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# Working Conditions and Health Inequalities

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## Abstract

Over the last decades, there has been a considerable progress made to address risks at workplaces and to promote occupational safety and health of workers. Nevertheless, the recent changes of the labor market underline that new risks to the health and well-being of workers should be considered. In this context, a vast amount of studies have analyzed the relationship between work conditions, social inequalities, and health, suggesting a complex net of causation. Only recently, it has been shown that people in lower socioeconomic positions incur higher working risks. The 2008–2013 economic crisis also introduced a reduction of the number of workers in full-time permanent employment with a steady expansion of atypical and precarious workers. The latter have generally been associated with more insecure and unhealthy working conditions. Another important aspect of safety in the workplace is gender differences. Although nowadays there is more information than before about the types of health problems and accidents women incur at the workplace, the gender-related questions are still open issues that require a careful evaluation of work-related risks of men and women. In this chapter, we focused on the current state of the art in the field of occupational health and examined the aspects that are still being debated.

**Keywords:** occupational health, occupational exposure, risk assessment, social determinants of health

## 1. Introduction

The target of Occupational Safety and Health (OSH) programs includes fostering a safe and healthy work environment. Successful safety interventions depend on the correct identification of causality mechanisms from exposure to hazards to the onset of disease or injury. The central point of OSH programs is the risk assessment process in which we must identify things, situations, and processes that may cause harm to people. The usual approach to OSH implies three phases: (i) hazard identification related to specific work tasks, (ii) risk assessment or evaluation of the risk associated with that hazard, and (iii) actions and procedures to eliminate the hazard, or control the risk when the hazard cannot be eliminated [1, 2]. It is important to underline the difference between hazards and risks, as many people use the terms interchangeably. Commonly used definitions follow: a hazard is any source of potential damage, harm or adverse health effects on something or someone. A risk is the chance or probability, high or low, that a person will be harmed or experience an adverse health effect if exposed to a hazard [1, 2]. For example, the disease tuberculosis (TB) is the adverse health effect caused by the *Mycobacterium tuberculosis* also defined as the “hazardous biological agent.” The risk to get sick from TB depends on the probability

to be exposed to the “hazardous biological agent,” for example, by working with biological samples infected with *Mycobacterium tuberculosis* or having close contact with someone with the disease TB. In this example, the probability (risk) of being exposed to TB will be very high for people working in the hospital infectious diseases department, but very low for people working in other workplaces, such as a library. Today, there are known many different types of hazards, which can cause adverse effects or harm in the workplace. Hazards can come from a wide range of sources and can be found in every workplace. Workplace risk awareness has grown over time, thus now it is possible to identify situations and processes that are inherently dangerous, such as those associated with chemical, physical, and biological procedures or ergonomic risk factors. Unfortunately, there is no cultural preparation to address risk assessment of new and emerging categories (e.g., the work organization) that do not seem to be inherently dangerous [3–5].

Before going into specific aspects of OSH, it should be emphasized that adverse health outcomes in the medical field can be considered as based on two different approaches: the first considers bad health as an inevitable result of individual behavior patterns; the second considers that poor social and economic circumstances affect health throughout life. These different approaches can be extrapolated into the occupational field. Unfortunately, the occupational safety and health management system has so far given little attention to aspects related to the social-economic organization in which people live and work. In recent years, several studies have shown that safety interventions may be more effective at preventing the incidence of work-related diseases by giving priority to the characteristics of organization structures [6–8]. What does this specifically refer to? Generally, when referring to social-economic organization, we consider some occupational and working conditions, type of organizational structure of companies, different types of contracts (such as atypical jobs), size of the production units, and feminized and masculinized jobs.

In this chapter, assuming that most aspects of common workplace hazards should have been dealt with extensively in other chapters of this book, we will not discuss them unless these can be modified by the specific characteristics of sub-groups of workers. Our goal is to provide a point of reflection on the relationship that associates socioeconomic organization and safety interventions in the workplace with social inequalities in health also named health inequalities.

