Public Health Inspectors Classification and Assessment of Environmental, Psychosocial, Organizational Risks and Workplace Hazards in the Context of the Global Climate Crisis

Ioannis Adamopoulos * , Niki Syrou , Demetris Lamnisos , George Dounias

Posted Date: 6 December 2024

doi: 10.20944/preprints202412.0639.v1

Keywords: Psychosocial Risk; Climate Crisis; Public Health Inspectors; Classification Assessment; Occupational Risks; Safety and Health; Environmental Risks; Workplace Hazards; Educational

Article

Public Health Inspectors Classification and Assessment of Environmental, Psychosocial, Organizational Risks and Workplace Hazards in the Context of the Global Climate Crisis

Ioannis Adamopoulos [1,*], Niki Syrou [2], Demetris Lamnisos [3] and George Dounias [4]

[1] Hellenic Republic Region of Attica, Department of Environmental Hygiene and Public Health Inspections, Central Sector of Athens, 11521 Athens, Greece
[2] Department of Physical Education and Sport Science, University of Thessaly, 42100 Karies, Trikala, Greece
[3] Department of Health Sciences, European University Cyprus, 2404 Nicosia, Cyprus
[4] Department of Public Health Policy, Sector of Occupational & Environmental Health, School of Public Health, University of West Attica, 11521, Athens, Greece
* Correspondence: adamopoul@gmail.com; Tel.: +306971802117

Abstract: The global climate crisis impacts health in numerous ways, and Public Health Inspectors (PHIs) are also addressing these issues at work. Their responsibilities have evolved in response to this pressing crisis. This study examines the effects of PHIs in classifying and assessing environmental psychosocial, organizational risks and workplace hazards exacerbated by the global climate crisis at the workplace. It highlights PHIs' challenges in adapting to changing environmental conditions and the implications for Public Health. A mixed-methods approach was utilized, combining Quantitative Reviews, and Secondary Data Analysis in the Development model of occupational risk, and environmental health incidents reported over the past decade, by public health inspectors. PHIs. The methodology is approached from a variety of sources, including PubMed, Medline, EMBASE, CINAHL, Web of Science, ScienceDirect, alongside databases and resources provided by WHO, OSHA. By categorising environmental risks and workplace hazards PHIs to identify, classify these risks, prioritize their efforts, and develop targeted strategies for prevention and mitigation. Findings underscore the necessity for enhanced educational, training and resources to address the evolving landscape of environmental health risks effectively, to handle climate-related challenges and continuous education. Public Health services and organizations must enforce regulations to sustainable practices, leading to new workplace dynamics.

Keywords: psychosocial risk; climate crisis; public health inspectors; classification assessment; occupational risks; safety and health; environmental risks; workplace hazards; educational

1. Introduction

In light of the global climate catastrophe, Public Health Inspectors (PHIs) face a challenging but essential role in classifying and evaluating environmental risks and workplace hazards. The global climate crisis poses significant challenges to public health, particularly in the assessment and management of environmental risks and workplace hazards. PHIs play a crucial role in identifying and mitigating these risks, ensuring the safety and well-being of communities [1]. PHIs play also a crucial role in safeguarding the well-being of the community, their primary objective is to mitigate the potential risks of illness and injury that stem from various environmental hazards, they cover various areas such as drinking water quality, swimming facilities, food services, air pollution, industrial inspections [2,3]. By advocating for enhanced environmental standards, PHIs aim to minimize exposure and subsequently enhance overall health outcomes, this includes addressing concerns surrounding premature mortality and chronic diseases, both of which can be influenced significantly by environmental factors [4]. Through rigorous monitoring and collection of statistical

 doi:10.20944/preprints202412.0639.v1

evidence, PHIs have unequivocally established the remarkable impact that living conditions and health status share, underlining the imperative need for their continuous efforts in this important field [5,6]. Authorities promote public health inspections by focusing on zero-failure areas and implementing short-term inspections, health authorities conduct annual or biannual inspections over multiple years to compensate for limited resources [7]. Education and training on new environmental risks and prevention measures reduce environmental illnesses [8]. Successful environmental health inspections across different countries highlight the significance of resilient and efficient preventive research and practices at all levels [9]. The focus should be on the public health workforce and work-related health, global authorities need to protect individuals' well-being through alerts and indicators [10,11].

The public health system should have the capability to respond to environmental disruptions and unforeseen events [12]. Resilience in public health is based on physical and psychosocial components [13,14]. Furthermore, the influence of climate change on plant physiology has the potential to heighten pollen allergenicity and toxicity, as well as to affect food yield and nutrient content [15,16]. These impacts on plants can ultimately affect human health through changes in food quality and supply [17], water security, and the availability of regional natural resources, all of which play a role in a wide range of health issues [18,19]. As climate change continues to alter environmental conditions, the responsibilities of these PHIs are becoming increasingly complex [20]. The PHIs are responsible for monitoring environmental health risks, conducting inspections, and enforcing regulations to protect public health [21]. Their work encompasses a wide range of areas, including food safety, water quality, and occupational health. Climate change has been linked to a variety of environmental risks, including increased air and water pollution, extreme weather events, and the emergence of new pathogens [20]. These changes necessitate a reevaluation of existing risk assessment frameworks used by PHIs. Workplace hazards are also influenced by climate change, with rising temperatures and extreme weather events posing new risks to workers [22]. The findings indicate that PHIs are facing significant challenges in adapting to the impacts of climate change on environmental risks and workplace hazards [23]. Enhanced training programs focusing on climate-related health risks are essential for equipping PHIs with the necessary skills to address these challenges [1]. Furthermore, inter-agency collaboration is crucial for effective risk assessment and management [20]. The global climate crisis poses significant challenges to public health, necessitating a reevaluation of how environmental risks and workplace hazards are classified and assessed. PHIs play a crucial role in identifying and mitigating these risks, yet their methodologies and effectiveness in the context of climate change remain underexplored [6,23,24]. Recent studies indicate that climate change is linked to an increase in environmental hazards, including air and water quality deterioration, extreme weather events, and occupational health risks [25]. PHIs are tasked with monitoring these risks, but their ability to adapt to the changing landscape is often limited by outdated frameworks and insufficient training, consider climate impacts in risk assessment protocols [26,27].

The study's Hypothesis are:

Classification is one part of the process of systematically identifying and assessing risks.

Questions are posed by PHIs to begin the process of classifying the degree and type of risk.

The PHIs are affected by the research hypothesis:

H1. How much of the risk exists? **H2.** What is the relationship to exposure? **H3.** What public or subpopulations are at elevated risk? **H4.** Is there a cluster of cases or a higher-than-expected number of cases or incidents? **H5.** How can environmental health screening tools be refined for public practice? **H6.** In contemporary public and environmental health offices, the role of PHIs can be shaped by systematic, standardized tools for environmental health hazard assessment and risk communication [28]. Standardized tools are not yet available for public health surveillance, monitoring, or practice. Developing nomenclatures takes time and can create confusion [29]. Risk classification is important for early warnings, research, and planning [30]. Decision support systems accelerate entity categorization, but advanced software can lead to criticism in interpretation and policy-making. International collaboration drives classification system development [31,32]. The

 doi:10.20944/preprints202412.0639.v1

aims of this research and study's scope are to employ a mixed-methods approach, PHIs and quantitative analysis of environmental risk data. Aims to explore the classification and assessment processes employed by PHIs in the context of the climate crisis. Analyze the current practices of PHIs and propose strategies for improvement. Provide Authorities and promote public health inspections by focusing on zero-failure areas and implementing extraordinary short-term inspections. Ongoing education and training on new environmental risks and prevention measures reduce environmental and occupational hazards. Reports that inspection activities in different countries emphasize the importance of resilient and efficient preventive research and practices at all levels: local, regional, national, European, and Global International.

