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UOEH International Symposium 2025

November 14-15, 2025

Mini Review / Poster Abstract

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UOEH International Symposium 2025

"Inclusive Occupational Health
Advancing Beyond Well-Being through Diversity from Epidemiology to Green Transformation"

Dates: November 14-15, 2025
Venue: Ramazzini Hall, University of Occupational and Environmental Health, Japan, Kitakyushu, Fukuoka, JAPAN

This symposium is supported by the UOEH 40th anniversary project, the City of Kitakyushu and the Kitakyushu Convention and Visitors Association, Saneikai, Sangyouidai service Ltd., Horishoten Co., Ltd., Mitsufuji Corporation and Boston Medical Sciences, Inc.

<DAY 1> Friday, November 14, 2025

13:30 - 14:00 **Opening Remarks**
Prof. Yoichi Ueta (President of UOEH, Japan)

Congratulatory Address
-Mr. Takashi Nagayama (Executive Industrial Health Specialist, Industrial Health Division, Industrial Safety and Health Department, Labour Standards Bureau, Ministry of Health, Labor and Welfare, Japan)
-Dr. Kenichiro Nishi (President of the Association for the Promotion of Occupational and Environmental Health (SANSUIKEN), Japan)
-Dr. Toshiaki Higashi (The Special Advisor to Nishinihon Occupational Health Service Center, Senior Advisor and Former President of UOEH, Japan)

14:00 - 15:00 **Keynote Lecture**
[Chairperson] Prof. Masayoshi Zaitsu (Center for Research of the Aging Workforce, UOEH, Japan)
"Inclusive Occupational Health: Advancing Well-Being from Epidemiology to Green Transformation"
Prof. Ichiro Kawachi (John L. Loeb and Frances Lehman Loeb Professor of Social Epidemiology, Department of Social and Behavioral Sciences, Harvard School of Public Health, Harvard University, U.S.A)

15:10 - 17:10 **Symposium *"Shaping Inclusive Workplaces through Diversity and Technology"***
[Chairpersons] Prof. Chang-Chuan Chan (Dept. of Public Health/Institute of Environmental and Occupational Health Sciences, National Taiwan University, Taiwan), Prof. Yoshiya Tanaka (Distinguished Professor, Dept. of Molecular Targeted Therapies, School of Medicine, UOEH, Japan)

1. ***"What Drives Occupational Health Practices? The Role of Regulation, ESG, and Corporate Governance"***
   Prof. Ro-Ting Lin (Department of Occupational Safety and Health, College of Public Health, China Medical University, Taiwan)

2. ***"Building Inclusive Workplaces Across Generations: Italian and European***

Strategies on Disability, Aging and Return to Work"
Dr. Marco Biasioli (Occupational and Environmental Medicine Physician, Occupational Medicine Unit of University Hospital of Padua, University of Padua, Italy)

3. ***"Future-Ready Workplaces: Shaping Health, Safety, and Inclusion for Tomorrow"***
Dr. Thanawat Rattanawitoon (Public Health Technical Officer, Senior Professional Level, Division of Occupational and Environmental Diseases, Department of Disease Control, Ministry of Public Health, Thailand)

4. ***"Health and Productivity Management Initiatives in Japan: Practice and Effectiveness"***
Assoc. Prof. Tomohisa Nagata (Dept. of Occupational Health Practice and Management, Institute of Industrial Ecological Sciences, UOEH, Japan)

17:10 - 17:15 **Wrap-up Remarks**
Prof. Masayoshi Zaitsu (Center for Research of the Aging Workforce, UOEH, Japan)

17:15 - 17:20 **Photo Session**

17:30 - 19:30 **Reception**

<DAY 2> Saturday, November 15, 2025

9:30 - 10:30 **Poster Presentation**

10:30 - 11:00 **Pitch Presentations by UOEH students for ILO Youth Congress at EXPO 2025**
[Chairperson] Prof. Tomohiro Ishimaru, (Vice Director of International Center, Dept. of Medical Humanics, School of Medicine, UOEH, Japan)
Team B ***"The new approach to work-life balance"***
Team C ***"Are women the only ones looking for a comfortable workplace?"***
Team D ***"Promoting Mental Health for All Workers"***
Team E ***"A diagnostic approach like the MBTI"***
Team A ***"Ignite a change-resilient workplace through workstyle reforms"***

11:30 - 12:30 **Workshop *"Inclusive Well-Being in Academia: A Collaborative Workshop"***
Floorball / Poi poi Battler (Water gun activity) @Gym/Athletic Field

12:30 - 13:30 **Lunch Break**

13:30 - 14:30 **Transition Session *"SF 2040: Backcasting a Sci-Fi Future of Fall-Free (Slide/Trip-Free) Workplaces"***
[Chairpersons] Assist. Prof. Nuri Purwito Adi (Dept. of Community Medicine, Faculty of Medicine, Universitas Indonesia), Prof. Takeshi Ebara (Vice Director of International Center, Dept. of Ergonomics, Institute of Industrial Ecological Sciences, UOEH, Japan), Prof. Masayoshi Zaitsu (Center for Research of the Aging Workforce, UOEH, Japan)

1. ***"AI-Driven Laxative-Free CT Colonography: A Paradigm Shift in Colorectal Cancer Screening"***
   Dr. Masaki Okamoto (Founder & CEO, Boston Medical Sciences, Inc., Japan)

2. ***"Human society in 2040 defying aging and gravity: thinking from the two "Homo Deus" 100 years ago and today"***
   Prof. Tomonori Kawano (Department of Life Science and Biotechnology, Faculty of Environmental Engineering, The University of Kitakyushu, Japan)

3. ***"Indonesian Fall Risk Assessment Tools (I-FRAT): the fall screening instruments for older adults in elderly homes and the community"***
   Prof. Indri Hapsari Susilowati (Dept. of Occupational Health and Safety, Faculty of Public Health, Universitas Indonesia, Indonesia)

14:30 - 15:30 **Plenary Lecture *"Future Prospects of Occupational Health in the next 10 years"***
Prof. David Koh (Saw Swee Hock School of Public Health, National University of Singapore, Singapore)

15:30 - 15:40 **Excellent Poster Award Ceremony**
Prof. Seichi Horie (Vice President of UOEH/Director of International Center, UOEH, Japan)

15:40 - 15:45 **Introduction of UOEH International Symposium 2026**
Prof. Akinori Nakata (Dept. of Preventive Medicine and Community Health, School of Medicine, UOEH, Japan)

15:45 - 15:55 **Closing Remarks**
Prof. Seichi Horie (Vice President of UOEH/Director of International Center, UOEH, Japan)

15:55 - 16:00 **Photo Session**

Mini Review

UOEH International Symposium 2025

Inclusive Occupational Health:
Advancing Well-Being from Epidemiology to Green Transformation

Ichiro Kawachi

John L. Loeb & Frances Lehman Loeb Professor of Social Epidemiology, Harvard T.H. Chan School of Public Health, Harvard University, U.S.A

Extensive literature has already documented the associations of psychosocial work stress with employee health – e.g., job strain (the combination of excessive psychological demands and lack of autonomy), effort reward imbalance, organizational justice, long working hours, job insecurity, shift work, workplace harassment and bullying.

The changing nature of work in the 21st century poses emerging risks for the health of workers. The classical job strain model captures job task-related exposures (psychological demands and job control) but does not speak to the broader picture of what has been happening to the workplace during the era of globalization, automation, and the rise of alternate forms of work. Arguably the most significant trend in the workplace during the past fifty years is the shift of power away from employees toward employers. The balance of power has been shifting in response to pressure on corporations to deliver shareholder value, which has translated to squeezing maximum productivity from workers. Four trends exemplify this shift: digital surveillance, just in time (JIT) scheduling, workplace fissuring, and the rise of the gig economy. In this presentation I discussed evidence linking each of these threats to the health of workers. In the field of occupational health, we need to shift attention toward strengthening workplace *assets* to improve worker wellbeing, including efforts to improve work-life balance, improving work schedule stability, increasing worker voice, strengthening workplace social cohesion, and augmenting workers' opportunities for growth.

What Drives Occupational Health Practices? Regulation, ESG, and Corporate Governance

Ro-Ting LIN

Department of Occupational Safety and Health, College of Public Health, China Medical University, Taiwan

Abstract

Occupational health practices in East Asia have evolved due to growing concerns about overwork, psychosocial risks, and related health impacts. This mini-review analyzes how regulation assigns responsibility for occupational health risks, how environmental, social, and governance (ESG) disclosure requirements affect the reporting of occupational safety and health, and how corporate governance determines the implementation of these requirements. The discussion focuses mainly on recent research from Taiwan, with selective comparisons to Japan.

Regulation establishes formal responsibility for occupational health. In Taiwan, revisions to the recognition guidelines for overwork-related cerebrovascular and cardiovascular disease expanded eligibility and required employers to provide working-time documentation during the recognition process. These changes improved case identification; however, milder cases remain under-recognized. In Japan, prevention-oriented laws and regulations were associated with reduced working hours and declines in overwork-related cardiovascular diseases.

ESG disclosure increases the transparency of occupational health practices through reporting. In Taiwan, mandatory reporting has established occupational health as a standard requirement for many listed companies. In contrast, voluntary reporting in Japan reflects corporate priorities and social expectations, placing relatively greater emphasis on psychosocial risks and mental health measures compared to Taiwan.

Corporate governance influences whether responsibility and disclosure are put into practice. In Taiwan, companies with stronger corporate governance are more likely to implement occupational health and mental health measures and to provide more extensive ESG disclosure.

In summary, regulations that define responsibility, ESG disclosure requirements and expectations for companies, and corporate governance that integrates occupational health management into daily organizational decision-making collectively shape occupational health practices.