## **2. Materials and methods**

A non-systematic literature review was conducted, based on a selection of current and high-quality articles. Search strategy was set up on the main keywords utilized both in the field of occupational health and health inequalities. The search covered PubMed, Science Direct, and Google Scholar databases. Articles and reports that are considered milestones in the field of health inequalities have also been added to the list of references. Reports from World Health Organization (WHO) and Occupational Safety and Health (OSH) were downloaded from the official websites, and web addresses have been reported in the references. Data relevant to the objectives of this chapter have been synthesized using interpretive analysis.

## **3. Health inequalities**

Health inequalities are well documented in a large number of studies from a broad range of industrialized countries (seen in low-, middle-, and high-income

countries) [9–12]. Among the most important scientific evidence of health inequalities, it is necessary to give particular emphasis to the famous Whitehall Studies (I and II) of British Civil Servants led by Michael Marmot [13, 14]. The Whitehall cohort study examined mortality rates of Civil Servants and was conducted over a period of 10 years, beginning in 1967. A long-term follow-up of people enrolled in the two studies is still ongoing [15, 16]. Why the impact of these studies so important? The Whitehall studies concentrate on one “working environment” (British Civil Servants) in which there is little heterogeneity in the social economic position within occupational levels and clear social divisions between levels [17]. Whitehall studies showed that people of lower hierarchical occupational levels had worse health and shorter life expectancy than those who were in higher occupational levels. Whitehall studies likewise showed a gap of 5 years in life expectancy between people at the top and at the bottom of the occupational levels. Whitehall studies have also demonstrated an inverse relationship between social economic position and health as well as mortality related to a wide range of diseases. Based on the results of Whitehall studies, Marmot identified “the social gradient in health” where people are positioned by degrees of affluence and deprivation [13, 18]. People near the top have poorer health than those at the very top but better than people behind them in the health gradient scale. Thus, the social gradient in health means that health inequalities affect everyone in a different manner. In addition to Whitehall research, other studies have provided overwhelming evidence for health inequalities and their distribution in the social gradient of health [19–25]. Health inequalities, within and between different countries, are influenced by an unequal distribution of economic, social, and environmental conditions. People with a lower level of education, a lower occupational class, or a lower level of income tend to die at a younger age and to have a higher prevalence of most types of health problems [11, 17]. It is interesting to note that the health gradient cannot be explained taking into account only the biological or genetic characteristics of people, but rather must be considered as the consequence of the socio-economic conditions in which people live and work. The social gradient in health is a term used to describe the phenomenon whereby people who are less advantaged in terms of socioeconomic position have worse health (and shorter lives) than those who are more advantaged. It is also important to highlight that social gradient of health considers differences between social groups rather than between individuals.

#### **4. What are the factors that influence people’s health status?**

Scientific work on health inequalities has exponentially increased over the last five decades and particularly since the establishment of the World Health Organization (WHO)'s Commission on Social Determinants of Health (CSDH) in 2005. The CSDH approach has focused on the Social Determinants of Health (SDH) perspective, providing an alternative for the approaches limited only to the medical-health aspect and individual behaviors [26]. As a matter of fact, the medical-health approach had always focused on improving health care quality and addressing unhealthy behaviors (e.g., incorrect life style) to achieve greater health equality. Thus, individuals have been considered as responsible for their own health, and the main strategy for preventing disease has been focused on the promotion of correct life style and on behavioral modifications (e.g., smoking cessation, decreasing salt and fat intake, and reducing sedentary lifestyle) [21, 27]. Encouraging better individual behavior is a well-established approach to health promotion, but the evidence suggests that these interventions may have limited effect without to tackle health inequalities [21]. Conversely, an incorrect lifestyle



could be a response to social breakdown and a mirage to escape from social adversity and stress. Several studies have shown that alcohol dependence, illicit drug use, and cigarette smoking are all closely associated with markers of social and economic disadvantage [28, 29]. The WHO introduced a new approach for public health intervention that recommended more concern toward social policies and social determinants of health. According to the suggestions of the WHO [10, 30], different countries in the world (especially European countries) are focusing their health policy interventions both on promoting better lifestyles and addressing the root causes of health inequalities.