2. Materials and Methods

2.1. Methodology

The methodology addressing a mixed-methods approach was utilized, combining Quantitative Reviews, and Secondary Data Analysis in the Development model (QRSDAD) of occupational risk, and environmental health incidents reported over the past decade, by public health inspectors. The data collection was obtained from excluded previous cross-sectional Nationwide research from a web-based questionnaire. Experiences, challenges, and strategies in assessing occupational environmental risks and workplace hazards associated with the climate crisis and extreme weather events. Data analyzed using statistical software SPSS v. 28 to identify trends in environmental health incidents were thematically analyzed to extract key themes related to the PHIs roles and challenges. The building of cases, the Research Scheme Secondary Analysis, and the interpretative model of analysis scoping review are a particularly useful tool for the wider scientific community, useful to convergence and are distinguished by the fact that the method is considered an "empirical exercise on data that have already been collected" [33], whether these are quantitative or qualitative, whether or not the primary study researcher is involved in the analysis of these data. The main practical advantage of the method is based on its potential to analyze high-quality data with the minimum financial cost [34], using sophisticated and reliable sampling methods, ensuring maximum quality and reliability [33,35]. A model of analysis, a necessary prerequisite for the realization of research, is composed of two elements: a) the key concepts and b) the working hypotheses. These elements are combined to form a framework that must be characterized by internal consistency and clarity.

To "verify" empirically this model should, in addition to the verification of each hypothesis, the results of the collected data and observations should clearly demonstrate that the rates are the highest when all the conditions leading to a high level (occupational health risk factors from the impact of the climate crisis) are met and the lowest when all the conditions leading to a high level (occupational health risk factors from the impact of the climate crisis) are met at the same time, all intermediate cases should have success rates significantly differentiated-between-the-two-extremes.

The literature review methodologies approach made use of a comprehensive and relevant analysis of previous research that was accessible through electronic databases, including reports and studies from worldwide scientific organizations. A range of databases and resources from WHO, OSHA, and UNESCO were used to collect the data, including PubMed, EBSCO, Medline, EMBASE, CINAHL, Scopus, Web of Science, Science Direct, and Google Scholar. By classifying occupational hazards and environmental risks, PHIs can prioritize their efforts, identify and categorize these risks, and create focused risk prevention-mitigation programs.

2.2. The Design of the Study

It is a methodical review of the literature using a variety of research analysis techniques. When choosing which research to include in the mixed methods review.

The following requirements must be met:

1) Every study must have been published in a peer-reviewed journal.
2) All of the included studies were written in English.
3) All of the examined studies included sample studies of the PHI linked to risk variables for climate

 doi:10.20944/preprints202412.0639.v1

change and occupational risks.

a) The included studies evaluated the PHIs using measures reported for environmental, occupational, and climate change risk variables.

b) The included papers evaluate aspects of the climate problem, extreme weather occurrences, and their effects.

The following are the exclusion criteria for the scoping review and mixed methods research:

a) English is the only language used in the study.

b) Studies using a sample that did not contain or analyze medical and laboratory personnel or healthcare workers were excluded.

c) All authors participated in the study selection process.

Figure 1 displays the PRISMA guidelines [36], and a flow chart diagram, which incorporates all of the articles, reviews, and reports included in this study's literature.

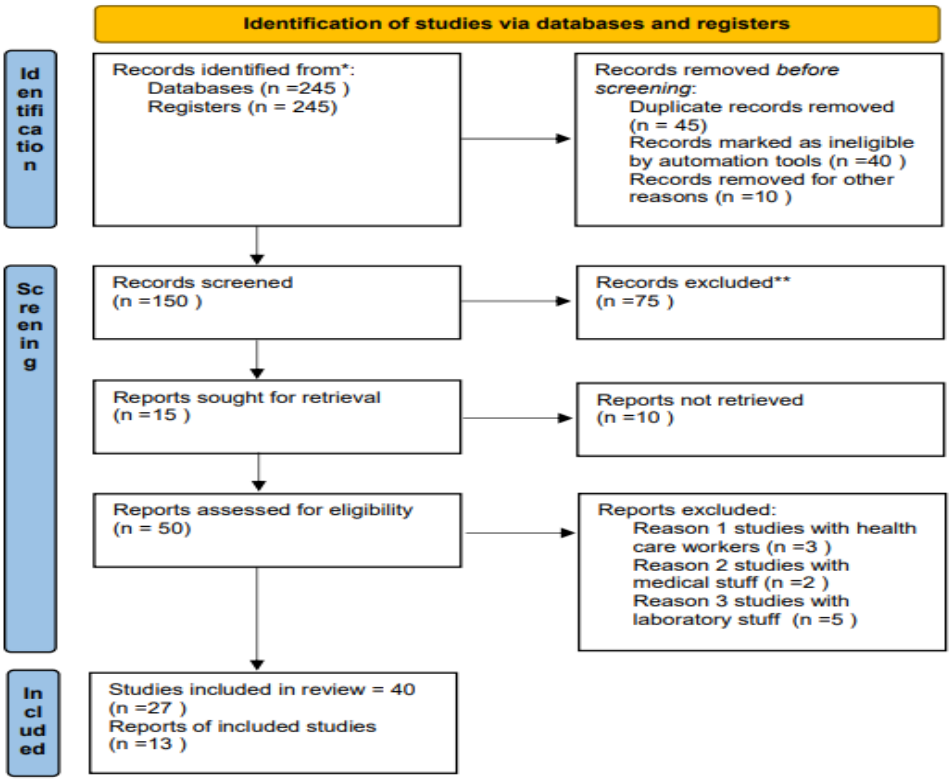


Figure 1. PRISMA flow chart diagram of this study's literature [36].

3. Results

The role of public health inspectors has evolved significantly with environment, public health and community sustainability and infrastructures. Today, it not only involves inspecting food safety or sanitation but also evaluating environmental, psychosocial, organizational risks and workplace hazards under the Global Climate Crisis. This complexity largely stems from the ongoing Climate Change, which poses unique challenges. PHIs play a crucial role in safeguarding community public health. They assess various risks and ensure compliance with health standards. Specifically, they focus on:

Food Safety; Sanitation Standards; Psychosocial and Violence Risks; Organizational Risks; Environmental Hazards; Inspecting Workplaces; Investigating Complaints; Teaching Public Health Practices; Monitoring Air Quality; Assessing & Evaluating Water Safety, and Wastewater Surveillance; Conducting Epidemiology Investigations and Research, etc.