***Keywords*:** Occupational health practices; regulation, ESG disclosure, corporate governance, Taiwan

Introduction

Occupational safety and health (OSH) is now a significant concern in sustainability, governance, and corporate responsibility, as organizations increasingly include OSH in decision-making and accountability frameworks. International initiatives, such as ISO 45003 on psychosocial risk (International Organization for Standardization, 2021), the International Labour Organization's recognition of OSH as a fundamental right (International Labour Organization, 2023), and the International Financial Reporting Standards Foundation's Sustainability Disclosure Standards (International Financial Reporting Standards Foundation), require organizations to address OSH in corporate governance, management practices, and public reporting.

In East Asia, long working hours and high job demands are linked to increased risks of cardiovascular and cerebrovascular diseases (CCVD), mental disorders, and death from overwork (karoshi) (Ke, 2012; Nishiyama & Johnson, 1997; Tsai et al., 2016). In Japan and Taiwan, awareness of these health effects has led to a transition from addressing overwork through individual endurance to managing it through government regulation, corporate responsibility, and corporate governance. This development raises the central question of this review: what factors drive changes in occupational health practices, and how do regulation, ESG disclosure, and corporate governance affect the adoption and implementation of these changes?

Japan and Taiwan offer a comparative context for examining these issues (Chang & Lin, 2019; Yamauchi et al., 2017). Both countries have formally recognized overwork-related cerebrovascular and cardiovascular diseases as occupational diseases through regulation (Iwasaki et al., 2006; Nishiyama & Johnson, 1997; Yamauchi et al., 2017). Japan established disease recognition criteria earlier and enacted legislation in 2014 to prevent karoshi, institutionalizing overwork prevention (Tsutsumi, 2019). Taiwan later adopted similar recognition criteria through regulatory revisions prompted by domestic social events and policy review, which expanded worker protection and increased employers' preventive responsibilities (Chang & Lin, 2019). ESG disclosure requirements have also led to increased corporate reporting on occupational health management in both countries (Nagata & Lin, 2025). However, companies subject to the same regulatory standards and ESG disclosure requirements show considerable variation in occupational health practices, suggesting that corporate

governance may significantly influence organizational responses.

Building on this context, this mini-review examines and synthesizes existing research on occupational health practices in Taiwan, with selective reference to Japan. The review focuses on how regulation defines responsibility for overwork-related health risks, how ESG disclosure requirements influence the reporting of OSH management, and how corporate governance affects whether these external requirements are implemented as concrete occupational health practices.

Regulation as a driver of occupational health practice: Defining responsibility for overwork-related health risks

In Japan and Taiwan, regulatory frameworks for overwork-related CCVD were established in response to overwork-related deaths and rising public concern (Chang & Lin, 2019; Takahashi, 2019; Yamauchi et al., 2017). Initial recognition criteria depended on qualitative assessments of "abnormal workload," emphasizing whether the work immediately preceding disease onset seemed heavier than usual. This method did not account for the cumulative health effects of long working hours, resulting in systematic under-recognition of overwork-related disease (Chang & Lin, 2019; Park et al., 2012; Yamauchi et al., 2017).

Subsequent revisions introduced disease recognition criteria that connected CCVD to quantified working hours. These criteria required employers to document working time and determine eligibility based on specific hour thresholds. After Japan and Taiwan adopted hours-based criteria, the rate of recognized overwork-related CCVD cases increased by a factor of 2.58, which suggests improved identification of previously unrecognized cases (Lin et al., 2017). In Taiwan, the 2010 revision of recognition criteria coincided with modest reductions in average working hours in sectors with long working hours (Lin et al., 2019). Setting numerical thresholds for working hours not only improved case identification but also influenced how employers managed the risk of overwork. However, dose-response analyses show a steep, non-linear increase in CCVD risk with longer monthly working hours, especially for fatal outcomes, indicating that working time is a central pathway through which regulation affects health outcomes (Lin et al., 2018).

Japan later expanded its regulatory approach from disease recognition to prevention. The 2014 Act on the Promotion of Preventive Measures against Karoshi and Other Overwork-Related Health Disorders addressed long working hours and psychosocial stress by implementing measures focused on work organization and working-time management (Lin et al., 2020). Following the Act's enactment, the incidence of recognized overwork-related CCVD decreased.

Industry-level analyses estimate an incidence rate ratio of about 0.88 compared with the period before enactment (Lin et al., 2020; Yamauchi et al., 2017). Mediation analyses show that reductions in working hours explained approximately 41% of this decrease, while the remaining reduction likely relates to changes in enforcement, awareness, and work organization not directly reflected in working-time data (Lin et al., 2020).

Evidence from Japan and Taiwan indicates that regulation influences occupational health practice through mechanisms beyond compensation. By mandating working-time documentation and setting specific hour thresholds, recognition criteria assign responsibility to employers and make overwork-related health risks visible within organizational management. When recognition-based systems are integrated with prevention-oriented legislation, regulation can also reduce exposure to these risks. Thus, regulation shapes both the identification and management of overwork-related risks in the workplace, driving occupational health practice.

Public attention following regulatory change

Regulatory changes in Taiwan were followed by clear shifts in public attention to overwork-related issues. Google Trends data showed that search volumes corresponded with major policy revisions and implementation events (Lin et al., 2020). After the 2010 revision of guidelines for recognizing overwork-related CCVD, searches for "overwork" increased sharply (Lin et al., 2020). Searches for "working hours" rose more gradually, peaking in January 2017, which coincided with the implementation of amendments to the Labor Standards Act after the 2016 revision (Lin et al., 2020). In contrast, search interest in "job stress" remained low and stable over time, despite its recognized role in overwork-related disease (Lin et al., 2020).

These patterns indicate that regulatory changes specifying concrete and measurable parameters, especially working hours, attract more public attention than diffuse psychosocial risks. By influencing what is visible and open for discussion, public attention reinforces regulatory signals and focuses social expectations on working-time control. This context increases the likelihood that organizations will respond and provide related ESG disclosure about overwork prevention.

ESG disclosure and corporate governance as drivers of occupational health practice

Building on regulatory definitions of responsibility, ESG disclosure influences how OSH is presented to external stakeholders through corporate reporting. Evidence from Taiwan's construction industry, one of the most injury-prone sectors, shows that disclosure of OSH indicators increased from 2013 to 2020, covering policies, measures, and outcomes (Chang et

al., 2024). However, companies reported indicators related to overwork and psychosocial risk much less frequently than accident rates and safety training (Chang et al., 2024). Therefore, increased OSH disclosure in the construction industry focused mainly on traditional safety indicators, with limited reporting on health-related issues (Chang et al., 2024).

Cross-country comparisons show that disclosure regimes influence reporting practices. Analyses of ESG and sustainability reports from listed companies in Taiwan and Japan found that Taiwanese companies reported more OSH indicators, reflecting mandatory disclosure requirements (Nagata & Lin, 2025). Japanese companies, which mainly follow voluntary disclosure regimes, reported fewer indicators but more often disclosed mental health initiatives (Nagata & Lin, 2025). Mandatory disclosure increases coverage and comparability by establishing a common reporting baseline, while voluntary disclosure highlights organizational priorities and elements of corporate culture that companies choose to emphasize.

Even within the same national context, where listed companies follow similar disclosure requirements, significant differences remain in how disclosed commitments are implemented. This variation suggests that corporate governance is a key factor influencing occupational health actions. During the COVID-19 pandemic, the rapid increase in remote work revealed differences in organizational responses to emerging occupational health risks (Li et al., 2024). Survey data from 295 listed companies in Taiwan show that companies with stronger corporate governance were more likely to implement specific occupational health and mental health measures, such as communication about psychosocial risks, monitoring working time, flexible leave arrangements, and access to digital mental health support (Li et al., 2024). In contrast, companies with weaker governance more often issued general well-being statements without systematic risk assessment (Li et al., 2024). These findings show that while ESG disclosure structures how occupational health practices are reported, corporate governance determines the actions taken and, therefore, what is available for disclosure.

Recent evidence from Taiwanese listed companies further clarifies how corporate governance translates formal expectations into workplace practice. A longitudinal analysis of 134 listed companies showed that stronger corporate governance was associated with a higher likelihood of adopting workplace mental health practices (Lin et al., 2026). Serial mediation analysis indicated that most of this association was direct (approximately 83%), while a smaller but meaningful proportion (17%) was mediated through structured OSH engagement: recognition, goal-setting, and implementation (Lin et al., 2026). Among the engagement stages, OSH implementation played the most important mediating role, whereas recognition alone was not directly associated with practice adoption (Lin et al., 2026). Together, these findings suggest

that corporate governance does not merely signal commitment but also shapes internal processes that enable organizations to move from recognition to the concrete implementation of occupational health measures.

Conclusions and implications for occupational health practice

Evidence reviewed in this mini-review shows that, across national and organizational settings, occupational health practice depends on the influence of regulation, ESG disclosure, and corporate governance. Regulation assigns responsibility for occupational health risks. Clear recognition criteria and prevention-focused regulation can identify previously overlooked overwork-related health outcomes and, when they affect working time, help reduce disease incidence. ESG disclosure increases transparency by making occupational health practices more visible and comparable. However, its impact relies on whether reporting goes beyond regulatory requirements to include a wider range of occupational health risks. Corporate governance influences organizational decision-making and determines how regulatory responsibilities and disclosure expectations are implemented. In all institutional contexts, effective occupational health practice requires alignment among regulation, ESG disclosure, and corporate governance.

Declarations

Ethical Statement: This study is a narrative mini-review based on previously published literature and secondary data sources. It did not involve human participants, identifiable personal data, or animal experimentation. Therefore, ethical approval and informed consent were not required.