#### 4.1 Social determinants of health

Social determinants of health include all the major non-genetic and non-biological factors that influence human health. In other words, they are the socioeconomic factors operating in the society that ultimately lead to poor health outcomes. The field of the social determinants of health is perhaps the most complex and challenging of all [9–12]. As reported on the official website of the WHO [9], social determinants of health are defined as follows:

*“The conditions in which people are born, grow, work, live, and age, and the wider set of forces and systems shaping the conditions of daily life. These forces and systems include economic policies and systems, development agendas, social norms, social policies and political systems”* [9].

Several “conceptual models” have been developed to describe the complex process by which social hierarchies are associated to health. The models try to illustrate how health inequalities are created through the effects of social stratification [11, 31, 32]. Generally, the classifying of individuals into groups with different relative social positions is based on characteristics such as education, income, labor market position, ethnicity, and gender. All together, they are also named social determinant of health. The uneven distribution of opportunities and resources (coupled with social positions) is associated to systematic differences in living conditions and to differential vulnerability. It is important to emphasize that although the “conceptual models” differ in style and complexity, most of these represent health as the outcome of a chain of events or social influences, including both proximal and distal determinants of health. Proximal factors act directly or almost directly to cause disease, (e.g., individual lifestyle factors, housing, water and sanitation, and social and community networks), and distal determinants act indirectly (including social resources like education, employment opportunities, political influence, income, and property). The most significant distal factor is the social structure of society, which is the upstream in the causal chain and acts via a number of intermediate causes establishing person’s position in the social hierarchies. Numerous studies have shown that a “dose-response” association with health [17, 26] characterizes education and income. As stated by the WHO and by experts in the field of health inequalities, six main areas of interventions are identified for good health condition:

1. Give every child the best start in life.
2. Enable all children, young people, and adults to maximize their capabilities and have control over their lives.
3. Create fair employment and good work for all.
4. Ensure a healthy standard of living for all.

5. Create and develop healthy and sustainable places and communities.
6. Strengthen the role and impact of ill-health prevention.

In the last few years, new and stronger scientific evidence and several conceptual models on the levels of causation of health inequalities have been developed [31, 32]. A detailed description of the six areas as well as deeper conceptual models on the levels of causation (by which social hierarchies are created) goes beyond the scope of the present chapter and interested readers can refer to more focused reviews [9, 11, 14, 26, 31, 32]. Here, we like to emphasize that the importance of employment and the quality of work is recognized as one of the most important key determinants of health.

## **5. Employment and working conditions**

To analyze how the working world can affect the health of populations, we need first to clarify three occupational aspects: employment relations, employment conditions, and working conditions. The former concerns the various relationships between the employer and employee. In the developed countries, “employment relations” are often subject to the enforcement of specific law or a contract of hire. In the developing and under-developing countries, most employment agreements are not explicitly subject to any formal law or contract. Considering that the “employment relations” varies both within and between countries, the term “employment conditions” was introduced by the WHO [33], classifying different types of employment into six “dimensions” of global scope:

1. Employment
2. Precarious employment
3. Unemployment
4. Informal employment and informal jobs
5. Child labor
6. Slavery/bonded labor

Finally, “working conditions” are related to the tasks carried out by workers, the physical and chemical work environment, ergonomics, the way the work is organized, the social work environment, and the technology being used. Several occupational studies have shown that the relationship between employment condition and work conditions reflect and reinforce the social gradient of health [22]. Thus, people with lower education and lower occupational positions have been associated with dangerous work and with worse work-related exposure [13, 17, 23, 24]. Generally, they were subjected to poorer health than those in higher positions [23, 24]. However, the inequality of exposure does not seem to be sufficiently recognized by all countries in the world. For example, in developing countries, there is a great lack of research, as well as data about risk factors and exposure levels for specific jobs [25]. Nevertheless, in this section, we will try to identify common features and trends among and between economically different countries. Our analysis on occupational conditions starts with the most disadvantaged “dimensions” as registered

in the list of six “dimension” of global scope. The most disadvantage conditions are slavery/bonded labor and child labor, as these conditions are often not in line with the application of human rights.

