

Comparing Occupational Heat-Related Illness Patterns and Prevention Strategies in South Korea and the United States: A Preliminary Review

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Abstract: Extreme weather events and severe heat pose significant hazards to the safety and health of workers, leading to increased accidents, mortality, and morbidity during hot climate conditions. Workers who are exposed to extreme heat or work in hot environments are at risk of occupational heat stress, which can result in heat stroke, heat exhaustion, heat syncope, heat cramps, heat rashes, and even death. Heat-related illnesses and diseases are a growing concern in various industrial and occupational settings. This comparative study examines the patterns of heat-related injuries and the effectiveness of prevention strategies in South Korea and the United States – two industrialized nations experiencing increasing frequency and severity of heat waves. In South Korea, heat-related injuries are most prevalent in the construction and manufacturing sectors, with nearly half of all recognized cases occurring among construction workers. The 2024 summer season saw 3,704 reported heat-related illness (HRI) cases and 34 deaths, with the highest incidence rates in outdoor and smaller workplaces (Korea Disease Control and Prevention Agency, KDCA). The majority of cases involved heat exhaustion, while heat stroke accounted for most fatalities. South Korea's prevention approach is characterized by government-led seasonal campaigns, mandatory self-inspections, and recent legal reforms such as the Serious Accident Punishment Act, which increases employer accountability for heat-related incidents. In contrast, the United States reports the highest rates of occupational HRI in agriculture, construction, and waste/remediation services. Agriculture alone accounts for over 20% of occupational heat-related deaths, with construction contributing nearly 37%. The U.S. approach to prevention is more decentralized, featuring enforceable state-level standards in regions like California and Washington, alongside federal Occupational Safety and Health Administration (OSHA) guidelines. Common preventive measures in both countries include the provision of water, shade, rest breaks, and worker training, though regulatory enforcement and worker protections vary. This analysis reveals that while both nations share similar risk profiles—outdoor, physically demanding industries (e.g., construction) are most affected—South Korea's recent legislative changes and centralized campaigns contrast with the U.S.'s regionally diverse regulatory landscape. Both countries face challenges in protecting vulnerable workers, such as nonpermanent employees and migrant laborers, and in adapting workplace practices to increasingly extreme climatic conditions. The findings underscore the urgent need for robust, adaptable prevention strategies and cross-national learning to mitigate the rising burden of occupational heat-related injuries amid global climate change. Recommendations include harmonizing standards, enhancing surveillance, and prioritizing high-risk industries for intervention.

Keywords: Heat-related illness, Heat stress, Occupational, South Korea, United States, Surveillance, Early warning systems, Prevention strategies

1. Introduction

Climate change has intensified the frequency, duration, and severity of extreme heat events globally, with profound implications for public health and worker safety (Khorshid & Song, 2025; Kjellstrom et al., 2016). Workers exposed to extreme heat or hot environments are at risk of occupational heat stress, which can result in a spectrum of health outcomes,

including heat stroke, heat exhaustion, heat syncope, heat cramps, heat rashes, and, in severe cases, death (Calkins et al., 2019). The International Labour Organization (ILO) estimates that millions of workers are exposed to excessive heat annually, with significant impacts on productivity and well-being (ILO, 2024).

South Korea and the United States, as advanced industrial economies, have both experienced record-breaking heatwaves in recent years, leading to increased reports of HRIs. However, their approaches to prevention, regulation, and enforcement differ markedly. This paper provides a comparative analysis of occupational HRIs in these two countries, focusing on patterns of injury, legal and regulatory frameworks, and the effectiveness of prevention strategies. By identifying best practices and persistent challenges, we aim to inform cross-national learning and policy development amid escalating climate risks.

2. Methods

This study employs a comparative policy analysis framework, drawing on recent government reports, peer-reviewed literature, and occupational safety data from South Korea and the United States. Data sources include the Korea Occupational Safety and Health Agency (KOSHA), the Ministry of Employment and Labor (MOEL), the U.S. Bureau of Labor Statistics (BLS), and the U.S. Occupational Safety and Health Administration (OSHA). We reviewed national statistics on HRIs, sector-specific risk profiles, and recent legislative and regulatory changes. Prevention strategies were assessed through policy documents, government campaigns, and industry guidelines. The analysis focuses on the period from 2019 to 2025, capturing recent trends and policy responses to extreme heat events.

3. Results

3.1 Patterns of Heat-Related Illnesses/Injuries

3.1.1 South Korea

In South Korea, heat-related injuries are most prevalent in the construction and manufacturing sectors, with nearly half of all recognized cases occurring among construction workers. The 2024 summer season saw 3,704 reported HRI cases and 34 deaths, with the highest incidence rates in outdoor and smaller workplaces. The majority of cases involved heat exhaustion, while heat stroke accounted for most fatalities. Vulnerable groups include foreign and nonpermanent workers, who are disproportionately affected due to job insecurity and limited access to training (Choi and Shin, 2024; Han, 2019; Kwon, 2016; Lee and Ahn, 2016).

