


# Workplace Safety and Occupational Health Job Risks Hazards in Public Health Sector in Greece

Ioannis Pantelis Adamopoulos<sup>1,2,3\*</sup> , Niki Fotios Syrou<sup>4</sup> 

<sup>1</sup> Region of Attica, Department of Environmental Hygiene and Public Health Inspection, South Sector of Athens, Athens, GREECE

<sup>2</sup> Department of Health Sciences, School of Medicine, European University Cyprus, Nicosia, CYPRUS

<sup>3</sup> Research Center of Excellence in Risk & Decision Sciences CERIDES, School of Sciences, European University Cyprus, Nicosia, CYPRUS

<sup>4</sup> Department of Physical Education and Sport Science, University of Thessaly, Trikala, GREECE

\*Corresponding Author: [adamopoul@gmail.com](mailto:adamopoul@gmail.com)

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## ABSTRACT

**Background:** A systematic literature review in field of occupational health and safety job risks hazards in public health sector under the view of process that applies principles and techniques to create, communicate, and deliver value in order to influence target audience behaviors that benefit society as well as the intended employers, and also managers. The aim of the study is to change the activities in the workplace and society that will support the overall public health sector services in Greece and global.

**Methods:** Review conducted and select research studies from January 2000 through February 2022, also the last two years on the recent frame of period of COVID-19 pandemic. Detected 195 studies and selected seven articles were included in this review according to criteria. These articles reported a variety of exposures faced by public health professionals working in public health sector. This review also revealed a number of strategies that can be adopted to control, eliminate, or reduce hazards job risks in occupational safety and health in Greece and global.

**Conclusion:** This review highlights, the positively association and correlations between workplace safety and occupational health and safety job risks hazards in public health sector in Greece. Few papers are published based on the very contemporary title considered for the article; hence, this study identified several articles in the scientific literature, but only few articles were classified as eligible according to the previously established criteria especially in public health services and organizations sector.

**Keywords:** job risks, workplace safety, occupational health, safety hazards, public health sector

## INTRODUCTION

The history of occupational medicine for health and safety in the workplace begins several centuries ago. It dates back to when man discovered metals, gold, silver, copper, lead, and engaged in their extraction and processing when accidents at work and occupational diseases made their first appearance (Gallegos, 2012).

Fifteen thousand years ago, the ancient Egyptians used copper to make weapons, tools, and various other objects. This knowledge was transferred to Europe in 4000 BC. Mining is one of the most ancient industries and working in it has always been dangerous. Working conditions in Ancient Egypt and Greece were appalling and dangerous for the health of workers. Since the worker of ancient times was a slave or a convict, there was no reason to improve working conditions because of one of the purposes of this hard work as punishment. Nevertheless, it seems that the slaves in ancient Egypt were

not completely abandoned to their fate. There were also doctors whose mission was to take care of the health of the slaves in the large construction sites of the empire 2500 years BC. Herodotus 2,000 years later, in 450 BC, wrote that the workers (slaves) who built the pyramids received a special allowance to feed on radishes, garlic, and onions, which are considered protective against disease (Gallegos, 2012).

In Greece, in the 7th BC century, philosophers observed the relationship between natural phenomena and their effects on the human body. Hippocrates (460-380 BC), the founder of medicine in his book 'On gases, water and places' observed the relationship between the living organism and the environment. During the Middle Ages, the miners' situation changed because there was a significant increase in trade, which created a demand for currency and capital, which was derived from the increase in the supply of gold and silver from the mines. As a result, the mines went more profound, and conditions worsened (Gallegos, 2012).

Agricola, in 1527 proposed the appointment of a doctor in the mines in a Bohemian city, which was a center of metal mines. At that time, mortality from lung diseases was not reported because the causes were not known. It would, however, include deaths from silicosis, tuberculosis, and lung cancer due to work in radioactive mineral mines. It is characteristic that in the Carpathian mines, there were women who had married seven husbands in a row. This was due to premature deaths because apart from the improvements in ventilation, the workers were without any substantial protection. Nevertheless, they were organized in societies, which provided for sickness benefits and funeral expenses, thus providing some security and preventing extreme cases of social misery (Walters and Quinlan, 2019).

Agricola was a Saxon physician and made excellent observations on metalworking and mining. Other physicians and writers followed, making remarkable observations about working conditions in various fields and their effects on workers' health (Walters and Quinlan, 2019).

Industrialization in the 19th century resulted in workers being exposed to various harmful factors, accidents, and excessive fatigue due to the long duration of their work. Technology was advancing, and machines were becoming faster and more dangerous, while untrained workers handled them under stressful conditions due to production needs. The consequence of all this was the abundance of occupational diseases and accidents at work (Abubakar, 2015).

Liberal ideas born in the 18th century have aroused the interest of humanitarian governments and employers for the worker under inhumane conditions. At the end of the century, the French Revolution allowed the creation of trade unions, which in most countries were illegal. From now on, the protection of labor becomes essentially necessary, and in England, first, in 1833, two fundamental laws were passed (Abubakar, 2015):

- The prevention of labor inspectors.
- The certificate, from a doctor, of the age of a child, who in order to work must be at least nine years old.

From a historical point of view, reducing working hours in the mercury mines to six hours per day can be considered the first legislation of industrial hygiene. In the United States, Massachusetts, in 1835, also passed a law banning child labor under the age of 10. He also set up a job statistics office. Other states followed, and eventually, this office became the Ministry of Labor with responsibility for enacting laws to protect workers from harmful factors and long-term work (Abubakar, 2015).

The US Federal Government established the Labor Office in 1884, the Mining Office in 1910, and the Office of Industrial Hygiene in 1914. The purpose of the above actions was to encourage activities related to protecting workers' health, conduct research, and advise the States on specific problems (Abubakar, 2015).

After World War II, the economic boom and the rapid advancement of technology made it necessary to create a particular branch of "medicine" called "occupational medicine." Most countries have accepted and implemented this policy to protect workers' health, which is based on

recommendation 112 of the International Labor Office of 1959 and its subsequent replacement (Abubakar, 2015).