Data Sharing Statement: No new data were generated or analyzed in this study. Data sharing does not apply to this review.

Conflict of Interest: The author declares no conflicts of interest related to this work.

Data availability statement: This study did not generate new datasets. All data discussed in this review are derived from published sources cited in the manuscript.

Author Contribution Statement: The author conceptualized the review, conducted the literature synthesis, interpreted the findings, and drafted and revised the manuscript.

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Building Inclusive Workplaces Across Generations: Italian and European Strategies on Disability, Aging, and Return to Work

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Abstract

Background: The industrialized world faces an unprecedented demographic shift characterized by rapid population aging and a shrinking active workforce, with Italy and Japan leading this global trend. As the age-dependency ratio rises, the exclusion of workers with disabilities or chronic conditions becomes economically unsustainable.

Policy Framework: This perspective reviews the Italian legislative model, specifically the intersection between the strict risk-based safety regulations (Legislative Decree 81/2008) and the targeted placement system for persons with disabilities (Law 68/1999). We analyze the tension between the "duty of safety" and the "right to work," often mediated by the Occupational Physician.

Observations: Despite a quota system reserving up to 7% of positions in large firms, data reveals a significant mismatch between labor supply and demand. Large enterprises account for 78% of unfilled reserved positions, indicating structural barriers in integrating workers with reduced functional capacities.

Perspectives: We argue that the traditional "fitness-for-work" assessment—often binary and defensive—is obsolete. The sustainability of the productive system requires a paradigm shift from "selecting the fit" to "fitting the job." We propose a multidisciplinary operational model integrating the Occupational Physician with emerging roles such as the Disability Manager and the Occupational Therapist to implement effective workplace accommodations and ensure genuine inclusion.

***Keywords*:** Occupational Medicine, Return to Work, Disability Management, Law 68/1999, Aging Workforce, Occupational Therapy

Introduction: The Demographic Imperative

The global workforce is undergoing a significant demographic shift characterized by progressive population aging, presenting challenges that are particularly acute in industrialized nations. Japan and Italy represent the industrialized nations with the highest average age, exemplifying a demographic trajectory that affects the developed world. Japan is currently the oldest country globally, with approximately 30% of its population aged over 65. Italy follows closely as the second oldest, with nearly 25% of its citizens in this age bracket (Figure 1) [1].

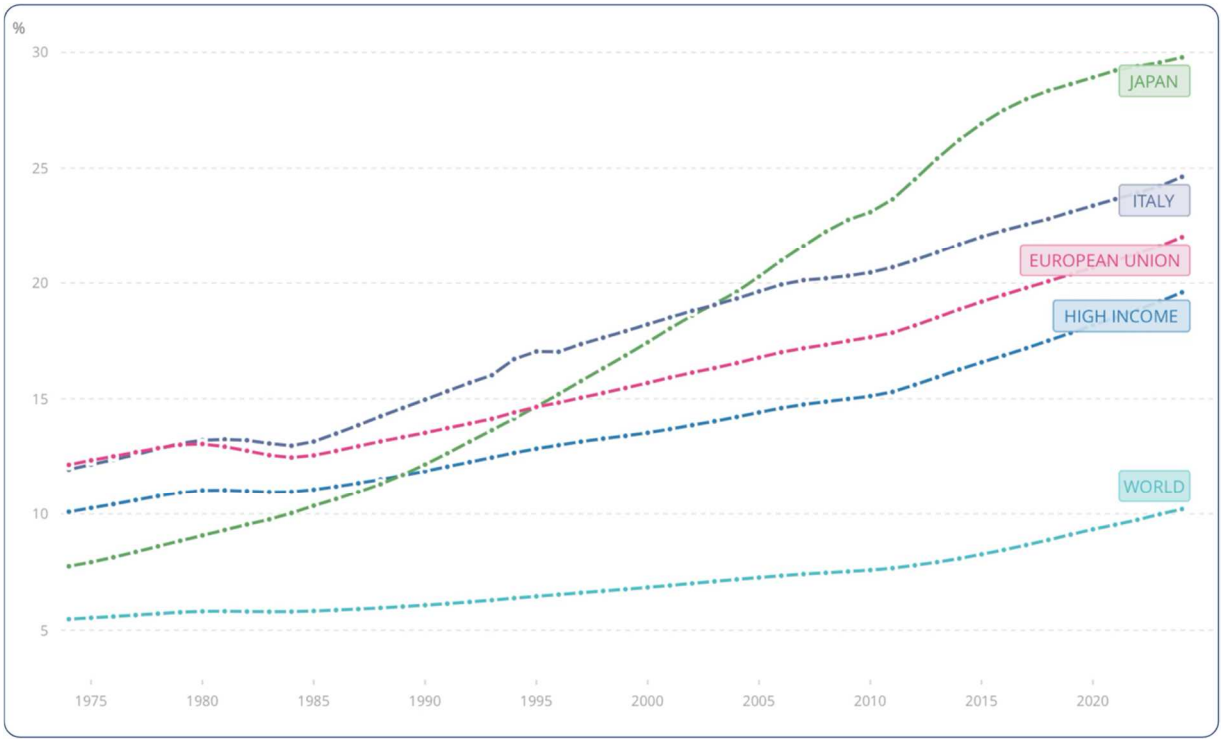

Figure 1. *Population ages over 65 (% of total population) in Italy and Japan*. Source: World Population Prospects, United Nations (via World Bank Open Data).

Current data reflect the initial phase of a consolidated long-term demographic trend rather than a transient observation. Predictive modeling by supranational institutions substantiates the structural nature of this transformation, indicating a progressive expansion of the elderly demographic over the coming century. Consistent with these forecasts, Eurostat projections estimate that by 2100, the proportion of the European population aged 65 years and older will reach approximately 32% (Figure 2) [2].

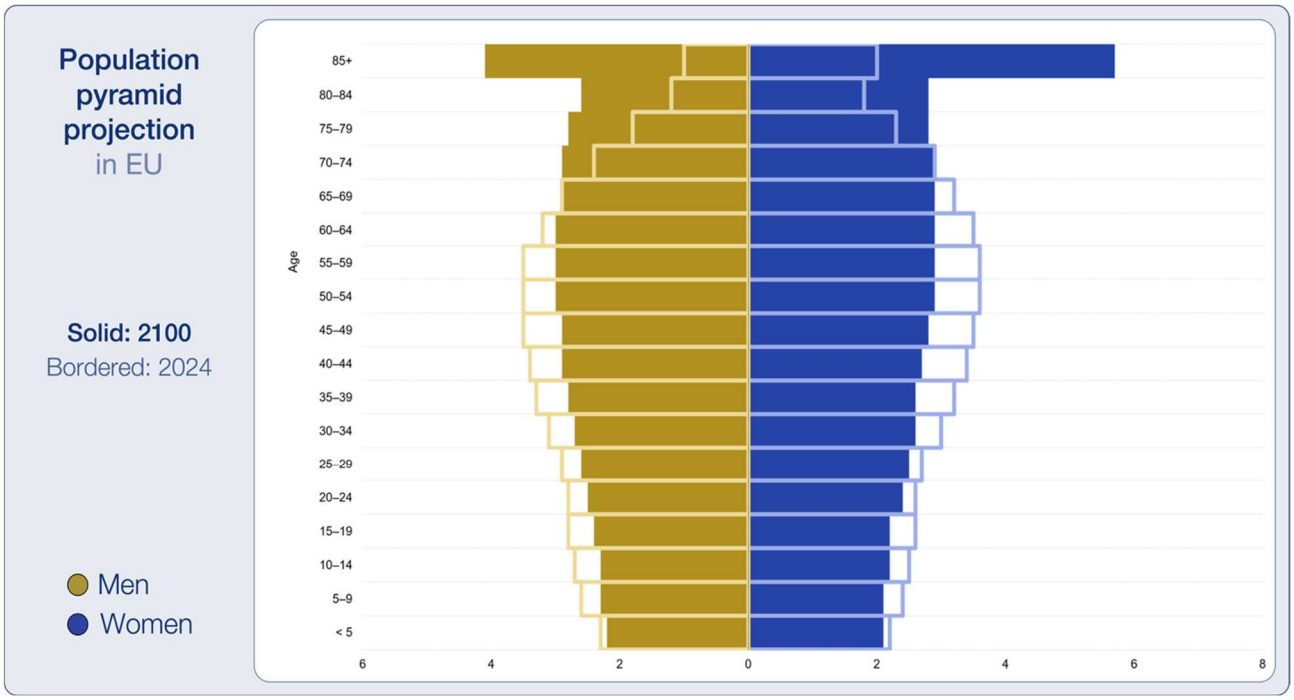

Figure 2. Projected population pyramid of the European Union (2024 vs 2100). *Source: Eurostat.*

More critically, the total age-dependency ratio — defined as the share of individuals (young and elderly) dependent on the support of the working-age population — is set to rise significantly. In the European context, this ratio is projected to surge from the current 56.8% to 83.9% by the end of the century.