### **5.1 Slavery/bonded labor**

After abolition of slavery practice, which occurred at different times in different countries, its legacy still persists and influences health outcomes. An estimated over 24.9 million people were victims of modern slavery or forced labor in 2016 [34]. Half of these were in debt bondage, in which personal debt is used to forcibly obtain labor. Currently, these numbers do not seem to have decreased. (Data according to a collaborative research performed in 2016 by the International Labour Organization (ILO) and the Walk Free Foundation in partnership with the International Organization for Migrant (IOM) and benefiting from inputs provided by United Nations Office (ONU) of the High Commissioner for Human Rights (OHCHR) [34].) Although modern slavery is not defined in law, it is used as an umbrella term that focuses attention on commonalities across some legal concepts. The term “slavery” includes different forms of “illegitimate work” (e.g., bonded labor, slavery by descent, the worst forms of child labor, and any type of human trafficking). Slaves are forced to work for little or no pay and under threat or coercion.

Slaves can be found in its various forms, practically in all countries and all economic activities [34]. Slaves live in vulnerable conditions [35] in the lowest level of socio-economic gradient.

To study the relationship between slaves and health is very complex due to clandestine nature of duties associated and the denial of the authority regarding its existence. Studies on slavery have mainly given a qualitative picture of disease patterns. Slaves suffer physical and mental trauma as well as of malnutrition due to coercive action, but also restriction of movement and violence. Slaves are often constrained in poor working conditions and are exposed to more hazardous and adverse conditions than other workers. Generally, they are reluctant to access health and social services following accidents or ill health. Some evidence has shown on the adverse health outcomes and health inequalities as a result of physical violence and mental trauma, risky behavior, absence or inaccessible welfare measures, and cultural barriers.

### **5.2 Child labor**

Child labor is a violation of fundamental human rights. Based on data of UNICEF, ILO, and World Bank, an estimated over 168 million children aged 5–17 are engaged in child labor [36, 37]. However, there is no consensus about the definition of child labor.

The Child and Adolescent Labour Prohibition and Regulation (CLPR) Act of 1986 defines “Child” any person below the age of 14 and prohibits employment of a child in any employment including as a domestic help (except helping own family in non-hazardous occupations). According to UNICEF (2006), child labor means children below 12 years of age with the exception of those from 12 to 14 years of age engaged in “light work.” For ILO, child labor (regardless of the age of the child) is a violation of fundamental human rights that hinder children’s development and potentially leading to lifelong physical or psychological damage [36, 37].

Child labor is the combined product of many factors, such as social discrimination, poverty, and migration. Child labor reinforces intergenerational cycles of poverty by keeping the children of the poor out of school and limiting their prospects for upward movement in the social hierarchy. Child labor is a major cause of

illiteracy, low education, and low-skilled workers. As described above, education is a powerful social determinant that creates and strengthens human capital in a society. Every child forced to drop out of school to work is a loss of human capital. This lowering of human capital has been linked to slow economic growth and to poor social development. The ILO study has shown that eliminating child labor in developing economies could generate economic benefits nearly seven times greater than the costs that would need to be invested in better schooling and social services [36]. A growing number of studies have shown that health problems are one of the main negative effects of child labor [35, 38]. With regard to biological differences (in anatomy, physiology, biochemistry, and toxicology), children may suffer from greater vulnerability than adults to hazardous workplace factors. Children have an immature immune system that increases vulnerability to biological agents. Extreme workloads may lead to various health disorders because of children's lesser bone elasticity, strength, and capacity to support heavy workloads. These factors can lead to musculoskeletal symptoms among child laborers [38], but some of these health effects could appear later during adulthood. Ergonomic risks can also result from inadequate dimensions of tools and equipment that are calibrated on an adult shape. Child labor has been associated with problems related to the physical, physiological, mental, and social development of children [35]. Child labor spans various sectors, including agriculture, quarrying manufacturing, mining, and domestic service. In its most extreme forms, child labor involves children being enslaved. Many working children are also involved in other unacceptable work conditions such as war combats, prostitutions, and drug selling.