Since its inception, the European Economic Community has contributed to the adoption of directives to the Member States on Occupational Health and Safety. In particular, the Advisory Committee on Health, Safety, and Health at Work, intensively to this end (Walters and Quinlan, 2019).

In Greece, the first steps concerning occupational medicine and occupational safety are made between the years 1911-1914. Then the government of Eleftherios Venizelos passed a series of laws aimed at protecting workers' health. Thus, in 1911 the bill 'On work and minors' is submitted, in 1913, the Royal Decree 'On the health and safety of workers' is published (Anyfantis et al., 2018).

Perceived job risks stress, burn out and job satisfaction levels were affected by demographics and more specifically the workplace environment (urban vs rural) (Adamopoulos and Syrou, 2022). Environmental factors, such as job characteristics, pay, equality, and justice in the workplace, have a significant impact on the satisfaction of the individual with his work (Adamopoulos, 2022).

Public health inspectors are exposed to a variety of occupational health and safety hazards on a regular basis while performing their duties (Tustin et al., 2019). Risk factors were identified, such as exposure to viruses, insufficient ventilation of workplaces, lack of personal protective equipment, overlapping of responsibilities, and shortcomings in the legal framework in terms of defining the responsibilities at each level of hierarchy (Adamopoulos et al., 2022).

The authors assessed the titles and abstracts of the studies identified during the initial search and excluded. Inclusion criteria in texts were subsequently reviewed to assess eligibility. This study aims to systematically literature review and produce pooled estimates of complications, following the association and correlation at workplace safety and occupational health, job risks hazards in public health sector in Greece and global.

## METHODOLOGY

This study employed the preferred reporting items for reviews to organize the flow of information through the various steps of the review. We used the following key words in our literature search: occupational health and safety, risk factors, public health sectors, healthcare professionals, control strategies, international and Greece. Studies conducted between January 2009 and June 2022 were included in the study.

The data sources for this review included MEDLINE, Pub Med, ONE, Cumulative Index of Allied Health Literature (CINAHL), Scopus, Web of Science, Science Direct, unpublished government, academic, and agency articles, research or reports mainly Google Scholar, and ILO and WHO research database.

This research obtained a large number of initial articles ( $n$  initial=195); however, the application of inclusion and exclusion criteria considerably reduced the number of articles for inclusion in the systematic review ( $n$ =seven articles). The

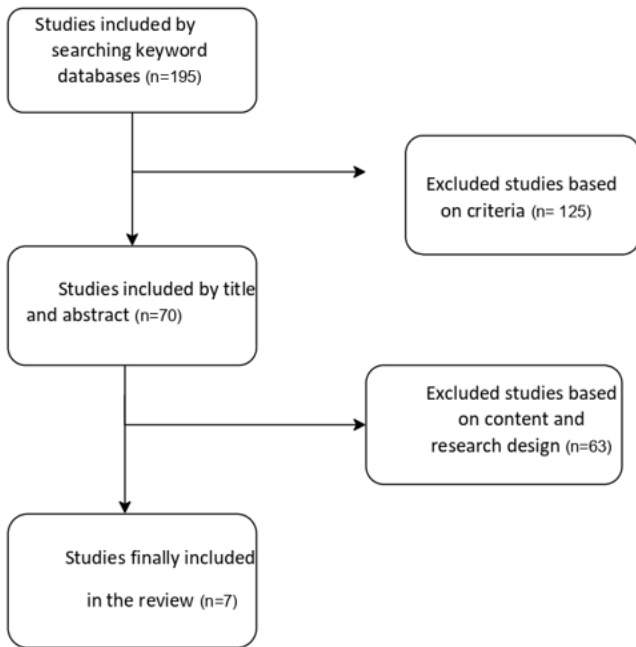


Figure 1. Flowchart review

seven articles focused on occupational health and safety, occupational hazards, job risks, workplace safety, and public health employees. Systematic review conducted and select research studies from January 2009 through until year 2022, also the last two years Sources, information and search plans at databases were searched. The search strategy was adjusted for each database. Detected 195 studies and selected seven articles were included in this review according to criteria. These articles reported a variety of exposures faced by public health professionals working in public health sector. Furthermore, the reference sections of all articles included in the study were screened for additional eligible studies. Inclusion/exclusion criteria all published/unpublished articles covering prospective and retrospective observational studies. We also excluded studies and studies in languages other than English. This review also revealed a number of strategies that can be adopted to control, eliminate, or reduce hazards job risks in occupational safety and health in Greece and global. Used materials and methods in this systematic review where conducted in accordance with the tools and reporting items PRISMA instructions (Moga et al., 2012; Moher et al., 2009).

Figure 1 presents a flow diagram depicting the application of screening of article inclusion and exclusion of study.

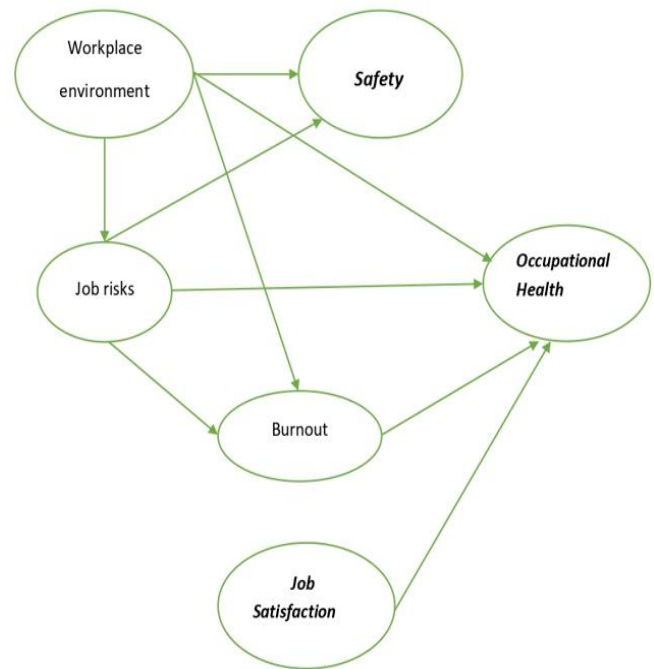


Figure 2. Relationships hypothesized in workplace safety and occupational health job risks hazards in public health sector

Figure 2 presents the relationships hypothesized in workplace safety and occupational health job risks hazards in public health sector.