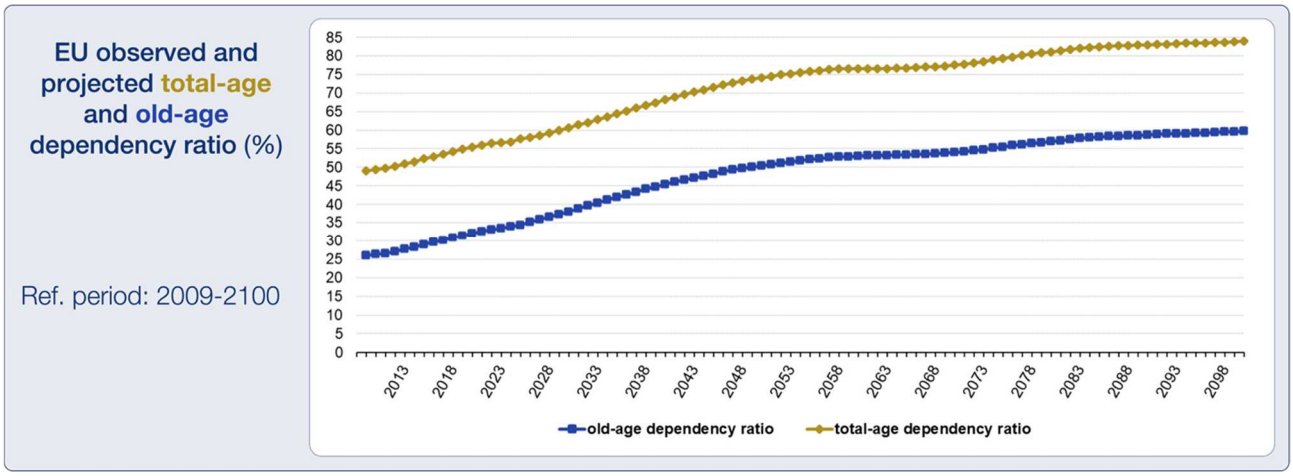

Figure 3. Projected evolution of the total-age dependency ratio in the European Union (2023–2100). *Source: Eurostat.*

This statistic implies a shrinking active workforce tasked with sustaining an increasingly dependent society. Consequently, the traditional model of the workforce, which relies on a steady influx of young, healthy workers to replace retirees, is rapidly becoming obsolete.

In this context, the exclusion of potential workers based on disability or chronic health conditions is no longer just a social equity issue but it is a profound economic inefficiency.
To ensure the sustainability of productive systems, it is imperative to expand the definition of the "employable workforce." This requires a paradigm shift from viewing disability inclusion as a charitable obligation to recognizing it as a strategic necessity. This review explores the Italian model of Occupational Medicine and inclusive placement (Law 68/1999) as a case study in navigating these challenges, highlighting the pivotal, evolving role of the Occupational Physician in bridging the gap between workplace safety and social inclusion.

The Italian Legislative Framework: A Strict Risk-Based Model

The cornerstone of occupational health and safety in Italy is Legislative Decree 81/2008, often referred to as the "Consolidated Act on Health and Safety" [3].
This legislation - that is the Italian transposition of European Directive 89/391/EEC - serves as a comprehensive regulatory framework that harmonizes previous fragmented regulations into a single, unified text. It regulates virtually every aspect of occupational medicine and safety management, defining the specific tasks, hierarchies, and responsibilities for all key organizational figures.
Understanding the Italian approach to disability and return-to-work requires an analysis of the mandatory safety organizational chart that every company must establish. (Figure 4)

1. The Employer

In the Italian system, the Employer is not merely a financial stakeholder but the "Supreme Guarantor" of safety. The law identifies the Employer as the person holding decision-making and spending powers. Their liability is strict; they bear the ultimate legal responsibility (including criminal liability) for any harm occurring to workers. Crucially, Decree 81/2008 identifies two non-delegable obligations that the Employer must perform personally:

- The Appointment of the Head of Prevention (RSPP): The Employer must designate a technical lead for safety, known as the RSPP in Italian.
- The Risk Assessment: The Employer must draft and sign the Risk Assessment Document (DVR). This is a comprehensive legal document that must identify every conceivable hazard in the workplace (chemical, physical, biological, ergonomic, and organizational) and calculate the associated risk levels.

2. The Head of the Prevention and Protection Service (RSPP)

The RSPP is the technical right arm of the Employer. This figure (who can be an internal employee or an external consultant) does not have decision-making or spending power but possesses the technical expertise required to analyze workplace processes. The RSPP's primary role is to map the workplace hazards and draft the technical content of the Risk Assessment Document. They determine the preventive measures (e.g., machinery guards, ventilation systems) and protective equipment needed to reduce risks to an acceptable level. However, the RSPP does not evaluate the health status of workers; their focus is solely on the environment and the process.

3. The Occupational Physician

Specific to the Italian context is the mandatory role of the Occupational Physician. If the Risk Assessment identifies specific health risks (e.g., manual handling of loads, exposure to noise, chemical agents, or video terminal use exceeding 20 hours/week), the Employer is legally obliged to appoint an Occupational Physician. The Physician plays a dual role:

- Consultant: They must collaborate with the Employer and RSPP in drafting the Risk Assessment, ensuring that health implications are considered before accidents happen. They are also required to inspect the workplace at least once a year.
- Health Surveillance: This is the core of their function. The Physician performs medical examinations (preventive, periodic, and upon return from prolonged sick leave) to assess the specific interaction between the worker's health status and their job tasks.

The culmination of this clinical assessment is the "Fitness for Work" judgment. Indeed, the defining feature of the Italian model - and the friction point for inclusion - is precisely the legal nature of this outcome. Unlike many other countries where a medical opinion is advisory, in Italy, the Occupational Physician's judgment constitutes a legally binding administrative act. At the end of the assessment, the Physician must issue one of the following judgments:

- Fit: The worker can perform all tasks.
- Fit with prescriptions/limitations: The worker can perform the job, but with specific restrictions (e.g., "no lifting over 10kg," "no night shifts," "must use specific ergonomic seating").
- Temporarily Unfit: The worker cannot work for a set period.
- Permanently Unfit: The worker is medically incapable of performing the specific job tasks.

The Employer must respect these limitations under penalty of law. This creates a "defensive" mechanism: to avoid liability for worsening a worker's health, Physicians have historically tended to list extensive limitations. While this protects the worker's health strictly, it creates a "rigid" worker profile that can be difficult for organizations—especially rigid ones—to accommodate, inadvertently leading to exclusion rather than integration.

4. The Workers' Safety Representative (RLS)

The organizational framework is completed by the Workers' Safety Representative (RLS), a figure elected directly by the employees. This representative has the right to be consulted on the Risk Assessment and to access safety documentation, ensuring that the workers' perspective is integrated into the safety management system.

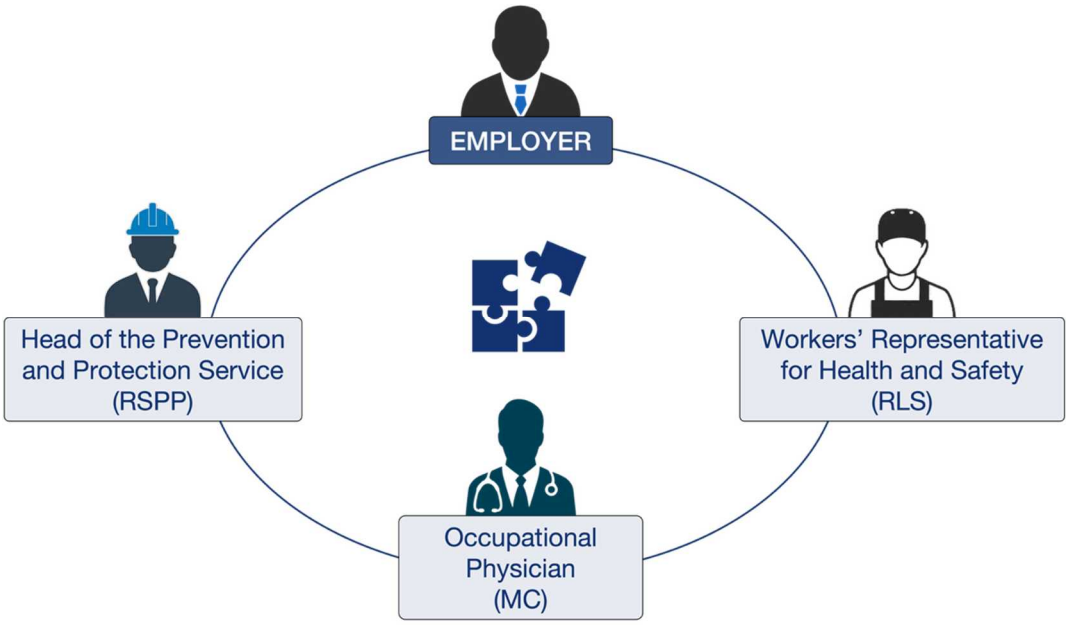

Figure 4. Organizational chart of key health and safety roles defined by Legislative Decree 81/2008.

The Inclusion Model: Law 68/1999 and Targeted Placement

Law 68/1999 [4] integrates this regulatory framework by introducing the concept of "Targeted Placement". This legislation represents a cultural and operational paradigm shift: it moves away from a purely compensation-based model (providing financial aid to the disabled) to an active placement model aimed at integrating individuals into the productive cycle.

The law applies to working-age individuals with a certified civil disability percentage 46% or a work-related disability percentage 34%. However, possessing a disability certificate is merely

the prerequisite; the actual path to employment involves a sophisticated multi-step technical procedure designed to bridge the gap between the worker's impairment and the job's demands.

1. The Integrated Functional Assessment

A key innovation of Law 68/1999 is the requirement of a functional assessment to access the targeted placement lists. The candidate is subject to a specific evaluation by an Integrated Medical Commission at the Local Health Authority. Unlike standard medical boards, this commission is multidisciplinary: it includes not only forensic doctors but also social workers and experts in labor integration. Their mandate is not to certify the "percentage of invalidity" (which is a clinical-legal index) but to draft a functional diagnosis. This document is pivotal: it translates clinical data into operational language. It does not list diseases, but describes the "residual working capacities," identifying:

- The type of tasks the individual is suited for.
- The specific environmental conditions required (e.g., wheelchair accessibility, low-noise environment).
- The necessary relational or organizational support.