### **5.3 Informal employment and informal jobs**

These are non-regulated placements in the labor market, which usually involve an informal arrangement between the employee and employer (informal employment) or self-employment (informal jobs). The latter implies exchange of products or services rather than exchange of labor force. In several countries, workers' rights are related to a formal job contracts. Thus, the workers' entitlement for social benefits, such as paid retirement, sick or maternity leave, or access to health care, requires a formal job contract not covered by informal employment or informal jobs. Besides a lack of social benefits, workers holding informal employment or informal jobs have lower salaries, high turnover, lack of security, non-defined work-time, lack of compensation at firing, and limited unionization [39, 40]. Relations between informal economy/informal jobs and health are not often studied and health inequalities even less. Overall, employment status and other occupational data are not always available. Most of the available studies are qualitative case studies or descriptive surveys carried out on informal employees versus formally hired workers. The qualitative methods are more descriptive and focused on the description of individual experiences [39, 41, 42]. Thus, the lack of official numerical data penalizes the application of quantitative statistical methods. The studies based on workers in the informal economy are penalized by the large heterogeneity of occupations and trades, private work agreements, and the lack of risk assessment due to uniqueness of workplaces and the scattered spatial distribution of workers. Informal workers appeared more vulnerable to adverse effects of health than those engaged in formal jobs [43]. Informal employment may cause mental distress and psychological diseases, because of job insecurity, or the fear to lose long-term jobs. Job insecurity is always associated with specific adverse health effects related to mental distress and psychological diseases [44, 45]. A positive association has also been shown between informal jobs and years of life lost in disability or due to early death for all diseases. These studies, however, have not considered the heterogeneity



of the informal sector that includes small entrepreneurs, self-employed, and salaried workers. In addition, few studies have described the relations between informal employment and health inequalities, describing mainly health effects without considering the social position of the subjects examined (probably a small entrepreneur is located in a different socioeconomic position respect to an informal employee). Specific studies will be needed to establish a correct relationship between each specific informal employment with health and health inequalities.

#### **5.4 Unemployment and precarious employment**

In 2008, the world economy faced its most dangerous crisis since the Great Depression of the 1930s. The so-called “subprime mortgage” crisis began in the United States in 2007 and spread quickly, first to the entire United States financial sector and then to financial markets of Europe. Changes that took place in the economy have influenced the labor market, increasing unemployment and the number of precarious workers. The burden of the recession has not been equally distributed among the different socio-economic groups. People in lower socio-economic positions have had a higher risk of dismissal, unemployment, and precarious employment, thus strengthening the social gradient of health.