The study's flow chart on PHIs classification and assessment of environmental psychosocial, organizational risks and workplace hazards in the context of the global climate crisis is displayed in Figure 2.

 doi:10.20944/preprints202412.0639.v1

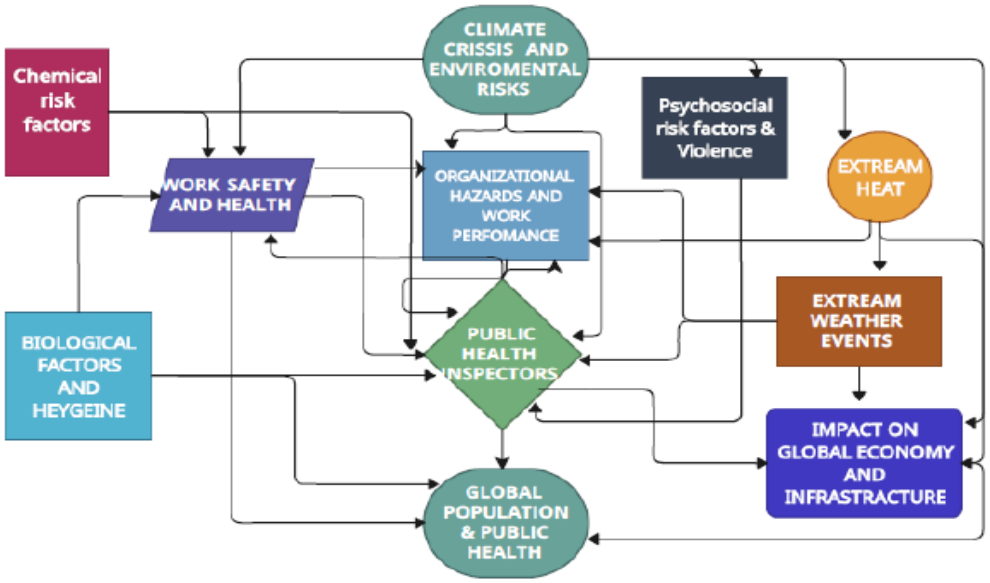


Figure 2. Study's flow chart on PHIs classification and assessment of environmental risks and Workplace Hazards in the Context of the Global Climate Crisis.

A sample of N=185 participants- PHIs from various regions was surveyed to gather insights into their experiences and challenges in assessing climate-related risks. Data were analyzed using statistical software to identify trends and correlations, up to September of 2024. The findings reveal that a significant percentage of inspectors (72%) reported feeling inadequately prepared to address climate-related hazards. Common challenges included a lack of updated training (65%) and insufficient resources (58%) [37]. Additionally, inspectors identified the need for more comprehensive data on environmental changes to inform their assessments, [38]. The results highlight a critical gap in the preparedness of PHIs to tackle the complexities of environmental risks in the context of climate change. Enhanced training programs that incorporate climate science and risk assessment methodologies are essential [39]. Furthermore, collaboration between public health agencies and environmental organizations can facilitate the sharing of resources and data, improving overall assessment capabilities, [40].

Quantitative-Findings

The analysis revealed an increase in reported environmental health incidents over the past with a notable rise in incidents related to heat stress and air quality analysis of identified three main themes: (1) the need for enhanced training on climate-related risks, (2) the importance of inter-agency collaboration, and (3) the challenges of resource allocation in addressing emerging hazards. The findings reveal that a significant percentage of PHIs (87%) reported feeling inadequately prepared to address climate-related hazards. Common challenges included a lack of updated training needs up to (79,42%) and insufficient resources (78%). Additionally, inspectors identified the need for more comprehensive data on environmental changes to inform their assessments, specific the results analytical reported in the Figure 3, informs specific for High and Low Risk Ratio of participants PHIs, reporting above average frequency/severity of Occupational Risk, Factors Training Quality, and Workplace Areas.

Preprints.org (www.preprints.org) | NOT PEER-REVIEWED | Posted: 6 December 2024 doi:10.20944/preprints202412.0639.v1

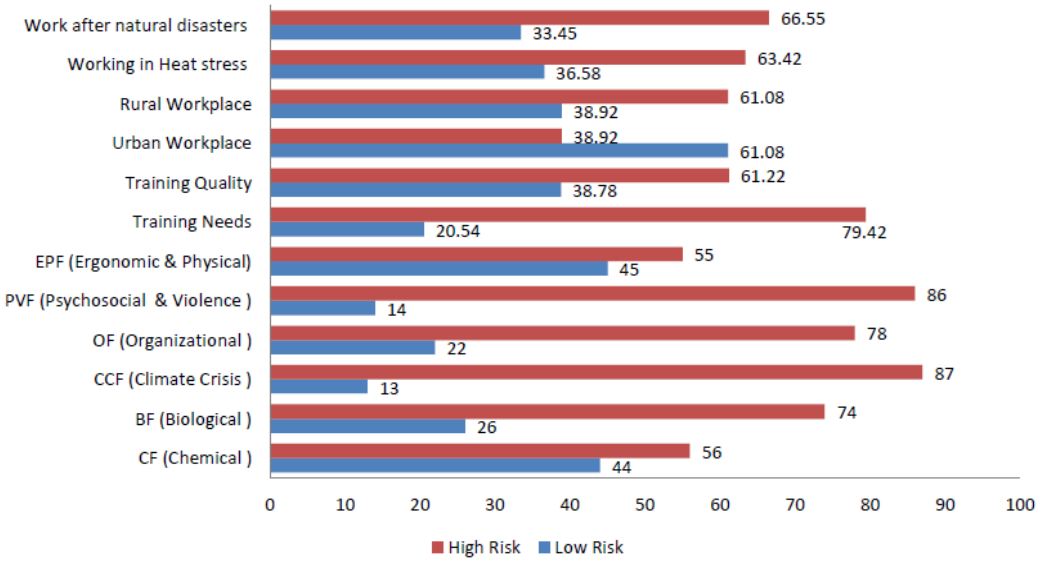


Figure 3. High and Low-Risk Ratio of participants reporting above-average frequency/severity of Occupational Risk, Factors Training, and Workplace Area.

Table 1. Lilliefors Significance Correction Test of Normality.

Tests of Normality						
	Kolmogorov-Smirnova			Shapiro-Wilk		
Risks Factors / Statistic		df	Sig.	Statistic	df	Sig.
EPF (Ergonomic & Physical)	0.120	185	0.000	0.975	185	0.002
CF (Chemical)	0.080	185	0.005	0.973	185	0.001
BF (Biological)	0.144	185	0.000	0.916	185	0.000
CCF (Climate Crisis)	0.081	185	0.005	0.965	185	0.000
PVF (Psychosocial & Violence)	0.092	185	0.001	0.951	185	0.000
OF (Organizational)	0.071	185	0.024	0.952	185	0.000

Hierarchical linear regression analysis was performed for Climate Crisis, and Heat Stress (CCF), reported analytically at Table 2. For Climate Crisis, and Heat Stress (CCF), job risk variables that were significantly correlated were imported as predictors (i.e., Chemical, Biological, Ergonomic, Psychosocial and Organizational risks), and the model was adjusted for demographics. For the unadjusted model, psychosocial risks (β=0.484, $p<0.001$) were associated with higher levels of (CCF), for PHIs (R^2=0.284). When adjusting for Demographics (R^2=0.449), only Psychosocial risks were a significant predictor of For Climate Crisis, and Heat Stress (CCF), (β=0.455, $p<0.001$), while being married (β=-0.166, p=0.022) and working in an urban environment (β=-0.184, p=0.017) decreased (CCF). On the other hand, working in a Rural Environment (β=0.167, p=0.031) had a positive effect on (CCF).

 doi:10.20944/preprints202412.0639.v1

Table 2. Hierarchical regression analysis for Climate Crisis, and Heat Stress .