Table 1 presents the studies examining workplace safety and occupational health job risks hazards in public health sector.

## RESULTS

### Legislative Framework and Obligations

The Law on Workplace Safety entered into force on 1 January 1997 and underwent two amendments, in 2001 and 2002. Law 25(1) of 2002 enters into force on 1 January 2003. The Law “provides for to ensure the safety, health, and well-being of persons at work in all sectors of economic activity and to protect any other persons against the risks to safety and health concerning the activities of persons at work” (Legal Framework Health and Safety of Work, 2010).

Table 1. Studies examining workplace safety and occupational health job risks hazards in public health sector

Author(s)	Title	Aim/study Purpose	Sample	Methodology	Results/relevant findings/outcome measures
Adamopoulos (2022)	Job satisfaction in public health care sector, measures scales and theoretical background	The aim of this research was to identify also analyze the knowledge of job satisfaction in the public health care sector, measures scales necessary to identify and knowledge objective to positively affect public health professionals’ job satisfaction and therefore health care sector quality services.	A systematic review was conducted for the last two-year in Scopus, Web of Science, Science Direct, and Scientific Journals, classified as eligible according to the previously established criteria.	A systematic review	The theoretical approach to the phenomenon of job satisfaction is a complex issue whose investigation involves many aspects of human behavior empirical studies of the phenomenon of job satisfaction in general for employees, health workers and especially for employees in the public health sector.

**Table 1 (Continued).** Studies examining workplace safety and occupational health job risks hazards in public health sector

Author(s)	Title	Aim/study purpose	Sample	Methodology	Results/relevant findings/outcome measures
Adamopoulos and Syrou (2022)	Associations and correlations of job stress, job satisfaction and burn out in public health sector	Connection of occupational job stress, job satisfaction, and burn out health and safety with public health and hygiene. Provided evidence of the exact risks that are perceived in public health sector in Greece. Comprehensive relative to possible occupational hazards of public health organization and services, with established and new evidence include organizational job risks.	A systematic review conducted on the recent period for the last decade published papers along in Scopus, Web of Science, Direct Science, and Journals.	A systematic review article	This study has identified the frequency, severity, and average impact of several burn out, job satisfaction and job stress risks for public health workforce. Psychosocial and organizational risk categories was found to be associated with burn out and job satisfaction. Perceived job risks stress, burn out and job satisfaction levels were affected by demographics and more specifically the workplace environment (urban vs rural).
Adamopoulos et al. (2022)	Public health and work safety pilot study: Inspection of job risks, burn out syndrome and job satisfaction of public health inspectors in Greece	The aim of this study was to report the job risks of public health inspectors in Greece and investigate possible relationships with burnout and job satisfaction.	A total number of 78 Greek Public Health Inspectors were contacted and 46 responses were collected (response rate 58.97%).	A cross-sectional, nationwide pilot study conducted via online questionnaire in the first quarter of 2021 in Greece.	The study found that biological, ergonomic, and psychosocial risks are perceived as most severe in public health inspection. Higher levels of emotional exhaustion were associated with more prevalent ergonomic and psychosocial risks. Job satisfaction was associated with ergonomic risks, but it was most strongly predicted by demographic variables. Perceived quality of job training was found to be negatively related to psychosocial risks. Public Health Inspectors in Greece face a variety of job risks the severity of which contribute to burnout and more specifically to emotional exhaustion.
Ji et al. (2021)	A methodology for harmonizing safety and health scales in occupational risk assessment	Develop a risk assessment method for managing health and safety risks. Particular attributes are needed to address chronic health in the process, and to develop a more objective scale for such harm.	A case study a risk assessment method	A method has been developed to include chronic harm in the risk assessment process.	The result was a comprehensive risk assessment method with consideration of safety accidents and chronic health issues. This has the potential to benefit industry by making chronic harm more visible and hence more preventable.
Lentz et al. (2015)	Aggregate exposure and cumulative risk assessment— Integrating occupational and non-occupational risk factors	A strategy is currently being developed in the context of programs and initiatives aimed at achieving total worker health. Occupational exposure limits have traditionally focused on preventing morbidity and mortality arising from inhalation exposures to individual chemical stressors in the workplace.	Risk assessment, several techniques have been developed to examine environmental and occupational exposures. Three of the more common techniques are (1) exposure monitoring, (2) exposure modeling, and (3) biomonitoring.	Methods and tools for evaluating aggregate and cumulative risk, that potentially may be adapted or modified for occupational health scenarios, are being developed and used in other disciplines. Technology transfer of methods and tools across allied fields will facilitate the consideration of both occupational and non-occupational risk factors.	Principles of aggregate and cumulative risk assessment increasingly are being applied for the general population in environmental and community-based settings, greater adoption, and implementation of these approaches. A variety of methods and tools have been developed or are being used in allied risk assessment fields to incorporate such considerations in the risk assessment process, for workers in occupational settings.