3.1.2 United States

The United States reports the highest rates of occupational HRI in agriculture, construction, and waste/remediation services. Agriculture alone accounts for over 20% of occupational heat-related deaths, while construction contributes about 34% of all occupational heat deaths (US EPA, 2025). Most outdoor fatalities (50–70%) occur in the first few days of working in hot environments, highlighting the importance of acclimatization (US OSHA, 2025). Migrant and temporary workers, especially in agriculture, face additional risks due to inadequate protections and healthcare access.

3.2 Legal and Regulatory Frameworks

3.2.1 South Korea

South Korea's approach is characterized by government-led seasonal campaigns, mandatory self-inspections, and recent legal reforms such as the Serious Accident Punishment Act, which increases employer accountability for heat-related incidents (Bang, 2024; Kim, 2022; Kim et al., 2025)

3.2.1 United States

The U.S. approach is more decentralized, featuring enforceable state-level standards in regions like California and Washington, alongside federal OSHA guidelines. As of July 2024, five states have permanent occupational heat stress standards, while federal protections rely on the OSHA General Duty Clause and proposed (but not yet enacted) national standards (Engling, 2024).

Table 1 highlights both the similarities and differences in sectoral risk, regulatory structure, and prevention approaches between South Korea and the United States.

Table 1. Summary of Comparisons on HRI Aspects between South Korea and United States

	South Korea	United States
Most affected sectors	Construction, manufacturing	Agriculture, construction, waste/remediation
Heat-related deaths (annual avg)	34 deaths (2024)	~34 deaths/year (1992–2022 avg)
Construction deaths (% of total)	~50% of recognized HRI cases	~34% of all occupational heat deaths
Agriculture deaths (% of total)	Not primary sector for HRI deaths	>20% of all occupational heat deaths
Vulnerable groups	Foreign, nonpermanent workers, small workplaces	Migrant, temporary, undocumented workers, small workplaces
Legal/regulatory approach	Centralized, government-led campaigns, mandatory self-inspections, new legal reforms	Decentralized, state-level standards (5 states), federal OSHA guidelines (proposed national rule)
Key recent legal change	Serious Accident Punishment Act (increased employer accountability)	Proposed OSHA national heat standard (pending), state-level standards in 5 states
Prevention measures	Water, shade, rest breaks, training, cooling gear, multilingual outreach	Water, shade, rest breaks, training, acclimatization protocols (in some states)
Reporting and surveillance	Centralized, government-mandated	Decentralized, variable by state and sector

The comparative analysis reveals that both South Korea and the United States face significant occupational health risks from extreme heat, particularly in outdoor, physically demanding sectors such as construction and agriculture. South Korea’s heat-related injuries are most prevalent in construction and manufacturing, with small workplaces and nonpermanent or foreign workers being most vulnerable (KOSHA, 2025; Choi and Shin, 2024; Han, 2019; Kwon, 2016; Lee and Ahn, 2016). The United States shows a similar pattern, with the majority of heat-related deaths occurring in agriculture and construction, and heightened risks for migrant and temporary workers (US EPA, 2025; US OSHA, 2025).

Regulatory approaches differ notably: South Korea employs a centralized, government-led model with recent legal reforms enhancing employer accountability, while the United States relies on a decentralized system with state-level standards and federal guidelines, resulting in variable protections across regions (Engling, 2024). Both nations implement core preventive measures such as water, shade, rest breaks, and training, but the scope and enforcement of these measures are stronger and more uniform in South Korea due to centralized oversight (Kim et al., 2025; Bang, 2024; Kim, 2022).

The comparison table further illustrates these similarities and differences, emphasizing the need for harmonized standards, targeted interventions for vulnerable groups, and improved surveillance to address the growing burden of occupational heat stress in both countries.

4. Discussion

The findings of this comparative analysis highlight both convergence and divergence in how South Korea and the United States experience and address occupational heat-related injuries. Despite differences in geography, labor market structure, and regulatory philosophy, both countries are grappling with the intensifying impacts of climate change on worker safety. The results underscore that industrial sector characterized by outdoor, physically demanding labor—particularly construction in South Korea and both agriculture and construction in the United States—are consistently at the highest risk for heat-related morbidity and mortality. These patterns reflect the inherent vulnerability of workers whose jobs require prolonged exposure to high temperatures, often compounded by the use of protective clothing or equipment that further impedes heat dissipation (Specht et al., 2025; Issac et al, 2025). A notable similarity between the two nations is the disproportionate burden borne by nonpermanent, migrant, and foreign workers (KOSHA, 2024). In both contexts, these groups frequently occupy the most hazardous positions, often in smaller workplaces with fewer resources and less regulatory oversight. Language barriers, job insecurity, and limited access to safety training exacerbate their vulnerability (Li et al., 2025). This convergence suggests that, regardless of national context, precarious employment status is a critical determinant of occupational health outcomes in the era of extreme heat (Li et al., 2025).