		Unstandardized regression coefficient B	Standardized regression coefficient β	p	95.0% CI	
					Lower	Upper
Model A R^2=0.2841	(Risks Factors-Constant)	1.3021		0.000	0.915	1.6891
	CF (Chemical)	-0.064	-0.077	0.354	-0.200	0.072
	BF (Biological)	0.131	0.166	0.080	-0.016	0.278
	EPF (Ergonomic & Physical)	0.096	0.100	0.261	-0.072	0.263
	PVF (Psychosocial & Violence)	0.451	0.484	0.000	0.276	0.627
Model B R^2=0.4491	OF (Organizational)	-0.128	-0.149	0.088	-0.275	0.019
	(Constant)	1.413		0.000	0.656	2.171
	CF (Chemical)	-0.037	-0.044	0.570	-0.163	0.090
	BF (Biological)	0.004	0.005	0.960	-0.143	0.151
	EPF (Ergonomic & Physical)	0.122	0.128	0.125	-0.034	0.279
	PVF (Psychosocial & Violence)	0.424	0.455	0.000	0.262	0.586
	OF (Organizational)	-0.056	-0.065	0.447	-0.202	0.089
	Occupational experience (years)	0.003	0.038	0.611	-0.009	0.015

 doi:10.20944/preprints202412.0639.v1

	Training Quality	0.151	0.185	0.440	-0.214	0.269
	Training Needs	0.124	-0.065	0.380	0.932	0.130
	Educational level	-0.060	-0.048	0.440	-0.214	0.094
	Urban Workplace	-0.263	-0.184	0.017	-0.479	-0.047
	Rural Workplace	0.0294	0.167	0.031	0.027	0.561

According to the Workplace Environment, the results of the Kruskal-Wallis tests of employment risks are shown in Table 3. The urban environment had higher CCF Climate Crisis risk scores (Mdn=3.0000) than all other groups, and the Kruskal-Wallis test showed that this difference was statistically significant ($\chi 2$=2.466, $p<0.01$).

Additionally, Village-Town (rural environment) had higher Biological risk scores (Mdn=3.29) than all other categories, and the Kruskal-Wallis test showed that this difference was statistically significant ($\chi 2$= 14.826, $p<0.01$).

Table 3. Univariate analyses of job risks in relation to workplace (Kruskal-Wallis test).

Workplace environment		**EPF Ergonomic & Physical**	**CF Chemical**	**BF Biological**	**CCF Climate Crisis**	**PVF Psychosocial & Violence**	**OF Organizational**
Urban environment	**Mean**	02.2670	2.0088	2.5605	**2.9189**	2.7588	2.6781
	Std. Deviation	0.73717	0.82409	0.90195	0.73196	0.75563	0.83395
	Median	2.3333	2.1429	2.7500	**3.0000**	2.8333	2.8125
	Range	3.33	3.57	4.00	3.33	3.33	3.88
Provincial city (semi-urban environment)	**Mean**	1.8889	1.7222	2.4514	**2.7361**	2.8264	2.4427
	Std. Deviation	0.77049	0.97097	0.89606	0.74149	0.65203	0.85113
	Median	1.8333	2.0714	2.5833	**2.8333**	2.8750	2.5000
	Range	3.33	3.43	3.33	3.17	3.25	3.06
Village-Town (rural environment)	**Mean**	1.7639	2.1706	**3.1389**	2.9815	2.8333	2.5590
	Std. Deviation	0.86316	0.70199	0.63870	0.71022	0.83023	0.68936
	Median	2.0833	2.3571	**3.2917**	3.2500	3.0417	2.5625
	Range	3.00	2.79	2.50	2.67	3.33	2.75
Kruskal-Wallis	χ^2	11.925	4.480	14.826	2.466	0.415	3.134

 doi:10.20944/preprints202412.0639.v1

	p	0.003	0.106	**0.001**	**0.291**	0.813	0.209

4. The Proposed Classification of Job Risks for Public Health Inspectors

The public workforce taxonomy of all specialties improves that Supervision Officers, Public Health, Environmental, and Health Inspectors are similar employees guarding, and providing public-health-inspections [37,41,42]. Research studies and literature reviews reveal that PHIs encounter a range of occupational hazards owing to the unique demands of their roles. According to Beck et al, Adamopoulos et al. and Tustin et al. these specialists routinely highlight safety issues, such as the dangers of working alone or being exposed to toxic chemicals [40–42].

Additionally, they suffer biological, ergonomic, physical, and emotional risks, including incidents of aggression and harassment [37,42,43]. Additionally, they face biological, ergonomic, physical, and psychosocial dangers, including instances of violence and harassment, the health and safety challenges highlighted, [37,42]. Chemical risks, biological agents, ergonomic risks, and psychosocial risks are significant health threats in healthcare settings [44].

EU-OSHA categorizes hazards into biological, chemical, ergonomic, and psychosocial risks, with an additional category for organizational hazards [45]. Psychosocial risks, including workplace violence, are also recognized by Tuckey et al.,[46]. Management of chemical and biological hazards is aided by guidance from the National Institute for Occupational Safety and Health, Psychosocial and ergonomic concerns are linked to work-related illnesses, which are commonly caused by inadequate resources and high workloads, [47,48]. The EU-OSHA healthcare risk assessment framework categorizes risk factors into physical, chemical, and biological hazards [49].

Chemical risks include insufficient ventilation, while biological risks include inadequate workplace cleanliness and sanitary restroom facilities[50]. Psychosocial risk factors include excessive workloads, stress, harassment, and corruption [51]. These factors are particularly relevant to healthcare professions, and the proper use of personal protective equipment is crucial for PHIs [52].

Additionally, the Climate Crisis has emerged as a significant and independent risk factor affecting the classification and assessment of environmental risks related to Occupational Safety and Health, and hygiene among the PHIs. This study presents a proposed classification of job risks faced by Public Health Inspectors all over the world Global, illustrated in Figure 5. The diagram of Figure 5 shows climate crisis factors and related OSH hazards, tools and strategies for integrating climate considerations into OSH assessments of PHIs.

 doi:10.20944/preprints202412.0639.v1

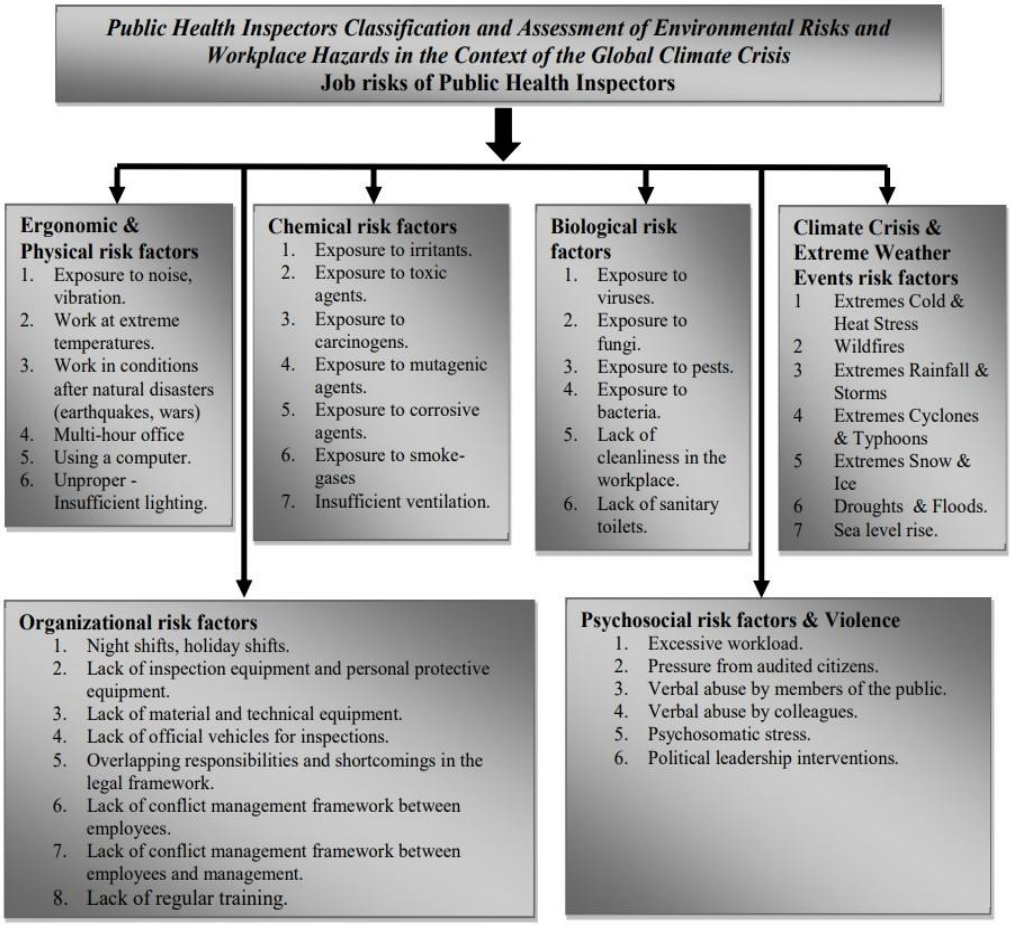
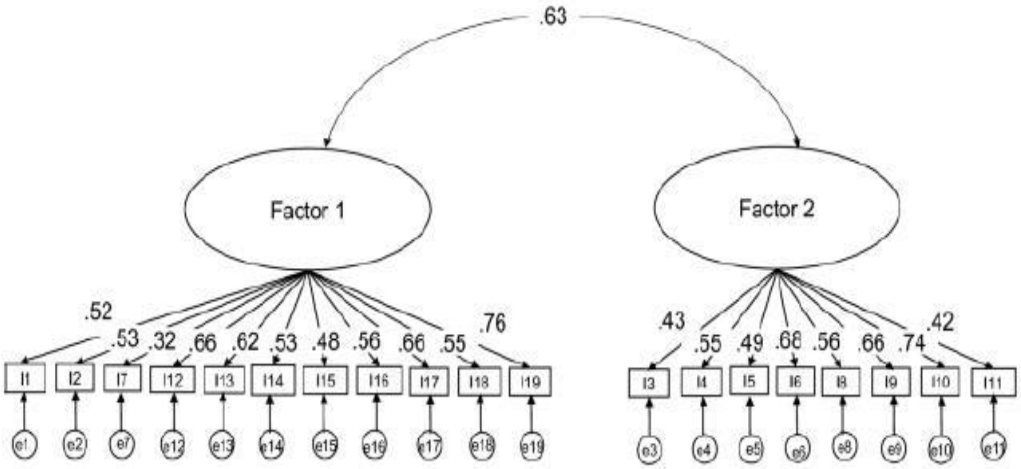