**Table 1 (Continued).** Studies examining workplace safety and occupational health job risks hazards in public health sector

Author(s)	Title	Aim/study purpose	Sample	Methodology	Results/relevant findings/outcome measures
Tustin et al. (2019)	Occupational health and safety hazards encountered by Ontario public health inspectors	To determine the type and extent of health and safety hazards faced by PHIs working for Ontario health units as well as their perception of risk with respect to these hazards.	Respondents met the inclusion criteria and were included in the study. A web-based survey, a total of 155 (23.70%) members responded.	A cross-sectional study design, in early 2018, a web-based survey.	Reported being somewhat concerned about their exposure to all types of hazards. This study provides novel information on the occupational health and safety risks as reported by Ontario Public Health Inspectors. Results showed PHIs reported safety hazards (e.g., slips or falls), working alone, and chemical hazards as the top three types of hazards.
Walters and Quinlan (2019)	Representing workers on occupational safety and health: Some lessons from a largely ignored history	The purpose of this paper is not so much to fill this historical gap as to examine this earlier development in terms of its contribution to better understand worker representation in OSH at the present time.	Indicated in Australia and the UK, statutory measures were the result of political actions following the mobilisation of miners around concern about protection for their safety and health, often in the wake of disasters.	Measures for representing workers' interests in OSH contribute to improved health and safety outcomes.	Provide valuable accounts of the role of unions, the limited capacity of mine managers to deliver safety along with inadequate regulatory inspection by the state and a wider context for understanding OHS, concern is not to re-examine/reprise these developments.

It applies to any workplace, where persons at work are or maybe, at any time. Also, with minor restrictive exceptions (domestic helpers in a private household, Armed Forces), it applies in any other case, where a business or other activity is carried out for profit purposes (Legal Framework Health and Safety of Work, 2010).

- Obligations of employers and self-employed persons.

According to Articles every employer must ensure the safety, health, and well-being at work of all its employees. (Legal Framework Health and Safety of Work, 2010):

- Providing facilities, systems, and working methods, safe and without health risks.
- Arrangements for safe use, handling, storage and transport of objects and substances.
- Providing information, instructions, training, and supervision.
- Maintaining workplaces in a safe condition and without health risks.
- Provide and maintain a safe and healthy work environment and adequate arrangements for well-being.

The employer implements the measures provided for in the above Based on the following precautionary principles (Legal Framework Health and Safety of Work, 2010):

- Avoiding the risks.
- Assessment of unavoidable risks.
- Fighting the risks at their source.
- Adaptation of labor to man.
- Monitoring the evolution of technology.
- Replacement of the dangerous by the non-dangerous or the least dangerous.
- Prevention planning by integrating technology, work organization, working conditions, human

relationships, and the influence of work environment factors.

- Priority in group protection measures over individual protection others.
- Providing appropriate instructions to employees.

Obliges each employer to run his business or business in such a way as to provide such information as to ensure, as reasonably practicable, that persons not employed by him but who may be affected by the activities of his business and will not be exposed to risk (Legal Framework Health and Safety of Work, 2010).

Provides that every self-employed person must run the business and carry out the work in such a way as to ensure, as reasonably practicable, that he and other persons who may be affected are not exposed to risk to their safety or health (Legal Framework Health and Safety of Work, 2010).

#### **Committee on occupational health and safety**

The main body is the Committee on Occupational Health and Safety, which is part of the Ministry of Labor. In more detail: The Supreme Labor Council of the Ministry of Labor has set up a department that is responsible for giving opinions exclusively on issues related to the protection of workers' health and occupational health and safety under the name "Occupational Hygiene Health and Safety Committee Institution" (Institution Committee on Occupational Hygiene Health and Safety [ELINIAE], 2021).

In cases where special issues concerning the public sector are addressed, the competent minister, on a case-by-case basis, with the care of the Occupational Hygiene Health and Safety Committee, appoints a representative who participates as a voting member. The main concern of the Committee for Occupational Hygiene Health and Safety is, in principle, to formulate an opinion on draft regulatory and administrative acts issued in implementation of the law on the health and safety of workers (ELINIAE, 2021).

This opinion on occupational health and safety and the protection of workers' health shall also be submitted by the authorities or bodies represented on the Commission. Finally, the suggestion to the Minister of Labor for the issuance of new legislative and regulatory decrees or the amendment of those that apply to the protection of workers' health and occupational hygiene health and safety (ELINIAE, 2021).

Therefore, it is clear that the Commission takes decisions on occupational health and safety, but the minister always has the final say. Of course, in some cases concerning the public sector, the minister appoints a person who participates as a member but always the council, before issuing the legislative decrees, informs the minister himself (ELINIAE, 2021).

### ***Safety technician and occupational physician***

Employers who employ an average of more than fifty employees a year must have a safety technician and an occupational physician. Also, before selecting the technician or doctor, the employer should inform the local labor inspectorate of their formal and essential qualifications and possible employment in another company, the data on the type and organization of the company, the number of employees, and other similar information. Also, a copy of the contract of employment of the technician and the doctor is notified by the employer to the labor inspectorate. Another obligation of the employer is to make available to them (the technician and the doctor) the necessary staff, premises, facilities, equipment, and generally necessary (Prassas, 2016).

Hiring the safety technician and the occupational physician, the employer is obliged to follow the legal procedures to notify the competent service. In addition to recruitment, it also reveals some characteristics, qualifications capable of proving their knowledge and previous service, and experience (Prassas, 2016).

The safety technician and the occupational physician should cooperate in their duties with the Committee on Occupational Health and Safety. Or the employee representative. They must inform the agent about any essential occupational health and safety issues and advise them on occupational health and safety (Prassas, 2016).

If the employer disagrees with the written instructions and advice of the safety technician or occupational physician, he must justify his views and communicate them to the Committee on Occupational Health and Safety or the representative. In case of disagreement, the dispute is resolved by the labor inspector alone (Prassas, 2016).

It is easy to understand how important the cooperation of the technician and the doctor is. They are two people whose role in the business is equally important. If these two people work together, the result will be much better for the employees and the employer himself. Severe and non-serious accidents will be avoided, which is the most important thing, but employees will also work in an area that will feel safe and secure. Everything is cooperation, not only between the technician and the occupational physician and the employees, the Occupational Health and Safety Committee or the employee representative and the employer (Prassas, 2016).

### **General Occupational Risk Assessment**

The concept of danger expresses the "imminent evil" and the "possible unpleasant outcome" of an event. However, when we refer to occupational risk, we mean the risk to the health and safety of workers, which comes from occupational exposure to harmful factors in the working environment (Pinto et al., 2011).