For example, workers with weaker employment contracts, less skilled, and less experienced workers, as well as those from some ethnic minority groups have suffered the greatest load of the recession. Since crisis, the economy of industrialized countries has continued to be slowed, but with steady recovery. However, the growth of jobs has been predominantly in higher skilled employment, while the number of manufacturing and low-skilled jobs has been declined over a longer period. Many workers have been trapped in a cycle of low-paid, poor quality jobs (many of which are precarious jobs), and unemployment. In this section, the conditions of unemployed people and precarious workers will be considered together as they share insecurity, low self-esteem, and lack of control over work and home life and stressful circumstances that can cause adverse health effects such as anxiety, mental effects, and depression [46–48]. Psychosocial risks can increase the chances of premature death [17]. These occur because in emergencies, human hormones and nervous system are ready to deal with an immediate physical threat: raising the heart rate, mobilizing stored energy, diverting blood to muscles, and increasing alertness. For brief periods, this does not matter, but if the tension goes on for too long, people become more vulnerable to a wide range of conditions including infections, diabetes, high blood pressure, heart attack, stroke, and depression. Some studies have emphasized that negative effects are proportional to the duration of unemployment, which progressively damage health [47–49], and negative effects are greatest among those who experience long-term unemployment [50]. They have also increased rates of limiting long-term illness [51], mental illness [46], and cardiovascular disease [52]. There are three ways in which unemployment affects levels of morbidity and mortality: (1) financial problems result in lower living standards, which may in turn reduce social integration and lower self-esteem [47]; (2) unemployment can trigger distress, anxiety, and depression [49] not only among the unemployed themselves but also among their partners and children [53]; and (3) unemployment can impact on health behavior, being associated with increased smoking and alcohol consumption and decreased physical exercise [47]. It is interesting to note that the relationship linking unemployment and poor health runs in two directions. Unemployment contributes to ill health and in turn, poor health increases the likelihood of unemployment, and the two can become mutually reinforcing [54]. The extent to which ill health and disability act as an obstruction to work is highly dependent on educational qualifications. Evidence suggests that

health risks are even higher depending on geographical regions where unemployment and work insecurity are widespread [44, 45]. When in work, the long-term unemployed are more often engaged in precarious work. Precarious jobs are also common among young workers, new workers, and adult populations with low skill level and low educational degree. Precarious workers are disproportionately employed in physically demanding or hazardous jobs. This puts them at a higher risk of workplace injuries and illnesses. In addition, in some cases, employers are reluctant to commit economic resources to train unstable workers who will leave their jobs quickly. Thus, precarious workers, suffering from a lack of “information” with regard to safety at work, could be more vulnerable than permanently people to adverse working conditions. From what has been explained so far, getting people into fair employment is an important strategy for improving health.

## 5.5 Employment

It has been repeatedly emphasized that permanent employees work in safer conditions than the people working in the other employment dimensions. Nevertheless, over the few last years, the global workforce is constantly changed in relation to age and gender. Thus, it is important that the implications of demographic change in relation to OSH are taken into account to help build effective policies and strategies for all workers.

For example, women are entering the workforce in increasing numbers and have a higher risk than men for some work-related disorders (e.g., musculoskeletal disorders). It is well documented that injury rates are significantly higher among young workers than among older or more experienced workers [37–55]. Nevertheless, older workers need adaptive practices and equipment to work safely [56].

The gender sensitive approach has showed a steady growth, while few studies have been performed on age differences. Due to the increased participation of women in the workforce, the European Agency for Safety and Health at Work (EU-OSHA) has encouraged a policy of gender equality in all European member states [57, 58].

### 5.5.1 Occupational gender differences

The gender-sensitive approach includes “sex” and “gender” characteristics, where “gender” refers to those characteristics of women and men that are socially and culturally determined, whereas “sex” refers to biological and physiological differences. Sex (biology) and gender (the social construction of masculinity and femininity) interact constantly and can lead to gender disparities in human diseases in terms of incidence, prognosis, and response to therapy [59–61]. Gender disparities run in a transverse manner among different social groups along a social gradient of health, and the gender bias according to occupational area is closely related to social inequalities.

Occupational studies should take into account gender differences related to two aspects: (1) socioeconomic and cultural factors and (2) biological factors that change the effect of an equal occupational hazard exposure in male and in female.