2. The Targeted Placement Services and Job Matching

Based on this functional profile, individuals are registered in specific provincial lists managed by Public Employment Services. These centers operate as the technical intermediary. They do not simply send the first available person to a company; they are tasked with a job-matching process. They cross-reference the functional profile of the candidate with the job descriptions provided by employers who need to fulfill their quota.

3. The Quota System and Compliance Tools

The demand side is driven by a mandatory quota system. Employers are legally required to hire workers from these protected categories based on the total size of their workforce:

- 15 - 35 employees: Must hire 1 worker with a disability
- 36 - 50 employees: Must hire 2 workers with a disability
- Over 50 employees: Must reserve 7% of the total workforce for targeted placement.

To facilitate compliance, the law offers flexible instruments known as Agreements. Instead of a forced, immediate hiring, companies can sign an agreement with the Employment Services to plan the intake of workers over time. This allows for pre-hiring training, internships, and a gradual integration period, ensuring that when the actual employment contract begins, the

worker is already adapted to the company's workflow. This "programmatic" approach is designed to reduce the friction between the rigidity of the obligation and the dynamic needs of the business.

4. The Evolving Role of the Occupational Physician

The intersection of Decree 81/2008 (Safety) and Law 68/1999 (Inclusion) is where the modern Occupational Physician must operate. The physician serves as the bridge between the "right to work" (inclusion) and the "right to safety" (prevention).

In the traditional view, the Occupational Physician's role was often reduced to a "gatekeeper," issuing judgments of unfitness to protect the employer from liability and the worker from harm. However, in an aging society where chronic conditions are the norm rather than the exception, this passive role is no longer sustainable.

The Occupational Physician must transition from a defensive posture to a proactive, functional approach. The fitness-for-work assessment should not be a "list of prohibitions" (e.g., "no lifting weights," "no night shifts"). Instead, it must be an operational framework that defines:

- Which essential functions are performable.
- Under which conditions.
- With which specific tools or accommodations.

This aligns with the bio-psycho-social model of disability. A worker is not "disabled" in a vacuum; they are disabled relative to a specific environment. By altering the environment—through ergonomic adjustments, flexible scheduling, or assistive technology—the physician and the company can "fit the job to the worker" rather than demanding the worker fit a rigid job description.

Data Analysis: The Gap Between Policy and Practice

Despite the robust legislative framework, the implementation of Law 68/1999 reveals a complex reality characterized by a significant "mismatch" between labor supply and demand.

Data from the 2020-2021 period highlights a significant structural mismatch. On the supply side, approximately 774,507 candidates are registered in targeted placement lists [5]. However, only ~380,000 are currently employed, resulting in an effective placement rate of just 49%.

Despite this surplus of available candidates, the system struggles to fill the mandatory quotas. Of the 540,527 total reserved positions required by law, approximately 162,000 remain vacant (30% vacancy rate).

The analysis identifies large enterprises (>50 employees) as the primary bottleneck. Although these companies bear the brunt of the requirement - holding 82% of all reserved positions - they demonstrate the greatest difficulty in compliance. Only 44% of large firms fully meet their obligations, accounting for 78% of the total national shortfall in reserved hires.

This discrepancy cannot be attributed solely to a lack of will. It points to a structural difficulty in integrating workers with disabilities into complex, highly optimized organizational structures. The "mismatch" often stems from a rigid interpretation of job roles and a lack of internal expertise in disability management.

Future Perspectives: Bridging the Gap with Specialized Roles

While the Occupational Physician remains the fulcrum of health surveillance, the complexity of modern return-to-work (RTW) strategies - particularly for aging workers or those recovering from acute events like stroke or traumatic injury - requires a multidisciplinary approach. The Italian system currently suffers from a "missing middle" between the medical diagnosis and the actual workplace adaptation. To close the compliance gap and ensure genuine inclusion, two key professional figures must be integrated into the corporate ecosystem: the Disability Manager and the Occupational Therapist.

1. The Disability Manager: The Organizational Coordinator

The Disability Manager is not a clinician but a strategic organizational figure. Their role is to orchestrate the inclusion process, harmonizing the requirements of the company (productivity, legal compliance) with the needs of the worker.

- Role and Competencies: The Disability Manager acts as a facilitator between the Human Resources department, the Prevention and Protection Service (RSPP), and the Occupational Physician. They handle the administrative complexity of Law 68/1999, manage funding applications for workplace adaptations and oversee the cultural integration of the disabled worker within the team.
- Education in Italy: Unlike health professions, the Disability Manager is not yet regulated by a single state exam. Training is currently provided through post-graduate university master’s degrees (typically II level Masters) or advanced specialization courses. Recent regional regulations (e.g., in Lombardy and Piedmont) have begun to formalize this profile, creating regional registers, but a national standard is the next necessary legislative step.

2. The Occupational Therapist: The Key to Functional Recovery

While the Disability Manager handles the process, the Occupational Therapist (OT) is the technical expert in enabling function. In the context of RTW, the OT is arguably the most critical yet underutilized resource in Italy.

- Role in Return-to-Work: The OT's core competency is the analysis of the interaction between the person, the occupation, and the environment. For a worker returning after a stroke or a debilitating injury, the Occupational Physician assesses fitness (safety), but the OT assesses function *(how to do it).* They design ergonomic modifications, train the worker in energy conservation techniques, and select assistive technology (e.g., voice-to-text software, adaptive seating) to restore autonomy.
- Education: In Italy, Occupational Therapy is a regulated healthcare profession requiring a bachelor's degree. The curriculum combines medical sciences (neurology, orthopedics) with psychology and ergonomics.
- The "Italian Anomaly": The diffusion of OTs in Italy represents a significant systemic weakness, recently described as a structural supply shortage. [6] Data highlights a stark contrast with European partners: while Northern European countries (e.g., Denmark, Sweden) boast ratios of 60-80 OTs per 100,000 inhabitants, and Germany has roughly 30, Italy has approximately 4 to 5 OTs per 100,000 inhabitants. [7]

  This dramatic shortage means that the "ergonomic/functional bridge" is often missing. Investing in the recruitment and integration of Occupational Therapists within Occupational Health Units or as external consultants for large companies is the single most effective intervention to transform "residual capacity" into "productive work."

A Multidisciplinary Alliance

The future of Italian Occupational Medicine lies in the transition from a solitary decision-making model to a collaborative one. The Occupational Physician provides the medical clearance and risk analysis; the Disability Manager navigates the bureaucratic and organizational landscape; and the Occupational Therapist engineers the practical solutions. Only by institutionalizing this triad can the legal obligations of Law 68/1999 evolve into a true leverage for sustainability.

Conclusions: Toward a Sustainable Productive Ecosystem

The demographic trajectories of Italy, Japan, and the European Union leave no room for ambiguity: the luxury of designing workplaces solely for "perfectly healthy" young workers is

a relic of the past. With the working-age population shrinking and the dependency ratio projected to exceed 80% by 2100, the inclusion of workers with disabilities and chronic conditions ceases to be merely a legal obligation or a corporate social responsibility initiative; it becomes a strategic imperative for economic survival.

The analysis of the Italian model demonstrates that legislative mandates, while necessary, are insufficient on their own. The persistence of over 160,000 vacant reserved positions—predominantly in large, resource-rich companies—exposes the limitations of a bureaucratic approach to inclusion. The friction between the rigid, penal-based safety framework (Decree 81/2008) and the inclusion goals of Law 68/1999 highlights the need for a cultural and operational evolution.

To bridge this gap, three decisive shifts are required:

1. From Diagnosis to Function: The medical assessment must evolve from a list of clinical limitations to a proactive analysis of residual capacities, as embodied by the bio-psycho-social model.
2. From Individual to Multidisciplinary Responsibility: The Occupational Physician cannot operate in isolation. The integration of Disability Managers to handle organizational complexity and Occupational Therapists to engineer functional solutions is the "missing link" required to convert legal compliance into productivity.
3. From "Fit for Work" to "Making Work Fit": Companies must transition from a passive search for the ideal candidate to an active modification of the work environment.

In conclusion, the challenge of the coming decades is not just to extend working life, but to enhance the quality of that working life through accommodation and flexibility. Only by institutionalizing this tailored, multidisciplinary approach can we build inclusive workplaces capable of weathering the demographic storms of the 21st century.

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Future-Ready Workplaces in Thailand: Shaping Health, Safety, and Inclusion for Tomorrow

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Abstract

Rapid advances in digital technology, population aging, climate change, and global health crises have reshaped the world of work and occupational risk profiles. In response, Thailand has strengthened its occupational health and safety (OHS) system to align with the Sustainable Development Goals (SDGs), especially SDG 3 and SDG 8. As the economy has shifted from agriculture and manufacturing toward service and technology sectors, new challenges have emerged, including psychosocial stress, long working hours, automation-related risks, and growing inequalities among vulnerable worker groups. This review employed a descriptive policy and systems analysis using national legislation, strategic policy documents, and OHS program reports, together with occupational health service data and workforce statistics. The study revealed in 2023 Thailand's workforce comprised approximately 40 million workers, nearly half engaged in informal employment. Common occupational health problems included work-related injuries, musculoskeletal disorders, pesticide poisoning, skin diseases, and noise-induced hearing loss. Key achievements included the Occupational Safety and Health Master Plan (2023–2027), integration of OHS services within Universal Health Coverage (UHC), and the COVID-19 "Bubble and Seal" workplace model. International collaboration with WHO, ILO, and ASEAN further strengthened national capacity. However, significant challenges remain, including limited access to OHS services for informal workers and small enterprises, underreporting of occupational diseases and injuries, emerging work-related risks, and shortages of trained personnel and integrated data systems. Therefore, stronger intersectoral collaboration, expanded OHS coverage for informal workers, improved digital surveillance, and greater focus on mental health and climate-related risks are essential for resilient and inclusive workplaces in Thailand.