Occupational risk is usually expressed as a synonym for occupational exposure, but it can also be expressed as a synonym for the damage caused by this exposure (Klimova et al., 2018). Thus, in the first case, we are talking about radiation risk, noise risk, explosion risk focusing on the employee's exposure to the reported risk, while in the second case, we are talking about cancer risk, hearing risk of shock wave injury, respectively, focusing on the result occupational exposure, i.e., to injury (Lentz et al., 2015).

Occupational risk related to the probability or frequency of exposure of employees to a source of risk located in the workplace, e.g., noise, chemicals, manual load handling, monotonous or repetitive work, unprotected moving machine parts, etc.), as well as the severity of the consequences, i.e., the biological damage caused by this exposure (Klimova et al., 2018). The synthetic approach of exposure probability and severity of consequences is expressed by the concept of risk determining the degree of occupational risk. The protection of health and safety and the prevention of the consequences of harmful factors in the workplace are the ultimate goals of occupational risk assessment procedures (Pinto et al., 2011). Occupational risk assessment of the working environment is a complex, timeless and dynamic process that, through deconstruction and analysis, contributes to creating a healthy and safe working environment adapted to human capabilities and capabilities. The prevailing view should be that occupational risk assessment functions to store technical information that is used exclusively for quantitative assessment methods, using risk indicators. The information obtained from the analysis of the working environment and its effects on health and safety, properly processed, contribute to the formation of prevention interventions that lead to the adaptation of the working environment to the dimensions of the working person (Klimova et al., 2018). These interventions must reverse the current situation, aiming at removing the endogenous risks of any productive activity that is an objective of inherent security. That is, they should not be limited to risk management only by taming it (Lentz et al., 2015).

Several ergonomic (multi-hour office work and use of a computer) and organizational risk factors (lack of inspection/personal protective equipment, overlapping responsibilities and shortcomings in the legal framework) have been also identified as prevalent in the Greek public health inspection setting. Lack of equipment may be explained by the specific economic and social conditions of Greece during the last decades (Adamopoulos et al., 2022).

The dynamic nature of occupational risk assessment procedures is expressed through the evaluation of interventions for the protection and prevention of workers' health and the timely monitoring of harmful factors concerning the adaptation of technology to new productive requirements (Pinto et al., 2011).

### **Basic occupational risk assessment actions**

#### **Key actions include (Cioca et al., 2010):**

- Identify the sources of risk to the health and safety of workers that characterize each production process.
- Identification of potential risks to the health and safety of workers arising from production processes.
- Assessment of the magnitude of the risk and its impact on health and safety.
- Planning and management of prevention procedures.

#### **The occupational risk assessment plan leads to the following potential “risk” assumptions for each workplace or workplace (Paustenbach, 2015):**

- In the absence of exposure hazards in the workplace.
- In the presence of risks of “controlled” exposure regarding the levels set each time by the National Legislation.
- In the presence of uncontrolled exposure hazards.

In the first case, the risks that are directly related to the production process are not highlighted. In the second case, the risks arising from the production process can be brought under “control” by applying the provisions of current legislation and international experience and practice on protecting and preventing the health and safety of workers. In the third case, occupational risk prevention interventions must be applied immediately depending on the area (Paustenbach, 2015).

### **Classification and definition of occupational risks**

Risks arising from any professional activity, although usually synergistic (e.g., intensifying work in a high-noise work environment creates the conditions for both an occupational disease and an occupational accident) to occur, for reasons arrangement and recording, are classified into three major groups which are the following (Marhavidas et al., 2011):

#### **Group A-Safety hazards or occupational accident hazards due to:**

- Building structures (e.g., compliance with urban and sanitary regulations, etc.).
- Machines (e.g., compliance with safety standards, etc.).
- Electrical installations, observance of electrical installation regulations, unsuitable installations, possibility of causing fire.
- Chemical agents and hazardous substances.
- Fires–explosions compliance with fire protection regulations.
- Physical factors.

#### **Group B-Health hazards due to:**

- Chemical agents (e.g., exceeding exposure limits).
- Physical factors (e.g., exceeding exposure limits).
- Biological agents (e.g., presence of biological pollutants).

#### **Group C-Ergonomic or transverse health and safety hazards due to:**

- Work organization (e.g., intensification, monotony, shifts, etc.).

- Psychological factors (e.g., informal forms of work, moral harassment, etc.).
- Ergonomic factors (e.g., non-ergonomic workplace design, etc.).
- Adverse working conditions (e.g., work with suitable equipment, work in adverse climatic conditions, etc.).

More specifically, safety hazards or accident hazards include the possibility of injury to employees due to exposure to the source of the hazard. The nature of the source of danger determines the cause and type of injury, mechanical, electrical, chemical, thermal, etc. Health risks include the possibility of altering the biological balance of workers (disease) due to occupational exposure to physical, chemical, and biological harmful factors of the working environment (Marhavidas et al., 2011). Ergonomic risks are characterized by the interaction of the employee and the work organization in which he is involved.

The causes of these risks are located in the very structure of the productive process, which leads to the forced adaptation of man to the demands of work. The planning of interventions for preventing and protecting workers from these risks must aim at a dynamic balance between man and the working environment, with an essential coordinate the adaptation of work to man. This adaptation presupposes the knowledge of the standard and pathological mechanisms of the human body (Marhavidas et al., 2011).

### **Procedural phases of occupational risk assessment**

The process of occupational risk assessment follows basic steps that lead to identifying sources of risk, the identification, and the quantitative and qualitative identification of harmful factors in the working environment. The first phase is to identify the sources of danger. This phase includes a careful and complete record of the production process of the countries or jobs in question (Paustenbach, 2015).

#### **The recording concerns (Damalas and Eleftherohorinos, 2011):**

1. The recording of the production process and flow, the description of the production technology of the plant machines, the materials, and substances used, the maintenance processes of the machines and plants, the treatment and disposal of the waste, as well as the internal and external handling of trucks and products.
2. The destination of use of workplaces (e.g., workshops, offices, warehouses, etc.).
3. The building characteristics of the workplace (seismic protection, surface, capacity, openings, etc.).
4. The characteristics of the employees in the examined parts of the production process (number of employees, gender, working shifts, working age, etc.).
5. Information from medical monitoring, if and when provided, and those related to accidents at work and occupational diseases.