Where the two countries diverge most sharply is in their regulatory and preventive approaches. South Korea has adopted a highly centralized, government-led strategy in response to the growing threat of heat stress. Seasonal campaigns, mandatory self-inspections, and recent legislative reforms—most notably the Serious Accident Punishment Act—have collectively raised the bar for employer accountability and standardized preventive measures across industries. The government’s proactive stance is further evidenced by targeted interventions in high-risk sectors and multilingual outreach to foreign workers. These efforts have contributed to a heightened awareness of heat hazards and, in larger firms at least, greater compliance with safety protocols (Khorshid & Song, 2025).

In contrast, the United States presents a more fragmented regulatory landscape. While some states, such as California and Washington, have enacted robust, enforceable standards for occupational heat exposure, the absence of a comprehensive federal standard means that protections vary widely across the country. OSHA’s guidelines, though well-intentioned, lack the force of law in most jurisdictions, leaving many workers reliant on the goodwill and initiative of their employers. This decentralization has fostered innovation in certain regions but has also resulted in significant disparities in worker protections, particularly for those in states without dedicated heat standards.

Despite these differences, both countries face persistent challenges in reaching the most at-risk workers and ensuring consistent enforcement of preventive measures. Small businesses, which often lack the resources or expertise to implement comprehensive heat safety programs, remain a weak link in both systems (Khorshid & Song, 2025). Furthermore, the increasing frequency and severity of heatwaves—driven by global climate change—are testing the limits of existing prevention strategies and regulatory frameworks. The comparative perspective offered by this study suggests that there is much to be gained from cross-national learning. South Korea’s centralized model demonstrates the potential benefits of strong government leadership and legal accountability, while the United States’ state-level experimentation points to the value of context-specific solutions and grassroots innovation (Khorshid & Song, 2025).

Moving forward, both nations would benefit from harmonizing standards, enhancing surveillance and data collection, and prioritizing interventions for high-risk industries and vulnerable worker populations. Only through a combination of robust regulation, targeted outreach, and adaptive workplace practices can the rising tide of occupational heat-related injuries be stemmed in an increasingly warming world.

5. Recommendations and Conclusion

Addressing the escalating challenge of occupational heat-related injuries requires a multifaceted and adaptive approach that integrates regulatory reform, enhanced surveillance, and targeted interventions. Both South Korea and the United States stand to benefit from harmonizing their standards to create clearer, more consistent protections for workers exposed to extreme heat. Establishing national-level standards that incorporate best practices from both countries—such as South Korea’s centralized legal accountability and the United States’ innovative state-level protocols—would help reduce disparities and ensure that all workers, regardless of location or employment status, receive adequate protection (Khorshid & Song, 2025; Taylor, 2025). Improving surveillance systems is equally critical. Robust, real-time data collection on heat-related illnesses and fatalities, disaggregated by industry, employment type, and demographic factors, would enable policymakers and employers to identify emerging risks and tailor interventions more effectively. Enhanced surveillance would also facilitate evaluation of prevention efforts, ensuring that resources are directed where they are most needed and that strategies evolve in response to changing climatic conditions (Khorshid & Song, 2025). Given the disproportionate impact of heat stress on vulnerable populations—such as migrant, nonpermanent, and foreign workers—interventions must be culturally and linguistically appropriate. Multilingual training programs, outreach campaigns, and accessible educational materials are essential to empower these workers with knowledge about heat risks and prevention measures. Moreover, prioritizing small and medium-sized enterprises in outreach and enforcement efforts is vital, as these workplaces often lack the infrastructure and resources to implement comprehensive heat safety programs (van Selm et al., 2025). Acclimatization protocols should be formally integrated into workplace safety practices, especially for new hires and workers returning from extended absences. This physiological adaptation period is crucial to reducing the incidence of heat-related illnesses and fatalities in the early days of exposure to high temperatures. Regular training for workers and supervisors on recognizing symptoms of heat stress and responding promptly can further mitigate risks (Taylor, 2025). Finally, fostering international collaboration and knowledge exchange will accelerate progress in occupational heat stress prevention. By sharing research findings, policy innovations, and technological advancements, countries can collectively enhance their capacity to protect workers in a warming world. This collaborative spirit will be indispensable as global climate change continues to reshape the landscape of occupational health and safety (Khorshid & Song, 2025).

Occupational heat-related injuries represent a growing public health challenge in the context of global climate change. South Korea and the United States, despite their differences in regulatory approach, face similar risks and vulnerabilities. Centralized, legally mandated prevention strategies in South Korea have improved compliance, while decentralized, state-driven efforts in the United States have produced regional innovations but also disparities. Both nations

must adapt and strengthen their prevention frameworks to protect workers in an increasingly hot world. Harmonizing standards, enhancing surveillance, and prioritizing high-risk industries are urgent steps toward mitigating the impact of extreme heat on worker health and safety.

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