Figure 5. The schematic representation of the flow chart of the study: PHIs Classification and Assessment of Environmental, Psychosocial, Organizational Risks and Workplace Hazards in the Context of the Global Climate Crisis.

The key risk factors linked to enhanced occupational safety, health, and hygiene for PHIs involve the Classification and Evaluation of Environmental, Psychosocial, Organizational Risks and Workplace Hazards in light of the Global Climate Crisis. The job-related risks faced by PHIs include Psychosocial Violence, and Organizational risk factors (Factor 1) excluded from exploratory Factor analysis, and risks stemming from the Climate Crisis and Extreme Weather Events (Factor 2), as illustrated in the study Figure 6.



 doi:10.20944/preprints202412.0639.v1

Figure 6. The job-related risks faced by PHIs include Psychosocial Violence, and Organizational Risk Factor (F 1) and risks stemming from the Climate Crisis and Extreme Weather Events Factor (F 2), and Exploratory Factor Analysis, as illustrated in the study.

H1. *Increased levels of perceived psychosocial risks are associated with increased levels of Workplace environment Biological Hazards.*

H2. *Increased levels of perceived All Job risks and Environmental Hazards associated with Workplace environment Biological Hazards*

H2.1 *The level of perceived job risks has an independent negative effect on decreased levels of Psychosocial Violence, and Organizational risk factors (F 1).*

H2.2 *The level of Workplace environment Biological Hazards has an independent negative effect on Psychosocial Violence, and Organizational risk factors (F 1).*

H3. *Workplace environment (rural, urban) affects perceived levels of job risks, Workplace environment Biological Hazards, Psychosocial Violence, and Organizational risk factors (F 1).*

H3.1 *Employees in rural environments present higher levels of perceived biological risks compared to employees in urban environments, stemming from the Climate Crisis and Extreme Weather Events (F2)*

H3.2 *Employees in rural environments report higher levels of Workplace environment Biological Hazards, compared to employees in urban environments, stemming from the Climate Crisis and Extreme Weather Events (F2).*

H3.3 *Employees in rural environments report lower levels of Psychosocial Violence, and Organizational risk factors, compared to employees in urban environments, stemming from the Climate Crisis and Extreme Weather Events (F 1)/(F2).*

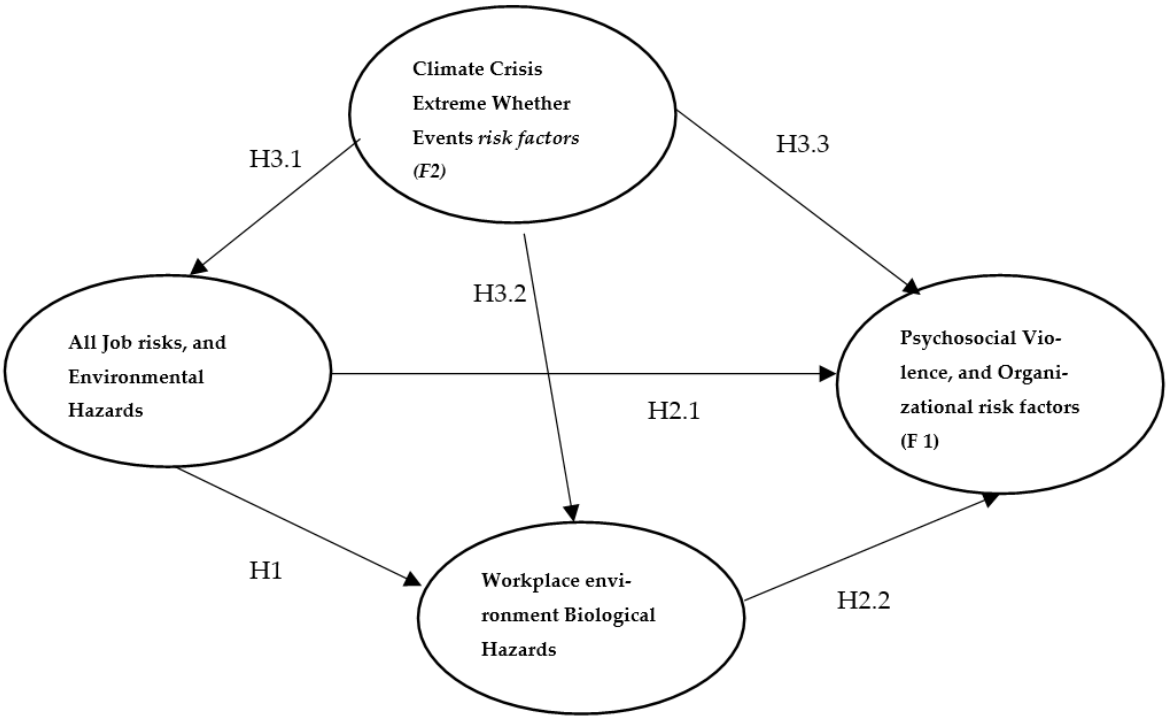


Figure 7. Research model and hypotheses of this study.