Keywords: Occupational health and safety, policy and systems analysis, informal workers, workplace health, Thailand

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Introduction

The nature of work and occupational risk has undergone profound transformation over the past several decades (Tamers et al., 2020). Rapid advances in digital technology, demographic shifts toward aging populations, climate change, and recurring global health crises have fundamentally reshaped employment patterns, working conditions, and worker health risks worldwide (International Labour Organization (ILO), 2019). These changes have altered not only how people work, but also how occupational health and safety (OHS) systems operate to protect workers' physical, mental, and social well-being (Mattei, Venturil, Ferrari & Galeazzi, 2018; ILO, 2019). Globally, the growth of services and knowledge-based economies, digital platforms, and automation has reduced some traditional occupational hazards while simultaneously introducing new risks, including psychosocial stress, work intensification. Climate change has also further intensified occupational risks through increased heat exposure, extreme weather events, and disruptions to livelihoods, particularly in agriculture, construction, and informal sectors (World Health Organization, 2025). At the same time, population aging has increased the proportion of older workers who may be more vulnerable to chronic conditions, functional limitations, and cumulative occupational exposures (National Academies of Sciences et al., 2022).

In response to these global trends, many countries have reoriented their OHS systems toward preventive, inclusive, and systems-based approaches. Thailand has actively engaged in this transition by progressively strengthening its national OHS framework to align with the Sustainable Development Goals (SDGs), with particular emphasis on SDG 3 for Good Health and Well-being and SDG 8 for Decent Work and Economic Growth (United Nations Thailand, 2026). These goals emphasize not only the prevention of occupational injuries and diseases, but also equitable access to health services, social protection, and safe working environments for all workers. In the past, Thailand's economy relied heavily on agriculture and manufacturing, where occupational risks were primarily exposed to physical, chemical, and biological hazards. Over time, employment has shifted toward service, trade, logistics, and technology sectors (Department of Labour Protection and Welfare, 2015). Although this transition has supported economic growth, it has also introduced new occupational health challenges, including psychosocial stress, long working hours, nonstandard employment arrangements, and widening inequalities between formal and informal workers (ILO, 2024).

Thailand's experience may also provide useful lessons for other countries facing similar demographic, economic, and environmental changes. Therefore, this study aims to examine Thailand's OHS system in the context of a changing world of work, with a focus on inclusiveness, adaptability, and future readiness. Presentation of this work at the UOEH International Symposium 2025 will further promote international dialogue, share practical experiences, and encourage collaboration among occupational health institutions facing similar challenges.

Methodology

This mini review was conducted between October and November 2025. It applied content analysis to examine Thailand's occupational health and safety system by reviewing the policy and legal frameworks, service delivery mechanisms, key achievements, and persistent gaps. The findings were used to support the development of resilient, inclusive, and future-ready workplaces in Thailand.

Results

1. Thailand Occupational Health Situations

In Thailand, the majority of establishments are categorized as small and medium-sized enterprises (SMEs), which play a key role in the country's socioeconomic development (Chaikittiporn, 2025). Thailand's labor force continued to reflect both traditional and emerging occupational hazards amid a shifting economy (ILO, 2024). According to recent national statistics, a substantial proportion of workers remain at risk of work-related injury and disease, highlighting ongoing challenges for OHS systems. In 2023, nearly 20% of Thailand's population (13.2 million people) was aged 60 years or older, signaling a move toward a complete-aged society and reflecting the increasing presence of pre-aging workers (Department of Older Persons, 2024). According to the Bank of Thailand reported, in 2025 population aged 15 years and above accounted for about 59.6 million, of whom approximately 40.1 million (67.42%) were in labour force. About 39.8 million people (99.23%) were employed, while approximately 300,000 people were unemployed (Bank of Thailand, 2025). When it comes to occupational distribution, about 11.7 million workers (29.18%) were employed in agriculture, whereas, approximately 28.1 million people were engaged in non-agriculture sectors such as wholesale and retail trade, manufacturing, construction, accommodation, food service activities, and transportation and storage. The details of occupational distribution are presented in Table 1.

Table 1: Distribution of occupational characteristics within Thailand's labor force**.**

Characteristics	n	%
1. Population 15 years and above	59,554.37	
2. Labour Force	40,154.27	67.42
- Employment	39,846.96	99.23
- Unemployment	272.73	0.68
- Seasonal Inactive Labour Force	34.58	0.09
3. For employment	40,154.27	
- Non agriculture	28,128.80	70.05
- Agriculture	11,718.16	29.18
- Other	307.31	0.77

(Unit: Thousand persons)

Last Updated: 30 Dec 2025

When it comes to occupational diseases or work-related health conditions in Thailand, in 2023 the Ministry of Public Health (MOPH), through the Health Data Center (HDC) reported that the most common health issue was occupational injuries with about 276 per 100,000 population. This was followed by Musculo-skeletal diseases (240 per 100,000), pesticide poisoning (14 per 100,00), work-related eczema (5 per 100,000) and noise-induced hearing loss (1 per 100,000) (Health Data Center, 2025).

With respect to informal workers, Thailand's National Statistical Office reported in 2023 about 5.9 million out of 21.0 million informal workers (28%) experienced occupational health or work-related issues. The most common problems were compensation-related concerns (47.5%), job discontinuity (18.0%), and heavy workloads (13.6%). Key environmental hazards included poor working posture (37.8%), exposure to dust, smoke, and odors (32.6%), and insufficient lighting (9.3%). Unsafe working conditions were also prevalent, especially chemical exposure (63.0%), followed by dangerous tools and machinery (15.9%) and hazards to hearing and eyesight (4.1%), highlighting persistent occupational risks among Thailand's informal workforce (National Statistical Office, 2023).

Table 2 below presents a comparison of occupational characteristics in Thailand before 2000 and in the 2020s. The study revealed that Thailand's occupational health landscape has changed significantly over the time. Before 2000, work was mainly concentrated in agriculture, manufacturing, and mining, with common risks such as pesticides, dust, noise, chemicals, and accidents. The workforce was predominantly male and manual, and occupational health systems focused on reacting to accidents, using paper-based reports with limited worker involvement. In contrast, during the 2020s, growth in services, technology, logistics, and healthcare has brought new risks, including stress, ergonomic problems, air pollution, AI-related workloads, and emerging infections. The workforce is now more diverse, and occupational health has shifted toward prevention, using digital systems, real-time monitoring, telemedicine, and stronger laws and health education.

Table 2: Evolution of Occupational Health in Thailand

Aspect	Before 2000	2020s–Present
Main sectors	Agriculture, manufacturing, mining	Services, logistics, technology, healthcare
Key hazards	Pesticides, dust, noise, chemicals, accidents	Stress, ergonomics, air pollution, AI workload, infections
Workforce	Predominantly male, formal, manual	Diverse: women, elderly, migrants, informal
OHS approach	Reactive (accident response)	Preventive, integrated with health promotion
Systems	Manual inspections, paper reports	Digital surveillance, AI, telemedicine
Governance	Limited awareness and participation	Stronger laws, empowerment, health literacy

2. Highlight Project

There are variety of projects addressing occupational issues in Thailand. In this review, the Health, Safety & Mental Well-Being Program in Workplaces, implemented under the Division of Occupational and Environmental Diseases (DOED), the Department of Disease Control (DDC), Thailand is presented as an example a significant national initiative (Division of Occupational and Environmental Diseases, 2020). This program was initiated in 2013 through collaboration among the DDC, the Department of Health and the Department of Mental Health within the MOPH. It applies the Total Worker Health concept to promote workers' safety and health while fostering safe and supportive work environment (Leso et al., 2024). This is a voluntary program that has been implemented across Thailand, allowing factories to apply for participation. The significant details of this program are shown in Figure 1.

Figure 1: Background of the Health, Safety & Mental Well-Being Program in Workplaces,

The current operational activities are as follows.

1. Provide workplaces with OHS knowledge, including capacity building for factory staff and workers.
2. Assign responsible personnel in factories and public health officers to actively implement and support program activities.
3. Set up OHS committees in factories to organize suitable health promotion activities.

4. Promote employee health within factories such as encouraging regular exercise, a well-balanced diet, and good mental health.
5. Conduct self-assessment and online evaluation to promote the program and enable factories to participate in online assessment.
6. Review online evaluation results and grant awards to factories through the DOED.

As a significant result of the program, workplaces adopted a holistic health approach that addresses general diseases, work-related illnesses, and mental health, contributing to improved worker well-being and safety. These efforts led to safer working environments and were associated with a reduction in non-communicable diseases (NCDs) and occupational injuries among workers.

To compare changes of the program between 2013 and present, this program has adjusted and applied that relevant to the real word situation. Since 2013, the program has been significantly improved. First, target workplaces are now clearly defined by factory type and size, allowing fair participation across industries. Second, standard evaluation criteria and checklists were developed, covering leadership and worker participation, prevention of non-communicable diseases, occupational health and safety including sanitation and hygiene, and mental health promotion. Third, the assessment process shifted from onsite inspections to online self-assessment, which increased participation and national coverage, especially among small and medium-sized factories. Fourth, to ensure accuracy, quality control measures, such as random audits of awarded factories, were introduced. Overall, these changes supported a shift from a reactive approach to a more preventive and holistic occupational health program, while also reducing budget requirements and improving operational efficiency.

3. Achievement and challenges on OHS in Thailand

Thailand has made notable progress in strengthening OHS through improved policies, programs, and partnerships (Boonruksa, Nontapa, & Theppitak, 2024; Chaikittiporn, 2025; Department of Labour Protection and Welfare, 2015; ILO, 2025). Key achievements are as follows.

