

EDITORIAL

Rethinking the prevention of work-related musculoskeletal disorders in the era of global health: Toward a convergence of One Health, Planetary Health, and Total Worker Health®

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Citation: Gorce, P. Rethinking the prevention of work-related musculoskeletal disorders in the era of global health: Toward a convergence of One Health, Planetary Health, and Total Worker Health®. *Global Health Econ Sustain*.
<https://doi.org/10.36922/GHES026310048>

Received: July 28, 2026

Published online: August 13, 2026

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Work-related musculoskeletal disorders (WMSDs) remain the leading cause of occupational diseases worldwide and pose a major challenge for health care systems, businesses, and public policymakers (de Kok et al., 2019; International Labour Organization, 2024). Despite several decades of progress in ergonomics, biomechanics, and occupational risk prevention, their prevalence remains high (Gorce *et al.*, 2025), and the benefits of traditional strategies appear to have plateaued. These persistent challenges indicate the need for a paradigm shift in WMSD prevention that requires reconsidering the very foundations of current prevention approaches. We argue here that WMSDs can no longer be considered merely the consequences of biomechanical exposures. They now represent the manifestation of complex interactions between biological, psychosocial, organizational, environmental, and societal factors (Hartvigsen *et al.*, 2018). In this sense, they represent a prime example of the contemporary challenges facing global health (Jacobsen *et al.*, 2025). This shift calls for a rethinking of the prevention of WMSDs by promoting convergence among One Health, Planetary Health, and Total Worker Health®, in order to build a new conceptual framework for occupational health (Missoni *et al.*, 2024; Whitmee *et al.*, 2015; Yasobant *et al.*, 2024)

For more than 40 years, the prevention of WMSDs has relied primarily on the identification of biomechanical stressors: physical exertion, repetitive movements, manual material handling, vibrations, and awkward postures (National Research Council, 2001). This approach has led to significant progress in the ergonomic design of workstations. However, the limitations of this biomechanical paradigm have become increasingly apparent, as current knowledge indicates that these factors explain only part of the observed variability in the occurrence of WMSDs. Psychosocial risks, sleep quality, chronic diseases, aging, physical fitness, metabolic factors, inflammatory processes, and social determinants strongly influence individual susceptibility and the chronicity of pain (Hartvigsen *et al.*, 2018; Oakman *et al.*, 2019). The prevention of WMSDs must therefore go beyond an approach focused solely on reducing mechanical stressors to incorporate individuals' adaptive capacities, work organization, and broader determinants of health. Several complementary perspectives and frameworks, including Global Health, One Health, Planetary Health, and Total Worker Health®, offer broader approaches to understanding and preventing WMSDs.

From a Global Health perspective, health can be understood systemically as a system in which biological, social, economic, environmental, and political determinants

interact continuously (Missoni *et al.*, 2024). This approach transcends the traditional boundaries between public health, environmental health, and occupational health. When applied to WMSDs, this approach leads to the consideration of biomechanical exposures as proximal determinants, which are themselves influenced by organizational, environmental, and societal factors. WMSDs thus serve as an indicator of organizations' ability to sustainably protect workers' health throughout their careers.

A One Health perspective provides another complementary lens. Historically focused on the interactions among human health, animal health, and the environment, the One Health approach is now evolving toward a more integrated understanding of health systems (Yasobant *et al.*, 2024). In the field of occupational health, this perspective leads to viewing the workplace as an ecosystem where workers, technologies, organizations, the physical environment, and the socioeconomic context interact. WMSDs are thus seen as the result of an imbalance in this ecosystem rather than simply the consequence of mechanical overload. This approach fosters the development of interdisciplinary collaborations involving ergonomics, occupational medicine, public health, physical therapy, psychology, engineering, and environmental sciences.

A Planetary Health perspective further highlights climate-related determinants of work-related musculoskeletal disorders. The effects of climate change on occupational health are increasingly well-documented (Whitmee *et al.*, 2015; World Health Organization, 2024). Extreme heat events, air pollution, and deteriorating environmental conditions alter physical capacity, increase fatigue, reduce cognitive performance, and may increase the risk of WMSDs. Planetary Health reminds us that workers' health depends directly on the quality of ecosystems and environmental policies. The prevention of WMSDs must therefore incorporate strategies for adapting to climate change.

At the level of practical prevention, Total Worker Health® provides an integrated approach. Developed by the National Institute for Occupational Safety and Health (NIOSH), the Total Worker Health® model is currently the most comprehensive strategy for integrating occupational risk prevention and health promotion (NIOSH, 2024). Total Worker Health® combines safety, mental health, physical activity, sleep, nutrition, work organization, and well-being into a comprehensive approach. This philosophy aligns directly with the principles of Global Health and provides an operational framework for the prevention of WMSDs.

Building on these complementary approaches, we

propose a Global Musculoskeletal Health Framework that integrates Global Health, One Health, Planetary Health, and Total Worker Health®. This model views WMSDs as resulting from dynamic interactions among five interdependent levels:

- (i) biological and biomechanical determinants;
- (ii) individual determinants;
- (iii) organizational determinants;
- (iv) environmental determinants;
- (v) societal determinants.

Work-related musculoskeletal disorders are no longer viewed as a simple consequence of physical strain, but rather as an emergent property of a complex system influenced by the interactions among these different levels.

Rethinking the prevention of WMSDs in the era of Global Health does not mean abandoning ergonomics but rather integrating it into a broader vision of health. The convergence of One Health, Planetary Health, and Total Worker Health® offers a unique opportunity to revitalize WMSD prevention policies and develop more resilient, sustainable, and equitable work environments. WMSDs could thus become a true sentinel model for global health, illustrating the interactions between human health, the environment, work organization, and public policy.

Conflict of interest

Philippe Gorce serves as an Editorial Board Member of this journal. The author declares no other competing interests.

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