 doi:10.20944/preprints202412.0639.v1

5. Discussion

The intersection of climate change and public health has garnered increasing attention in recent years, particularly regarding the role of Environmental, and Public Health Officers in managing environmental risks and workplace hazards. PHIs aren't solely accountable for illness resulting from environmental risks. Compliance requires evaluating risks in the environment and operational practices at water wells, plants, and care facilities, [54–57]. The literature reveals a pressing need for a comprehensive understanding of how climate change influences occupational safety and health, as well as the broader implications for public health. In article, Schulte et al. stress the need for better surveillance and risk assessment in order to effectively manage occupational health hazards due to climate change, [58]. The researchers argue that incorporating climate change into occupational health frameworks is crucial for improving health outcomes and implementing prevention measures. This perspective sets the stage for understanding the challenges faced by PHIs in managing climate-related health risks, [59]. Local governments must enhance their ability to safeguard public health amid climate change. They identified a lack of participation from Environmental Health Officers-PHIs in climate adaptation and mitigation planning [60]. The study underscores the significance of integrating public health strategies into climate change mitigation, given its extensive health effects. It emphasizes the necessity for PHIs to broaden their responsibilities to effectively address the intricate challenges brought about by climate change, [61]. Climate change can worsen workplace hazards, leading to more heat-related illnesses, respiratory issues, and injuries. Integrating climate considerations into Occupational Safety and Health (OSH) frameworks is crucial for protecting worker health, [62]. Suggest tools and strategies to ease this integration, such as using checklists to assess OSH hazards related to climate crisis. This practical approach helps PHIs classify and assess risks, improving their ability to address challenges from the climate crisis, [63]. Argument emphasizes the need to include global climate crisis in OSH framework recommendations to offer a path for improvement, and the importance of proactive measures to protect workers in vulnerable sectors [64]. Workforce shortages and lack of support hinder preparedness for climate-related health issues, this misperception creates a critical gap in public health preparedness [65]. Executives must recognize public health implications to foster effective climate action plans, emphasizing the need for a strategic reorientation in addressing climate change challenges for public health professionals [66]. Local governments must prioritize environmental health in their strategies to prepare PHIs for the evolving health risks linked to climate change, existing classification systems assess environmental risks and workplace health and safety hazards, prioritizing inspection protocols [67]. Factors considered include environmental health concerns, physical and chemical hazards, biological hazards, and individual and workplace considerations [68,69]. These frameworks are used globally to allocate resources and prioritize investigations on occupational risks, [70,71]. Innovations in technology provide health inspectors with more tools remote sensing permits the evaluation of office areas, and Geographic Information Systems' new tools and software allow for data mining to make more educated public health decisions, [72,73]. Risk assessors and inspectors must maintain their operational skills to make informed conclusions using the best possible methodology [74,75]. Data collection should inform expert opinion and help to advance the risk assessment process [76,77].

6. Conclusions

The purpose of this study was to investigate the classification and assessment of environmental, psychosocial, organizational risks, and workplace hazards in the context of the Global Climate Crisis on the PHIs. This study contributes to the literature in several ways and has identified the frequency, severity, and average impact of several job risks of environmental psychosocial, organizational risks, and workplace hazards in the context of the Global Climate Crisis on the updating the evidence from a limited global literature. According to previous research and the literature review, the level of job risks, especially for environmental factors climate crisis, extreme weather events, and psychosocial and organizational risk categories was found to be the most important. Moreover, perceived job risk, levels were affected by demographics and more specifically the workplace environment areas (urban vs rural, semi-rural) connecting the literature and scientific publications of Occupational Health and

 doi:10.20944/preprints202412.0639.v1

Safety with Public Health and Hygiene, and climate crisis with extreme weather events. The new global context, resulting from numerous likely risks, will shape the current policy. It is crucial for existing policies to include guidelines for countries to follow in formulating public health, environmental, and occupational health policies. With the elements outlined in the current work plan, there should be a dual focus on public health and work-related health. The main issues concern the ability of authorities to protect individuals' well-being. These encompass alerts, indicators, predictive environmental disruptions, and unforeseen events. The public health system needs to respond to these with various capabilities.

Author Contributions: Conceptualization, N.S., I.A., D.L., and G.D.; methodology, N.S., I.A., and G.D.; software, N.S., I.A., D.L., and G.D.; validation, I.A.; formal analysis, N.S., I.A., and G.D.; investigation, I.A., D.L., and G.D.; resources, I.A.; data curation, I.A.; writing—original draft preparation, N.S., I.A., D.L., and G.D.; writing—review and editing, N.S., I.A., D.L., and G.D.; visualization, N.S., and I.A.; supervision, I.A.; project administration, I.A., and D.L. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: The study was conducted in accordance with the Declaration of Helsinki.

Informed Consent Statement: Not applicable.

Data Availability Statement: The raw data supporting the conclusions of this article will be made available by the corresponding author upon reasonable request.

Conflicts of Interest: The authors declare no conflicts of interest.

References

1. Baker, M. G., et al. (2020). "Using GIS to Assess Environmental Health Risks." Environmental Health Perspectives, 128(4), 47001.
2. Obaideen K, Shehata N, Sayed ET, Abdelkareem MA, Mahmoud MS, Olabi AG. The role of wastewater treatment in achieving sustainable development goals (SDGs) and sustainability guideline. Energy Nexus. 2022 Sep 1;7:100112.
3. Karimi-Maleh H, Ghalkhani M, Dehkordi ZS, Singh J, Wen Y, Baghayeri M, Rouhi J, Fu L, Rajendran S. MOF-enabled pesticides as developing approach for sustainable agriculture and reducing environmental hazards. Journal of Industrial and Engineering Chemistry. 2024 Jan 25;129:105-23.
4. Sadrizadeh S, Yao R, Yuan F, Awbi H, Bahnfleth W, Bi Y, Cao G, Croitoru C, de Dear R, Haghighat F, Kumar P. Indoor air quality and health in schools: A critical review for developing the roadmap for the future school environment. Journal of Building Engineering. 2022 Oct 1;57:104908.
5. Dimitroulopoulou S, Dudzińska MR, Gunnarsen L, Hägerhed L, Maula H, Singh R, Toyinbo O, Haverinen-Shaughnessy U. Indoor air quality guidelines from across the world: An appraisal considering energy saving, health, productivity, and comfort. Environment International. 2023 Aug 1;178:108127.
6. Adamopoulos I, Frantzana A, Adamopoulou J, Syrou N. (2023a).Climate Change and Adverse Public Health Impacts on Human Health and Water Resources. In: 16th International Conference on Meteorology, Climatology and Atmospheric Physics— COMECAP 2023. Basel Switzerland: MDPI; 2023. p. 178.
7. Bernstein JB, Bensoussan A, Bender E. Reliability Prediction for Microelectronics. 2024.
8. Hallioui A, Herrou B, Katina PF, Santos RS, Egbue O, Jasiulewicz-Kaczmarek M, Soares JM, Marques PC. A Review of Sustainable Total Productive Maintenance (STPM). Sustainability. 2023 Aug 14;15(16):12362.
9. Drewniak R, Drewniak Z. Improving business performance through TPM method: The evidence from the production and processing of crude oil. Plos one. 2022.
10. Aranda MP, Kremer IN, Hinton L, Zissimopoulos J, Whitmer RA, Hummel CH, Trejo L, Fabius C. Impact of dementia: Health disparities, population trends, care interventions, and economic costs. Journal of the American Geriatrics Society. 2021 Jul;69(7):1774-83.
11. Eichbaum QG, Adams LV, Evert J, Ho MJ, Semali IA, van Schalkwyk SC. Decolonizing global health education: rethinking institutional partnerships and approaches. Academic Medicine. 2021 Mar 1;96(3):329-35.
12. Esmaeilzadeh P. Use of AI-based tools for healthcare purposes: a survey study from consumers' perspectives. BMC medical informatics and decision making. 2020.
13. Shah K, Mann S, Singh R, Bangar R et al. Impact of COVID-19 on the mental health of children and adolescents. Cureus. 2020.