This recording of the production process and the technological cycle, providing complete knowledge of the productive activities, allows the identification of the sources of risk for the health and safety of the employees. In order to achieve a substantial and non-

formal recording of production processes, it is necessary to obtain information from employees about the natural conditions prevailing in the workplace.

The second phase is the identification of exposure risks. Exposure risk identification is the process that allows us to identify the harmful factors to which employees are exposed qualitatively.

**The steps to follow are to examine and record the following (Damalas and Eleftherohorinos, 2011):**

1. The mode of operation (e.g., manual, automated, mechanical, mixed, etc.) and the form of productive activity.
2. The organization of productive activity in the work environment under consideration (e.g., time spent in the workplace, the simultaneous existence of other activities, etc.).
3. Taking or not taking protection and prevention measures for the health and safety of employees.
4. Employees' views on the conditions prevailing in the workplace in which they work and reports on the effects of harmful factors on their state of health (through labor subjectivity).

The third phase is the assessment of exposure risks. The exposure risk assessment was recorded and verified in the two previous phases of analysis of the working environment (first phase and second phase), implemented through (Damalas and Eleftherohorinos, 2011):

1. Controlling the application of safety rules (e.g., electric motors).
2. The control of the "acceptable" for health and safety working conditions regarding the nature of the risks, the duration, the way of implementation, and the productive activities regarding the current legislation.
3. The quantification of the harmful factors of the working environment and its effects on the health and safety of the employees by conducting both targeted measurements and targeted medical examinations.

### **Occupational Risk Assessment Methodology**

The occupational risk assessment process is based on a methodological guide that is appropriately adapted to each working reality and leads to the identification of sources of risk, the identification, as well as the estimation (quantification) of exposure risks, with the ultimate goal of formulation of a final occupational risk assessment report in the working environment of employees (Ji et al., 2021).

The following are the three main phases of the occupational risk assessment method (Pinto et al., 2011).

1. Identifying sources of danger.
2. Identification of exposure risks.
3. Exposure risk assessment.

Identifying sources of risk include a careful and complete description/recording of the production process of the places or jobs under consideration.

### **The description/recording concerns (Ji et al., 2021):**

1. The product of the production process and the volume/quantity of production, the description of the production technology (technological cycle), the machines, the facilities, the materials, and the substances used.
2. The recording of the production process and flow, the maintenance procedures of machines and facilities, the treatment and disposal of waste, and the internal and external handling of cargo and products.
3. The destination of use of workplaces (laboratory, office, warehouse, etc.).
4. The building characteristics of the workplace (area, capacity, openings, etc.).
5. The characteristics of the Homogeneous Group or the homogeneous groups of Employees in the examined parts of the production process (number of employees, gender, work shifts, working age, etc.).
6. The information is coming from the medical follow-up, if and when it is provided, and occupational accidents and occupational diseases.

The complete description/recording of the production process and the technological cycle provide the complete knowledge of the productive activities and consequently allow the identification of the sources of danger for the safety and health of the employees. It is advisable during this phase to take into account all available statistics for the industry in which the production process in question is included, the relevant bibliographic references, and previous experience (Ji et al., 2021).

At this stage, the expression of the labor point of view is of particular importance, not only as an element of valid information but also as a condition for effective and active participation in all phases of assessing and preventing occupational risk. The active and effective participation of employees in the protection and prevention of occupational risk is expressed not only by the "control" for the observance of each legislation but also by the expression and application of the labor point of view (Ji et al., 2021).

We must emphasize that at this stage, our attention is not so much focused on those elements of the production process, which due to their "internal dynamics" (their nature), are identified as sources of danger (machines, plants, chemicals, etc.), as well as the risks directly related to the mode of operation, form, and organization of each productive activity, as well as to the taking or not of protection and prevention measures (Ji et al., 2021). It is also necessary to include exposure risk sources and the data resulting from the subjective assessment of employees. In conclusion, it must be identified any exposure risk, for which the mode of operation, form, and organization of productive activity does not allow its controlled management (Damalas and Eleftherohorinos, 2011).

At the end of this phase and based on the collected data, the exposure risk control/verification program is collectively designed by the participants in the occupational risk assessment process, based on which the next phase will be implemented (Ji et al., 2021).



The exposure risk assessment recorded and verified in the two previous phases of the work environment analysis (phase 1 and phase 2) is carried out through (Ji et al., 2021):

- The control/verification of the application of the safety rules of the machines during their operation.
- The control/verification of the recipients for the health and safety of working conditions, concerning the objective examination of the nature of the risks, the duration, the way of implementation and the form of the productive activities, regarding the current National or Community Legislation as well as the International Scientific Practice and Experience in Health and Safety at Work.
- The control/verification of the conditions for the health and safety of the employees through the documents and/or files of the company (raw materials and substances, quantity/volume of production, spatial arrangement of machines, waste disposal, number of permanent and seasonal employees, recording of occupational accidents and occupational diseases, written instructions of the occupational physician, safety technician as well as the labor inspectors, the total results of the medical examination of the employees, training programs, minutes of three monthly meetings, etc.).
- The quantification of the working environment factors by conducting targeted measurements and correlating the results with the proposed exposure limits of the current National or Community Legislation and International Scientific Organizations (ILO, OSHA, NIOS, ICOH, etc.).

The International Commission on Occupational Health (ICOH) is an international non-governmental occupational company engaged in the scientific knowledge and development of occupational health and safety. It is recognized by the United Nations (UN) and works closely with the International Labor Organization (ILO), the World Health Organization (WHO), and other significant organizations. This quantification is also a legal obligation for several factors in the working environment, as defined by the current Presidential Decrees on asbestos, lead, noise, vinyl chloride, biological agents, etc. (Ji et al., 2021).