1. Strengthened enforcement of labor regulations, including improved inspection mechanisms and compliance with national OHS laws, which have contributed to better workplace safety standards across formal sectors.
2. Implementation of the National OHS Master Plan (2023–2027), which provides a strategic framework for prevention, protection, and promotion of workers' health, aligned with national development goals and international OHS principles.

3. Integration of OHS services into Universal Health Coverage, improving access to occupational health services, diagnosis, and treatment for work-related diseases and injuries, especially among the formal workforce (Siriruttanapruk & Praekunatham, 2022).
4. Strengthened legal and regulatory frameworks, increasingly aligned with international standards and conventions, including those promoted by the ILO, to enhance worker protection and employer accountability (ILO, 2025).
5. Expansion of workplace health promotion (WHP) programs, focusing on the prevention of non-communicable diseases, promotion of healthy lifestyles, and improvement of physical and mental well-being among workers.
6. Development of OSH information and surveillance systems (Division of Occupational and Environmental Diseases, 2025), including improved reporting and monitoring of occupational diseases and injuries to support evidence-based policymaking.
7. Implementation of innovative programs, such as the "Bubble & Seal" model during the COVID-19 pandemic to reduce workplace transmission (Ruksakom, 2021), and the development of electronic occupational disease surveillance systems, which enhanced early detection, data management, and continuity of workplace operations during public health emergencies. These have improved prevention and early detection of work-related health problems.

In addition, Thailand has also strengthened national and international cooperation with organizations such as WHO, ASEAN, and ILO, supporting capacity building, research, and policy exchange. Efforts to promote inclusion and equity have expanded services for informal workers, migrant workers, women, and other vulnerable groups, with increasing attention to workplace mental health.

Despite these achievements, significant challenges remain (Chaikittiporn, 2025; ILO, 2025). Many informal workers and small and medium-sized enterprises (SMEs) continue having limited access to OHS services and legal protection. Occupational diseases and injuries are often underreported, especially in informal and high-risk sectors, which weakens national surveillance and planning. Thailand is also facing new occupational risks, including mental health problems, climate-related hazards such as heat stress, and challenges linked to automation, artificial intelligence, digital platforms, and the gig economy, which are changing how people work.

In addition, system limitations remain, including a shortage of trained occupational health professionals, particularly outside urban areas, and fragmented data and coordination systems across agencies. These constraints continue to limit effective implementation, monitoring, and follow-up of OHS activities nationwide (Nilvarangkul, Phajan, Inmuong, Smith, & Rithmark, 2016).

4. Vision for 2040: resilient, inclusive, and future-ready workplaces

Thailand's Vision for 2040 aims to establish resilient, inclusive, and future-ready workplaces that can protect workers' health and well-being amid rapid social, environmental, and technological environment changes.

A key objective is to strengthen workplace preparedness and risk management so that organizations can better respond to emerging health threats, climate-related hazards, such as heat stress and extreme weather, and future public health emergencies.

The vision also places strong emphasis on safe and inclusive employment for all workers, focusing on informal workers, migrant workers, older and pre-ageing workers, and those in non-standard forms of employment, to reduce occupational health inequalities and ensure equitable access to prevention, protection, and health services.

Promoting mental health, psychosocial well-being, and work–life balance for all sectors is needed, especially in response to rising work-related stress, burnout, and mental health problems associated with digitalization, automation, and changing work patterns.

The vision also highlights the role of innovation and digital technologies, including digital surveillance systems, real-time hazard monitoring, artificial intelligence, and telemedicine, in strengthening occupational and environmental health systems through improved prevention, early detection, and service delivery.

In addition, intersectoral and international collaboration is emphasized as a key enable of sustainable progress, supporting coordinated action among government agencies, employers, workers, and international partners, and ensuring alignment with global frameworks and standards. Overall, these efforts provide a practical pathway toward a safer, healthier, more equitable, and productive workforce in Thailand.

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Health and Productivity Management in Japan: Its Development, Evidence, and Future Directions

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Abstract

This review summarizes the development, evaluation framework, empirical evidence, and remaining challenges of HPM initiatives in Japan, with implications for international adoption. National programs, including the HPM Stock Selection and the Excellent Corporations in HPM Program, use a standardized survey-based assessment to recognize companies that prioritize employee health. Analysis of HPM survey data demonstrates graded associations between higher HPM scores and favorable health indicators, including healthier body weight, higher exercise prevalence, better sleep, and lower smoking rates. Although HPM-certified companies show higher average stock prices than market benchmarks, causal relationships remain unclear. Despite the dominance of small- and medium-sized enterprises (SMEs) in Japan's labor market, SME participation in HPM is limited. Evidence from certified SMEs highlights perceived benefits for organizational climate, safety awareness, and recruitment, while also revealing challenges in employee engagement and external disclosure. Future directions include strengthening causal evidence, expanding SME participation, integrating occupational safety, and emphasizing organizational culture and communication. Japan's HPM model offers a policy-driven framework with potential relevance beyond Japan.

Keywords**:** Health and Productivity Management, stock, organizational climate, organizational culture

Mini-review:

Japan faces a rapidly declining working-age population, raising concerns about economic stagnation and the sustainability of social security systems. In 2012, the government launched the Japan Revitalization Strategy, emphasizing extending healthy life expectancy and maintaining workforce participation. Health and productivity management (HPM) emerged as one of a policy encouraging corporations to invest in employee health as a managerial priority. This review outlines the development, evaluation framework, empirical evidence, and challenges of HPM initiatives in Japan, and discusses implications for international adoption.

Development of HPM in Japan

HPM recognizes companies demonstrating strong commitment to employee health. Two major national programs include: HPM Stock Selection by the Tokyo Stock Exchange (launched 2015) and Excellent Corporations in HPM Program (launched 2017). These programs incentivize corporate participation through public recognition and reputational benefits. The conceptual pathway assumes that corporate investment in health leads to improved employee well-being, productivity, and ultimately enhanced corporate value.

The evaluation of HPM assessment is conducted through the standardized HPM Survey Sheet, consisting of about 80 items across four domains: Management Philosophy & Policy; Organizational Structure; System & Measure Implementation; and Evaluation & Improvement. The score is calculated as the weighted sum of the deviation scores for these four domains, weighted at a ratio of 3:2:2:3. Compliance and risk management are prerequisites for recognition.

Public availability of evaluation results allows use by job seekers, occupational health professionals, and investors. Companies that apply can understand their own status compared to other companies, especially competitors in the same industry, and can use the data to improve their activities. Job seekers can learn about the health management status of all companies. Many job seekers wish to work for companies with a positive organizational climate and culture, and the disclosed information serves as a reference for evaluating this. Investors, particularly institutional investors, are beginning to analyze the relationship between HPM initiatives and a company's financial performance by linking it to disclosed financial information. Whether HPM can be used in investment decisions will likely be subject to further verification going forward.

Evidence Linking HPM and Corporate Outcomes

Using data from the HPM Survey, we analyzed the relationship between HPM scores and health outcomes. We classified HPM scores into quintiles and examined their association with the proportion of workers at a healthy weight, smoking rates, the proportion of workers with exercise habits, and the proportion of workers with good sleep. As HPM scores increased, the proportion of workers at a healthy weight showed a consistent upward trend. The proportion of workers with exercise habits and those with good sleep showed similar trends. As HPM scores increased, smoking rates decreased. These results suggest a strong correlation between HPM scores and corporate health outcomes.

The relationship between HPM scores and stock prices is also beginning to be examined. The average stock price of HPM selected companies has consistently been shown to be higher than the TOPIX (Tokyo Stock Price Index) average stock price. However, this result does not account for the influence of confounding factors, and qualifying as an HPM selected company requires a certain level of financial performance. Therefore, it is important to note that this does not demonstrate a clear causal relationship.

HPM in Small- and Medium-Sized Enterprises

In Japan, 99.7% of companies are small and medium-sized enterprises (SME), and 60% of workers are employed there. SME participation in HPM programs remains below 1%. With the aim of learning from best practices in SMEs, we conducted a survey targeting executives of companies recognized as excellent in HPM [1]. A survey of HPM-certified SMEs (N = 1,901) found that 70% applied to improve corporate image. Employers perceived benefits including improved lifestyle habits and health literacy (56%), increased safety awareness (40%), and enhanced recruitment competitiveness (33%).

Organizational climate and culture are central to successful HPM implementation. POS—the belief that the organization values employees' contributions and well-being—has documented associations with job satisfaction, commitment, and performance. A prospective cohort study of 9,916 workers demonstrated that lower POS was associated with higher rates of occupational accidents and near-miss events, suggesting that supportive climates enhance both psychological and physical safety [2].

Cultivating an organizational climate and culture is no easy task for companies. Our survey found that many managers (64% of SMEs) find it difficult to engage employees in HPM activities [1]. Simple, enjoyable initiatives such as group educational sessions, shared healthy meals, or informal snack-time learning may foster communication and engagement,

particularly in small workplaces. Research and practical examples in this area need to be actively promoted.

Another challenge is the disclosure of activities to External stakeholders. Approximately 85% of certified SMEs disclose HPM information publicly, although substantive details of initiatives are often lacking. More detailed disclosures may enhance recruitment outcomes by signaling corporate commitment to employee health.

Challenges and Future Directions

Challenges include low SME participation, limited causal evidence linking HPM to health outcomes and corporate performance, and insufficient integration of occupational safety. Future efforts should expand incentives, strengthen evidence-based policy making, integrate safety metrics, and promote dialogue and communication as core components.

Japan’s HPM model offers strengths such as strong government leadership, high coverage among large corporations, and publicly available standardized evaluation data. This successful integration with the business community represents a best practice in Japan. Meanwhile, many countries outside Japan also implement policies promoting employee health management within companies. It will be necessary going forward to review the characteristics of each country's policies and analyze their strengths and weaknesses.