 doi:10.20944/preprints202412.0639.v1

14. Xiang YT, Jin Y, Cheung T. Joint international collaboration to combat mental health challenges during the coronavirus disease 2019 pandemic. JAMA psychiatry. 2020.
15. Marselle MR, Hartig T, Cox DT, De Bell S, Knapp S, Lindley S, Triguero-Mas M, Böhning-Gaese K, Braubach M, Cook PA, De Vries S. Pathways linking biodiversity to human health: A conceptual framework. Environment international. 2021 May 1;150:106420.
16. Singh BK, Delgado-Baquerizo M, Egidi E, Guirado E, Leach JE, Liu H, Trivedi P. Climate change impacts on plant pathogens, food security and paths forward. Nature Reviews Microbiology. 2023 Oct;21(10):640-56.
17. Mora C, McKenzie T, Gaw IM, Dean JM, von Hammerstein H, Knudson TA, Setter RO, Smith CZ, Webster KM, Patz JA, Franklin EC. Over half of known human pathogenic diseases can be aggravated by climate change. Nature climate change. 2022 Sep;12(9):869-75.
18. Watts N, Amann M, Arnell N, Ayeb-Karlsson S, Beagley J, Belesova K, Boykoff M, Byass P, Cai W, Campbell-Lendrum D, Capstick S. The 2020 report of The Lancet Countdown on health and climate change: responding to converging crises. The lancet. 2021 Jan 9;397(10269):129-70.
19. Fisher MC, Alastruey-Izquierdo A, Berman J, Bicanic T, Bignell EM, Bowyer P, Bromley M, Brüggemann R, Garber G, Cornely OA, Gurr SJ. Tackling the emerging threat of antifungal resistance to human health. Nature reviews microbiology. 2022 Sep;20(9):557-71.
20. WHO. (2021). Climate Change and Health: A Global Perspective. Retrieved from [WHO website: Accessed date 21-11-2024] At: (https://www.who.int/news-room/fact-sheets/detail/climate-change-and-health).
21. Hoffman, J. S., et al. (2019). Public health inspectors: A critical component of environmental health. Journal of Environmental Health, 82(1), 24-30.
22. Lemke, B., & Kjellstrom, T. (2012). Calculating occupational heat stress and its impact on productivity in the context of climate change. Industrial Health Journal, 50(3), 267-278.
23. Adamopoulos I, Frantzana A, Syrou N., 2024b. Climate Crises Associated with Epidemiological, Environmental, and Ecosystem Effects of a Storm: Flooding, Landslides, and Damage to Urban and Rural Areas (Extreme Weather Events of Storm Daniel in Thessaly Greece). *Medical Sciences Forum*. 2024; 25(1):7. https://doi.org/10.3390/msf2024025007
24. Smith R, Stancliffe R, Clark W, Adshead F and Braithwaite I (2020). Six steps to promote recovery of the health and social care system from the covid-19 pandemic. BMJ Opinion 24 September.
25. Jones, A., & Brown, T. (2021). Climate Change and Occupational Health: A Review. International Journal of Environmental Research and Public Health, 18(5), 2345.
26. Williams, P. (2022). Challenges Facing Public Health Inspectors in a Changing Climate. American Journal of Public Health, 112(7), 1020-1026.
27. Thompson, H., et al. (2023). Integrating Climate Change into Environmental Risk Assessment Frameworks. Environmental Science & Policy, 132, 45-56.
28. Salam MA, Al-Amin MY, Salam MT, Pawar JS, Akhter N, Rabaan AA, Alqumber MA. Antimicrobial resistance: a growing serious threat for global public health. InHealthcare 2023 Jul 5 (Vol. 11, No. 13, p. 1946). MDPI.
29. Gasser U, Ienca M, Scheibner J, Sleigh J, Vayena E. Digital tools against COVID-19: taxonomy, ethical challenges, and navigation aid. The lancet digital health. 2020 Aug 1;2(8):e425-34.
30. Araz OM, Choi TM, Olson DL, Salman FS. Role of analytics for operational risk management in the era of big data. Decision Sciences. 2020.
31. Elayan H, Aloqaily M, Guizani M. Digital twin for intelligent context-aware IoT healthcare systems. IEEE Internet of Things Journal. 2021 Jan 12;8(23):16749-57.
32. de Ruijter VN, Redondo-Hasselerharm PE, Gouin T, Koelmans AA. Quality criteria for microplastic effect studies in the context of risk assessment: a critical review. Environmental Science & Technology. 2020 Aug 28;54(19):11692-705.
33. Dale, A., Wathan, J. και Higgins, V. (2008). The secondary analysis of quantitative data sources. Στο P. Alasuutari, L. Bickman, J. Brannen, *The Sage handbook of social research methods* (pages.520-535). London: Sage.
34. Burton, D. (2000). Secondary data analysis. At D. Burton, Research training for social scientists (pages. 347-360). London: Sage.
35. Smith E.(2008) *Using Secondary Data in Educational and Social Research*, Berkshire:Open University Press.
36. Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021;372:n71. doi: 10.1136/bmj.n71
37. Adamopoulos I, Syrou N, Lamnisos D, Boustras G.(2023d). Cross-sectional nationwide study in occupational safety & health: Inspection of job risks context, burn out syndrome and job satisfaction of public health Inspectors in the period of the COVID-19 pandemic in Greece. Saf Sci. 2023 Feb;158:105960.
38. Johnson, R. (2023). The Impact of Climate Change on Public Health Risk Assessment. Environmental Health Perspectives, 131(2), 245-252.