#### *Permissible specification limits in the workplace*

##### **Building requirements**

Buildings that house workplaces must have structure, solidity, strength, and stability commensurate with the type of use and be constructed under the provisions of the building regulations and all building regulations (Lundberg and Cooper, 2010).

##### **Electrical installation**

The electrical installation, in any case, must comply with the provisions of the “regulation of internal electrical installations.” The execution of electrical installations, the supervision of their operation, and their maintenance are done only by persons who have the necessary qualifications, under the provisions in force on “execution, supervision, and maintenance of electrical installations” (Lundberg and Cooper, 2010).

##### **Floors**

Workplace floors must meet the following general conditions (Lundberg and Cooper, 2010):

- Bestable and solid.
- Do not show dangerous slopes.
- Do not pose a risk of slipping.
- Be smooth and free of bumps.
- Be of sufficient resistance to impacts, abrasions, and dynamic static loads they receive.
- Do not create dust due to wear.
- Have the ability to be easily cleaned and maintained.

##### **Walls-ceilings-roofs**

The surface of the walls and the dividing elements of the workplaces must be cleaned and maintained with ease and safety. Transparent or translucent walls and primarily entirely glass walls are located inside or near workplaces and corridors, must be marked and made of safety materials or be separated from such workplaces and corridors traffic so that workers do not come into contact with them nor are they injured by any of their fragments. The walls must be smooth and waterproof up to a height of at least 1.50 meters from the floor; where required for hygiene reasons or their use, they must be washed. Walls and partitions must be fireproof in areas with an immediate risk of fire due to sparks or the use of flame (Lundberg and Cooper, 2010).

Workplace ceilings should be easy to clean and easy and safe to maintain. Roofs and ceilings must ensure airtightness and adequate resistance to static and dynamic loads such as snow, wind pressure, machinery, suspended loads, etc.). Suspension of loads from floor roof elements is allowed only when these elements are calculated at the prescribed loads. In case of loads from wooden elements, they must be checked frequently for the adequacy of their strength and replaced if their strength has decreased; otherwise, the suspension must be prohibited. Access to roofs made of low-strength materials and roofs that are not designed and constructed to be passable (e.g., sloping roofs, etc.) is only permitted if facilities are in place or equipment is provided to protect workers from the risk of falling. Measures must be taken to protect workers below the glazed sections of upright roofs from any breakage. If there are particular problems from solar heat or cold favored by the construction and roofing materials, the roofs must be thermally insulated. Roof glazing sections must be constructed to protect workers from direct sunlight (Lundberg and Cooper, 2010).

##### **Windows and skylights of the countries**

Windows, skylights, and other natural light or ventilation systems must be opened, adjusted, and secured by workers safely and efficiently. They must not pose a danger to workers, impede their freedom of movement or restrict the minimum width of traffic corridors. Windows that do not open are only allowed if adequate ventilation is provided. Windows and skylights must be designed about the equipment or equipped with appropriate systems to be cleaned safely for the workers performing this work and the workers in and around the buildings (Lundberg and Cooper, 2010).

## Special areas

If the staff exceeds 50 employees or if the safety or health of the employees, mainly due to the type of activity, so requires, the employees must be able to make a rest area easily accessible. This provision does not apply when staff works in offices or similar workplaces, which offer the same rest opportunities during the break. Rest areas must be adequately sized and equipped with tables and chairs with backs in a number commensurate with that of the number of employees. Appropriate measures must be taken in rest areas to protect smokers from the nuisance caused by smoke. Rest areas should have as much visual contact with the outside environment as possible and be adequately lit and ventilated. Also, depending on the number of employees who can be present simultaneously, they should be provided with easy to clean tables, chairs with backs, trash cans, clothes hangers, and means for heating, cooling, and storing food and beverages. Finally, drinking water must be available. The business restaurant can also be considered as a resting place. If the nature of the work requires regular and frequent breaks and there are no rest areas, employees must have at their disposal other places during the work break which are equipped with a sufficient number of seats. Employees whose nature of work requires them to be upright should be allowed to rest for a few minutes in the workplace with suitable seats (Lundberg and Cooper, 2010).

## Emergency places

Workplaces with more than 100 employees must have one or more first aid kits. There must also be a first aid kit in other workplaces where the type of activity there and the frequency of accidents require it. The areas intended for first aid must be equipped with the necessary first aid facilities and materials, have running water, be served by one or more authorized and specially trained first aid personnel, and allow the comfortable entry of ambulances and stretchers (Lundberg and Cooper, 2010).

The quantities of the above items are determined according to the number of employees. The occupational physician determines their supplementation with other items. First aid kits must be marked appropriately. First aid equipment should be available even in areas where it is required due to working conditions. The material must be appropriately marked and easily accessible. A table with instructions for providing first aid accompanied as far as possible and with corresponding shapes and images should be posted in prominent places in the workplace (Lundberg and Cooper, 2010).

## Fire protection–Escape routes

Depending on the dimensions and use of the buildings, the existing equipment, the physical and chemical characteristics of the substances used as well as the maximum number of people that can be there, the workplaces must be equipped with appropriate and adequate firefighting equipment and, if needed, with detectors and alarm systems. Manual firefighting equipment must be accessible and easy to use (Lundberg and Cooper, 2010).

Escape routes and emergency exits must be kept free and lead from the shortest route to the countryside or a safe area. In the event of an emergency, all jobs must be evacuated quickly and in complete safety. The number, distribution, and

dimensions of roads and emergency exits depend on the use, equipment, and dimensions of the workplaces and the maximum number of people in these spaces. The emergency doors must open outwards; they must not be closed so that anyone who may need to use them in case of emergency cannot open them quickly and immediately. Sliding and revolving doors are prohibited as emergency doors. Also, notable escape routes and emergency exits must be marked, and this sign must be placed in appropriate places and be permanent. Emergency doors must not be locked. Escape routes and emergency exits and access corridors, and access doors must not be blocked by objects so that they can be used unhindered at all times. In the event of lighting failure, escape routes and emergency exits that require illumination must have adequate backup lighting (Lundberg and Cooper, 2010).