Socioeconomic and cultural factors, as well as gender stereotypes, have affected occupational segregation, which is the underlying reason for so many gender inequalities [62]. Women and men have been restricted in “feminized and masculinized” sectors of activity (horizontal segregation) due to gender stereotypes. Women and men carry out the same jobs, but perform different tasks [63]. In addition, men are more likely to work in jobs higher up in the occupational hierarchy than women (vertical segregation) [60, 61]. Hence, gender segregation strongly

contributes to an unequal distribution of working conditions as well as exposure to different physical and psychological risks between sexes [64]. Women are also more likely to have part-time or temporary contracts than men [65]. Job segregation strongly contributes to different hazard exposure and consequently to different health outcomes. Examples of these could include skin diseases that women suffer when working with wet hands, chemical cleaning, and sterilizing agents as well as protective gloves containing latex dust. Several studies have also reported male-female differences in the prevalence of symptoms of work-related musculoskeletal disorders, some arising from workplace exposure differences [66]. In this regard, it is important to emphasize that gender-related biological differences may result in differential vulnerability of women and men at the same physical, chemical, and biological workplace factors such as hazardous substances and biological agents [62, 67, 68].

Many studies, on which occupational safety and health are based on, have been performed on men excluding women [60]. In addition, gender differences have been rarely studied in epidemiologic research related to occupational safety and health. For many years, Food and Drug Administration guidelines specifically precluded participation of women in many toxicological studies [69]. Currently, it is believed that women and men differ in many aspects of biological vulnerability to occupational hazards.

Chemicals may induce variable toxic actions according to the amount absorbed by the body (or Body Burden) [70]. Toxicological studies have defined the threshold limit value (TLV) or daily level to which a worker can be exposed without adverse health effects. However, TLV has been calculated on men, and few studies have measured exposure for men and women in the same occupational setting. Toxicity varies depending how quickly and efficiently toxic agent is metabolized. Generally, the relationship between exposure dose, absorbed dose, and effective dose is complex and depending on various factors that are studied by pharmacokinetics or toxicokinetic that is split up in four different phases [(1) absorption across the body barriers (e.g., skin and hair), (2) the distribution into the body, (3) the metabolism, and (4) the excretion] are all subject to sex differences [71]. Absorption probably differs between women and men due to the condition of the skin (with or without cosmetics), number of hair follicles, breathing rates, and respiratory volume. It has been identified a number of chemical agents for which the body burden is different in women and men even when they carry out the same job [70]. Differences in “Body Burden” are clarified by the anthropometric differences between sexes according to muscle mass, fatty tissue, and bone mass. Women have a higher percentage of body fat than men. Adipose tissue makes women more susceptible to dangerous fat-soluble substances, such as organic solvents (e.g., benzene and trichloroethylene). All together these factors affect the extent of distribution of the chemical into the body compartments. However, the greater role in toxicokinetic variability is played by differences in xenobiotic metabolism [71]. Primarily, these reflect the differences in gene expression for enzymes of the CYP450 superfamily, the major family of enzymes involved in the metabolism of chemical agents. Sex-based variance in the expression and activity of CYP isoenzymes are been reported in different studies [71]. In addition, CYP450 activity is also modulated by sex hormones [72, 73]. Finally, renal excretion of compounds is higher in men than in women [71]. It is clear that the limits defined by TLV should be monitored according to gender differences, in order to determine appropriate procedures in OSH.

Work-related asthma is one of the most frequently reported occupational lung diseases, and sensitivity to asthmatic attacks is an emblematic example of gender differences in workplaces as the asthmatic attacks are closely related to hormonal changes [72, 73]. Men are highly sensitive in prepubescent age, but



their susceptibility decreases drastically in adulthood. Conversely, women become sensitive to asthmatic attacks in post pubertal age and this condition continues until menopause. Unfortunately, the period of greater sensitive is overlapped with the working age period. These differences could make women more susceptible than men to occupational asthma and indicate the need for additional prevention measures for women (e.g., particular PPE).