39. Miller, S., & Davis, K. (2022). Training Public Health Inspectors for Climate Resilience. Public Health Reports, 137(3), 345-352.
40. Garcia, L. (2021). Collaborative Approaches to Public Health and Environmental Management. Journal of Environmental Health, 83(4), 12-19.
41. Beck, Angela J et al. "The Public Health Workforce Taxonomy: Revisions and Recommendations for Implementation." Journal of public health management and practice : JPHMP vol. 24,5 (2018): E1-E11. doi:10.1097/PHH.0000000000000690
42. Adamopoulos IP, Frantzana AA, Syrou NF. General practitioners, health inspectors, and occupational physicians' burnout syndrome during COVID-19 pandemic and job satisfaction: A systematic review. EUR J ENV PUBLIC HLT. 2024;8(3):em0160. https://doi.org/10.29333/ejeph/14997
43. Tustin, J., Hau, J. and Hon, C. (2019). Occupational health and safety hazards encountered by Ontario Public Health Inspectors. Environmental Health Review, 62(1), pp.14-19.
44. Koulentianou, M. & Katsori. A. 2014. Organization of occupational health services in health care institutions in the European Union and Greece. Scientific Chronicles, 19(1),31-42.
45. EU-OSHA (n.d). E-fact 18 – Risk assessment in healthcare, at https://osha.europa.eu/en/publications/e-facts/efact18, [Accessed 20 November 2024].
46. Tuckey, M., Winwood, P., & Dollard, M. (2012). Psychosocial culture and pathways to psychological injury within policing. Police Practice And Research, 13(3), 224-240. doi: 10.1080/15614263.2011.574072
47. Talavera-Velasco, B., Luceño-Moreno, L., Martín-García, J., & García-Albuerne, Y. (2018). Psychosocial risk factors, burnout and hardy personality as variables associated with mental health in police officers. Frontiers in psychology, 9, 1478.
48. NIOSH, 2013. National Health Interview Survey: Occupational Health Supplement- Transportation, Warehousing, and Utilities. Cincinnati, OH: US, Department of Health and Human Services, Centers for Disease Control and Prevention, N I O S H, [Accessed 26 November 2024].https://www.cdc.gov/niosh/topics/nhis/transind.html
49. EU-OSHA-Safety and health at work-EU-OSHA. [online] Available at: https://osha.europa.eu/en/about-eu-osha [Accessed 18-11-2024].
50. Mannan, M., & Al-Ghamdi, S. (2021). Indoor Air Quality in Buildings: A Comprehensive Review on the Factors Influencing Air Pollution in Residential and Commercial Structure. International Journal Of Environmental Research And Public Health, 18(6), 3276. doi: 10.3390/ijerph18063276
51. Adamopoulos IP, Syrou NF. Administration safety and occupational risks relationship with job position training quality and needs of medical public health services workforce correlated by political leadership interventions. ELECTR J MED ED TE. 2023;16(3):em2305. https://doi.org/10.29333/ejmets/13585
52. Shehab, M., Shuaibi, S., Qadhi, I., & Alfadhli, A. (2021). Effectiveness of inspectors' team in increasing compliance with personal protective equipment use and reducing COVID19 infection spread among healthcare workers. Infection Prevention In Practice, 3(2), 100137. doi: 10.1016/j.infpip.2021.100137
53. Wirsching J, Graßmann S, Eichelmann F, et al. Development and reliability assessment of a new quality appraisal tool for cross-sectional studies using biomarker data (BIOCROSS). BMC Med Res Methodol. 2018;18(1):1-8. https://doi.org/10.1186/s12874-018-0583-x PMid: 30400827 PMCid:PMC6219097
54. Adamopoulos I, Lamnisos D, Syrou N, Boustras G. Public health and work safety pilot study: Inspection of job risks, burn out syndrome and job satisfaction of public health inspectors in Greece. Safety Science. 2022.
55. Kaewunruen S, Sresakoolchai J, Ma W, Phil-Ebosie O. Digital twin aided vulnerability assessment and risk-based maintenance planning of bridge infrastructures exposed to extreme conditions. Sustainability. 2021.
56. Ahmad YS, Hamid A, Saif S, Mehmood A. Assessment of health and safety risks in a textile industry. Journal of Natural and Applied Sciences Pakistan. 2020;2(1):350-69.
57. Frank JR, Karpinski J, Sherbino J, Snell LS, Atkinson A, Oswald A, Hall AK, Cooke L, Dojeiji S, Richardson D, Cheung WJ. Competence By Design: a transformational national model of time-variable competency-based postgraduate medical education. Perspectives on Medical Education. 2024 Mar 18;13(1):201.
58. Schulte PA, Bhattacharya A, Butler CR, Chun HK, Jacklitsch B, Jacobs T, Kiefer M, Lincoln J, Pendergrass S, Shire J, Watson J, Wagner GR. Advancing the framework for considering the effects of climate change on worker safety and health. J Occup Environ Hyg. 2016 Nov;13(11):847-65. doi: 10.1080/15459624.2016.1179388. PMID: 27115294; PMCID: PMC5017900.
59. Henderson J, Ward PR, Tonkin E, Meyer SB, Pillen H, McCullum D, Toson B, Webb T, Coveney J and Wilson A (2020) Developing and Maintaining Public Trust During and Post-COVID-19: Can We Apply a Model Developed for Responding to Food Scares? Front. Public Health 8:369. doi: 10.3389/fpubh.2020.00369
60. Taylor, Alan, et al. "How Australian health care services adapted to telehealth during the COVID-19 pandemic: a survey of telehealth professionals." Frontiers in Public Health 9 (2021): 648009.
61. Shadmi, E., Chen, Y., Dourado, I. et al. Health equity and COVID-19: global perspectives. Int J Equity Health **19**, 104 (2020). https://doi.org/10.1186/s12939-020-01218-z

62. Hassankhani, M.; Alidadi, M.; Sharifi, A.; Azhdari, A. Smart City and Crisis Management: Lessons for the COVID-19 Pandemic. *Int. J. Environ. Res. Public Health* **2021**, *18*, 7736. https://doi.org/10.3390/ijerph18157736
63. McGuirk P, Dowling R, Maalsen S, Baker T. Urban governance innovation and COVID-19. *Geographical Research*. 2021; 59: 188–195. https://doi.org/10.1111/1745-5871.12456
64. Wang, X., Zhang, X., and He, J. "Challenges to the system of reserve medical supplies for public health emergencies: reflections on the outbreak of the severe acute respiratory syndrome coronavirus . Bioscience trends, 2020.
65. Porat T, Nyrup R, Calvo RA, Paudyal P and Ford E (2020) Public Health and Risk Communication During COVID-19—Enhancing Psychological Needs to Promote Sustainable Behavior Change. *Front. Public Health* 8:573397. doi: 10.3389/fpubh.2020.573397
66. Gilmore, Anna B., et al. "Defining and conceptualising the commercial determinants of health." The Lancet 401.10383 (2023): 1194-1213.
67. Barron, Gabriela Cuevas, et al. "Safeguarding people living in vulnerable conditions in the COVID-19 era through universal health coverage and social protection." The Lancet Public Health 7.1 (2022): e86-e92.
68. Mohandes SR, Zhang X. Developing a Holistic Occupational Health and Safety risk assessment model: An application to a case of sustainable construction project. Journal of Cleaner Production. 2021.
69. Gul M, Ak MF. Assessment of occupational risks from human health and environmental perspectives: a new integrated approach and its application using fuzzy BWM and fuzzy MAIRCA. Stochastic Environmental Research and Risk Assessment. 2020 Aug;34(8):1231-62.
70. Ramos D, Afonso P, Rodrigues MA. Integrated management systems as a key facilitator of occupational health and safety risk management: A case study in a medium sized waste management firm. Journal of Cleaner Production. 2020.
71. Jepson PC, Murray K, Bach O, Bonilla MA, Neumeister L. Selection of pesticides to reduce human and environmental health risks: a global guideline and minimum pesticides list. The Lancet Planetary Health. 2020 Feb 1;4(2):e56-63.
72. Raihan A. A comprehensive review of the recent advancement in integrating deep learning with geographic information systems. Research Briefs on Information and Communication Technology Evolution. 2023 Oct 16;9:98-115. researchgate.net
73. Xia H, Liu Z, Efremochkina M, Liu X et al. Study on city digital twin technologies for sustainable smart city design: A review and bibliometric analysis of geographic information system and building information - Sustainable Cities and Society. 2022.
74. Fernández PM, López AJ, Márquez AC, Fernández JF, Marcos JA. Dynamic Risk Assessment for CBM-based adaptation of maintenance planning. Reliability Engineering & System Safety. 2022 Jul 1;223:108359.
75. Aderamo AT, Olisakwe HC, Adebayo YA, Esiri AE. AI-enabled predictive safeguards for offshore oil facilities: Enhancing safety and operational efficiency. Comprehensive Research and Reviews in Engineering and Technology. 2024;2(1):23-43.
76. Adamopoulos I., Lamnisos D., Syrou N., Boustras G., Training Needs and Quality of Public Health Inspectors in Greece during the COVID-19 pandemic, European Journal of Public Health, Volume 32, Issue Supplement_3, October 2022, ckac131.373, https://doi.org/10.1093/eurpub/ckac131.373
77. Hegedűs M, Szivós E, Adamopoulus I, Dávid LD. (2024). Hospital integration to improve the chances of recovery for decubitus (pressure ulcer) patients through centralised procurement procedures. Journal of Infrastructure, Policy and Development. 8(10): 7273. https://doi.org/10.24294/jipd.v8i10.7273