## Movements in the workplace

### Traffic corridors

Corridors, stairways, permanent stairs, docks, and loading platforms must be designed, constructed, arranged, and maintained to be easily used by pedestrians and vehicles safely and according to destination. Employees working near them may not be at risk from the use of traffic corridors. The calculation of the dimensions of the traffic corridors of persons or goods must be done according to the expected number of users and the type of business. If transport is used in these corridors, there must be sufficient pedestrian safety. Roads for vehicles must be within walking distance of doors, gates, crosswalks, walkways, and stairwells. If the premises' use and equipment require it, to ensure the protection of the workers, the layout of the traffic corridors must be placed in a prominent place (Lundberg and Cooper, 2010).

### Escalators and corridors

Escalators and escalators are a must (Lundberg and Cooper, 2010):

- To operate safely.
- Equip with the necessary security systems.
- Equip with emergency stop systems, which are easily recognizable and accessible.

## Protection against falls and falling objects–Danger zones

Workstations, corridors, platforms, steps, footbridges, ramps, and any other floor accessible to workers, which is more than 0.75 meters high, must have a protective curtain on each free side (Lundberg and Cooper, 2010).

A protective curtain is also required in the following cases (Lundberg and Cooper, 2010):

- In openings of floors and horizontal surfaces in general (ditches, hatches, channels, etc.) when they do not have a cover or other system that prevents workers from falling into them.
- In containers or tanks with hot, caustic, corrosive, or poisonous liquids, as well as in containers, bins or tanks with a mixing or stirring mechanism when their lips are on the floor or at the height of fewer than 1.00 meters from the floor and have no cover or other system to prevent workers from falling into them.
- In openings of walls and generally vertical surfaces.
- At crossings over dangerous zones.

In cases where there is a possibility of falling objects (e.g., from overhead jobs, stacked materials, etc.), appropriate protective measures must be taken to avoid the risk of injury to workers. If workplaces contain hazardous areas due to the nature of the work and pose a risk of workers falling or falling objects, these areas should be equipped, as far as possible, with a system to prevent the entry of workers who have not authorization in these areas. Appropriate measures must also be taken to protect workers authorized to enter dangerous areas. Finally, the danger zones must be marked with unique strips of 45° yellow-black or red-white color (Lundberg and Cooper, 2010).

### Physical factors

Indoor workplaces need fresh air, considering the working methods and the physical effort that employees make. Ensuring air quality must be based on the principles of hygiene. If air renewal is achieved by artificial means or systems (ventilation, air conditioning), then these should be (Lundberg and Cooper, 2010):

- To operate continuously.
- Keep them in good working order.
- Any system failure should be adequately indicated by an automatic device integrated into the system or medium.

If air conditioning or mechanical ventilation systems are used, they must be operated in such a way as to prevent workers from being exposed to annoying currents. Deposits and pollutants in air conditioning or mechanical ventilation systems that may pose a risk to workers' health due to inhaled air pollution must be reduced immediately (Lundberg and Cooper, 2010).

### Workplace temperature

Workplaces during working hours must have a temperature commensurate with the nature of the work and the physical effort required to perform it, always considering the climatic conditions of the seasons. Workplaces under the influence of high temperatures emitted by the plant should be cooled to a tolerable temperature, as far as practicable (Lundberg and Cooper, 2010).

In workplaces with windows and glass walls, measures must be taken to avoid excessive sun exposure, taking into account the type of work and the nature of the workplace. In case of heat, the extraordinary measures provided by the current provisions and the circular instructions are applied. The temperature of rest areas, hygienic restaurants, first aid, and outposts must meet the specific purpose of these areas (Lundberg and Cooper, 2010).

### Lighting

Workplaces, break, and first aid areas must have direct visual contact with the outside area. Excludes (Lundberg and Cooper, 2010):

- Workplaces in which technical production teams do not allow direct visual contact with the outside space.
- Workplaces with a floor plan of more than 2000 square meters, provided there are sufficient transparent openings in the roof.

Workplace and driveway lighting installations are constructed or arranged so that the safety and health of workers are not endangered (Lundberg and Cooper, 2010).

In particular, artificial lighting should (Lundberg and Cooper, 2010):

- Be proportionate to the type and nature of the work.
- To have spectrum characteristics similar to natural lighting.
- Minimize glare.
- Do not create excessive contrasts and brightness changes.
- Diffuse, direct and distribute appropriately.

The needs for general or local lighting or a combination of general and local lighting and the intensity of the lighting depending on the type, nature of the work, and the visual effort required (Lundberg and Cooper, 2010).

If the type of employment of the employees and the other unique characteristics of the company can arise risks of accident from an unexpected interruption of the general lighting, there must be backup safety lighting. The intensity of the backup lighting is 1/100 of the general intensity and not less than 1 LUX. Artificial light switches should be easily accessible even in the dark and should be located close to entrances and exits and along corridors and access points (Lundberg and Cooper, 2010).

## CONCLUSIONS

This study highlights, the positive and negative association and correlation between workplace safety of occupational health and safety hazards job risks in public health sector. Few papers are published based on the very contemporary title considered for the article hence this study identified several articles in the scientific literature, but only few articles were classified as eligible according to the previously established criteria.

Detected 195 studies addressing the issue of occupational health and safety hazards, above these, seven articles were included in this systematic review. These articles reported a variety of exposures faced by public health professionals. This systematic review also revealed a number of strategies that can be adopted to control, eliminate, or reduce hazards job risks in workplace safety and occupational health in Greece and global.

Public health sector facilities have many unique occupational health and safety hazards that can potentially affect the health and performance of employees. The impact of job risks hazards in occupational health and safety poses a serious public health issue in Greece and global, controlling, eliminating, or reducing exposure can contribute to a stronger workforce with great potential to improve workplace safety in public health sector. Eliminating or reducing hazards can best be achieved through measures, administrative policy, control strategies, and the use of personal protective equipment and very important issue in occupational safety educational training needs and quality.

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