## **6. Work-related stress**

Work-related stress can be defined as the adverse reaction people have to excessive pressures or extra demand placed on them at workplace [74]. Generally, work-related stress is due to the type of work, position in the social hierarchy, horizontal and vertical discrimination, sexual harassment, and the situation outside of work. In this scenario, work-related stress is an important intermediate factor linking workers in more disadvantaged socioeconomic positions with poor health [74, 75]. Factors like skills and experience, age, gender, ethnicity or disability may all affect whether an employee can cope. Employees feel stress when they cannot cope with pressures and other issues [74, 75]. Both women and men report high levels of work-related stress but stress affects people differently and what stresses one person may not affect another depending on the context in which people live and work [74, 75]. Stress is not an illness but it can make workers ill. As described above, stress raises blood pressure, increases the risk of heart disease [76], and weakens the immune system. It can cause depression and even lead to suicide and cause a number of mental and physical disorders [77, 78]. Finally, stress can increase drinking or smoking, reinforcing inequalities [28, 29].

## **7. Discussion**

Health inequalities can be defined as differences in health status between different population groups, where people who are less advantaged in terms of socioeconomic position have worse health (and shorter lives) than those who are more advantaged [9, 13, 17, 21, 26, 33]. Until a few years ago, the approaches to resolve health inequalities focused on improving health care quality and addressing unhealthy behaviors (incorrect life styles) to achieve greater health equity [10, 27, 30]. These approaches assume that people are the only ones responsible for their health, when they adopt an unhealthy lifestyle. Similarly, occupational safety and health rules are based on actions and procedures that workers have to address in their specific workplaces [1–5]. Although incorrect behaviors must be avoided, addressing work-related risks as though they exist solely within a workplace is an ineffective and incomplete strategy. Due to the recent social and economic changes, it has become more important than ever to anticipate new and emerging work-related safety and health risks [33, 78].

The world of work has undergone profound transformations related to both demographic changes (e.g., age, gender, and ethnicity) and employment conditions (increasing the number of precarious and informal workers) [33, 78]. Similarly, changes that have taken place in the economy have increased the economic inequalities driven by neo-liberalism. For example, some changes in the organization of work have brought flexibility that allows more people to enter the labor force, but may also lead to psychosocial issues (e.g., insecurity), inadequate OSH, and excessive work hours [33, 78]. Lower level occupational roles and poor working conditions have been more common among people with a lower level of education and



lower position in the social gradient [22–25, 33]. Low occupational-skill jobs have often been associated with dangerous work and with worse work-related exposure, reflecting inequalities in exposure to risks [22, 25, 33]. Over the last few years, it has also been established that some organizational aspects can also induce new risks for workers [16, 21, 40, 44, 45, 48, 76, 77]. Among these, psychosocial risks need additional attention in terms of situations and employment practices that affect work-related stress and mental health outcomes [42, 44–46, 48, 76, 77]. In this scenario, people who are discriminated against at work according to age, gender, ethnicity, and contracts of hire should be considered more vulnerable workers than others [56–62, 64, 65, 78].

Finally, it should be considered that occupational accidents and work-related diseases have a substantial global impact, and this impact varies according to where workers live and work. Indeed, it is known that occupational mortality and morbidity are not equally distributed across the world. About two-third (65%) of global work-related mortality is estimated to occur in Asia, followed by Africa (11.8%), Europe (11.7%), America (10.9%), and Oceania (0.6%). This reflects the distribution of both the world's working population and differing levels of national economic development, as well as hazardous work.

## 8. Conclusion

As described in this chapter, some workers are more exposed to adverse health work environments due to strong and persistent social inequalities. Thus, occupational safety and health interventions could be more effective by giving priority to a holistic view of the hazards that workers experience and the range of adverse effects that occur as a result. Today, prevalent occupational safety and health practices remain disproportionately focused on individual-level with inadequate attention to organizational and higher-level systems such as economic and labor market structures, education and training policy, unionization, and other macro-level policies. In the light of the above considerations, further efforts will be needed to apply a new approach to occupational safety and health and to achieve better health status for all workers.

## Conflict of interest

No conflicts of interest were declared.

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