chemical profile.
- **EXTEND THE EXISTING SCOPE OF OCCUPATIONAL HEALTH SERVICES UNDER NATIONAL OSH POLICIES AND MANDATES to include healthy lifestyle promotion, especially basic nutritional education components across workplaces.** Incentivize employers and worksites to reinforce government mass media campaigns on healthy eating and good nutrition.
- **INVEST IN HEAT STRESS PREVENTION.** Nation-states in the equatorial region, who will be most affected by heat stress, especially workers involved in agriculture, outdoor work, transportation, utilities, oil and gas, and chemical/ process industries, must invest in highlighting prevention of heat stress scenarios through appropriate strategies, including hydration, dietary changes, and ventilation/shading strategies.

FOR COMPANIES

The ILO's consolidation of existing chemical standards for a broader, progressive approach in alignment with SDG 12 (Target 12.4: environmentally sound management of chemicals and waste), and SDG 8 (Target 8.8 Safe and healthy work environment) requires action across the chemical lifecycle, and thus, has implications for companies across the chemical supply chain. Companies active at different stages (chemical manufacturing, handling, storage, transportation, product use and waste management) must progress towards adoption of safer, green chemicals, elimination and substitution of hazardous substances, and individual and collective worker protection and safety measures. This continues to be the foundation of Occupational Health and Safety, and will be further critical to processes and chemicals incorporating hazardous substances.

- **COMPANIES MUST ADHERE TO NATIONAL AND INTERNATIONAL OCCUPATIONAL EXPOSURE LIMITS** for specific hazardous substances with related processes for monitoring, reporting, and documentation of exposure levels, along with worker-level health surveillance and periodic health examination. Together, these measures are critical for appropriate risk management and inclusion of specific preventive and remedial measures designed to ensure a safe and healthy work environment for all.

- **RISK REDUCTION, PREVENTIVE, AND PROMOTIVE ACTIONS FOR WORKERS CAN ALSO BE SUPPLEMENTED BY WORKPLACE NUTRITION INITIATIVES.** Integrating workplace nutrition into chemical hazard management enhances worker resilience as nutrition-rich diets support detoxification, appropriate immune function, and recovery from exposures, aligning with broader occupational health promotion measures.
- **COMPANIES NEED TO COMMIT to well-designed and contextualized OSH-N (OSH X Nutrition) incorporation with healthy workplace meals, nutrition education, and workers' health monitoring.** The healthy food at work measures include providing hygienic, chemical-free zones for meals and offering low-cost, nutritious options. For example, increased portions of nutrition-rich staples, proteins, and fruits and vegetables that are high in Vitamin C and E for detoxification. At the same time, **companies can prioritize and incentivize healthy vending options, caterings with limited ultraprocessed foods, and emphasize whole foods and plant-based items.** This transition from calorie-dense to nutrient-dense, diverse food in workplace cafeterias will help workers improve their health parameters and reduce the risk of lifestyle diseases.
- **INTEGRATE, as part of the OSH-Nutrition strategy, the component of well-designed, appropriate nutrition education opportunities for workers.,** These can include the basics of nutrition support for modern lifestyles, with special sessions for workers on rotating shifts, performing physically or cognitively demanding tasks, and experiencing heat stress, to build inner resilience and withstand persistent exposure.
- **EFFECTIVELY UTILIZE THE POTENTIAL OF PERIODIC HEALTH MONITORING for workers.** The conventional role of periodic health and nutrition monitoring is to provide feedback to companies regarding hazard exposure, adherence to exposure limits, and responsive action through engineering and administration controls. Yet, such monitoring additionally helps workers to gain insights into their health patterns, immunity levels, and realign their diets and lifestyle so as to safeguard, withstand exposure, and hasten recovery. Companies must ensure worker privacy and confidentiality in this process.

FOR WORKER REPRESENTATIVES

Workers' health and safety is at the heart of ILO's OSH strategy and action. Workers are a heterogeneous category and may vary by age, gender, work profiles, or diverse socioeconomic backgrounds. They may have associated health issues, lifestyle aspects, sociocultural vulnerabilities, or may face environmental stresses that impact their well-being. Carefully designed workplace implementation programs are an exciting opportunity to promote quality, nutritious diets for all workers while improving their resilience, agency, and self-awareness, fostering an integrated approach.

- **Empower themselves through appropriate nutrition education and training on diet-hazard links** and advocate for improvement in workspace conditions related to nutrition, health and safety.
- **Participate in healthy menu planning,** choices for protective foods, and safe and contamination-free dining spaces and drinking water.
- **In equatorial regions, ensure regular hydration, short breaks from physically demanding work, shading and ventilation, and loose clothing.** Be aware of heat stress, heat strain, and protect the kidneys from repetitive stress events that may cause long-term damage.
- **Older workers must be aware of their physical changes, capacities for strenuous work, and immunity levels.** Their reduced capacities for managing heat stress and higher risks for metabolic syndrome, cardiovascular issues, and systemic inflammation that may or may not be work-induced may lead to increased health issues and poor recovery. Accordingly, diets need modification for better aging and improved longevity.
- Worker representatives involved in negotiations on collective bargaining agreements with employers to **emphasize the potential for comprehensive nutritional interventions, including healthy food at work, nutrition education, nutrition and health monitoring.**

REFERENCES & ENDNOTES, AND ACKNOWLEDGEMENT

End notes & acknowledgement

“The definitions of “chemicals“ in the two major ILO chemical instruments, the Chemicals Convention, 1990 (No. 170) and the Prevention of Major Industrial Accidents Convention, 1993 (No. 174), are both very broad. In Convention No. 170 a “chemical” is defined as all “chemical elements and compounds, and mixtures thereof“ (Art. 2(a)). A hazardous chemical is further defined as a chemical with “health or physical hazards“ (Art. 2(b) and 6(1)). The definition thus explicitly includes physical hazards such as dust, or asbestos.” Peters, P. (2019). ILO instruments on chemical safety: analysis and synergies with other international frameworks on the sound management of chemicals. ILO, pg 1.

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