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AI-Driven Laxative-Free CT Colonography: A Paradigm Shift in Colorectal Cancer Screening

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Colorectal cancer remains one of the most common and preventable causes of cancer death worldwide. However, the use of cathartic bowel preparation continues to limit participation in colorectal screening programs. To address this longstanding barrier, we have developed an AI-driven laxative-free CT colonography system, AIM4CRC, which applies deep learning–based image reconstruction and detection techniques to enable visualization of the colon without bowel cleansing.

This approach aims to provide diagnostic performance comparable to conventional CT colonography while significantly improving patient comfort and accessibility. Early clinical evaluation suggests that the system can assist radiologists in efficiently interpreting non-prepped CT images and identifying potential lesions in a standardized manner.

The development of a laxative-free, AI-supported imaging workflow represents a potential shift in the paradigm of colorectal cancer screening by reducing psychological and physical burdens associated with traditional preparation. Broader implementation of such technologies may enhance screening adherence and contribute to earlier detection in the general population.

This presentation includes information on an investigational medical device that has not yet received regulatory approval.

Human society in 2040 defying aging and gravity: Thinking from the two "Homo Deus" 100 years ago and today

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***Abstract*:** I have two books of "Homo Deus" in my hands. One book is "Homo Deus: A Brief History of Tomorrow" written by Yuval Noah Harari, which became a worldwide bestseller. The other book is also entitled "Homo Deus", but written as a classical science fiction novel authored by Felicien Champsaur in Paris, France in 1924. Since last year was the 100th anniversary of the publication of the latter "Homo Deus", I held a public seminar titled "The 100th Anniversary of the Publication of Homo Deus: A Century of Science and Science Fiction" at the Science Museum in Kitakyushu City (Space Labo, Oct., 2024). Whether in books from 100 years ago or today, "Homo Deus" means the ultimate human figure with God-like abilities. Yuval Noah Harari's "Homo Deus" depicts how humans are using science and technology to fight against their aging and how to free themselves from various constraints such as gravity. In this symposium, I would like to discuss the shape of human society in 2040 from the suggestions depicted in two "Homo Deus".

***Keywords*:** Extended phenotype, Future, Homo deus, Science Fiction, Science History

Introduction

The author was invited to a highly unusual and intriguing event for a medical school symposium: a symposium session discussing science fiction about defying gravity to eliminate falls in daily life by 2040. While specializing in bioengineering and environmental biology, the author also embraces the role of a “futurist” as a life's work, collecting historical scientific materials and proposing visions for the future. This invitation was therefore deeply gratifying. The perspective the author wished to share at the symposium was the comparison between two books, both titled “Homo Deus,” revealing humanity's imagination, the scientific progress made over a century, and the profound societal changes triggered by that scientific advancement. One “Homo Deus” was published in France a century ago, while the other, published in 2015 (Harari, 2017, US edition), became a global bestseller and is very familiar

to us today. Figure 1 shows photographs of both editions of "Homo Deus" from my bookshelf. Also shown is the covers of the books published in Japan translating the new book. Both books use science as their subject matter, discussing humanity's ultimate potential and its future. However, the book from 100 years ago is science fiction born from imagination, utilizing the essence of the science and technology of its time. The book published in 2015 is a contemplation of humanity's future brought about by the progress of science and technology. Comparing the imaginative visions of "humanity's future" offered by these books from 100 years ago and today reveals fascinating insights. As some critics suggest, scientific progress has advanced by technology catching up to the fantasies provided by science fiction. My presentation aims to discuss the near future of 2040, projected along the extension of this pace of scientific advancement.

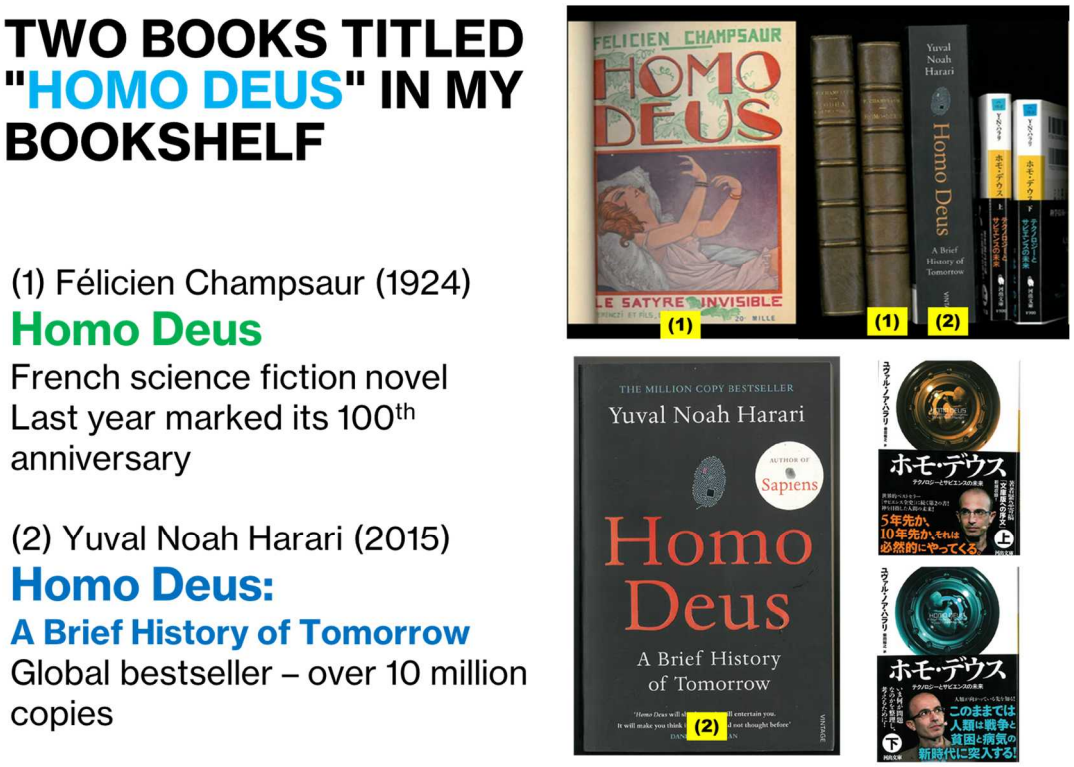

Fig. 1. Old and new "Homo Deus" published in 20th and 21st centuries.

Exploring the next generation human (Homo Deus) through DNA-based and Technology-based Evolutions

The two editions of Homo Deus discussed above explore the capabilities of the next generation of humanity likely to emerge after *Homo sapiens*. The use of the term *Homo deus* for this next generation, rather than *Homo sapiens*, is a metaphorical expression signifying that

human capabilities will advance to the point of reaching the realm of the divine. It does not actually posit a new species of humanity. Therefore, in this presentation, the author (myself) proposed describing the difference in capabilities between current humanity and the next generation as a difference in phenotypes. The concept of phenotype was introduced by Gregor Mendel to explain dominance and recessiveness in his laws of inheritance (Mendel, 1866). The phenotype refers to the observable characteristics that appear as outward traits, determined by combinations of the genotype (which is not visible from the outside).

Charles Darwin who authored “the origin of species” (Darwin, 1859), later applied these laws of inheritance to populations (crowds, communities) to discuss evolution of species (Darwin, 1872) as discussed in a recent book authored by this author (Kawano, 2022). As a side note, it is important to note that the word “evolution” first appeared in the sixth edition of On the Origin of Species (Darwin, 1872). The author owns a copy of this book, which was on display in the history of science zone at the SPACE LABO science museum in Kitakyushu City from April 2022 to February 2026.

Richard Dawkins, often called Darwin's modern successor, extended the concept of phenotype beyond physical traits to include the visible effects individual organisms create on their external environment, calling this the extended phenotype (Dawkins, 1982). For example, since an animal called North American beaver (*Castor canadensis*) and the dams it constructs by felling trees in forests and damming rivers for nesting purposes cannot be considered separately, Dawkins proposed that structures like beaver dams and the modified environments they create should also be called extended phenotypes. Extending this logic, the urban environments where humans currently live could also be called the extended phenotype of humans. Paradoxically, the biological reality of modern humans cannot be separated from science or the conveniences of the city. Crucial to this discussion is that the beaver's extended phenotype—the dam—does not have a one-to-one relationship with the beaver's genes. Similarly, the scientific technologies and urban environments humans have created as extended phenotypes are difficult to understand as inheritance based solely on information encoded in DNA. Therefore, Dawkins proposes the existence of carriers of “genetic” information beyond genes. This information, a play on the word “gene,” is termed a “meme” (Dawkins, 1982). While genes contribute to vertical inheritance across generations, memes are not necessarily involved in vertical inheritance of tradition alone; they are also used for information propagation within the same generation. This resembles the dissemination of information by viruses, which are carriers of information utilizing DNA or RNA. Therefore, we can imagine that the next generation of humanity, Homo deus, will not necessarily evolve based solely on

DNA changes but will likely exhibit an extended phenotype based largely on memes encoding scientific and technological knowledge.

What are the PHENOTYPES of Homo Deus?

I wish to discuss the stages of the Transition of extended phenotypes accompanying the shift from Homo sapiens to *Homo deus*. First, I will discuss the natural phenotypes visible externally on the body of *Homo sapiens*, such as hair and nails, for comparison with extended phenotypes. These are called natural integumentary appendages and are typical natural phenotypes just like other animals possess integumentary appendages (natural structures) obtained through natural evolution, such as scales, feathers, hair, and nails. It is important to note that hair and nails are natural integumentary appendages known as typical phenotypes coded by DNA.

Next, discussion goes to STAGE 0 of the extended phenotype (already existing examples). Here, we shall look at examples of exoprosthetic sensory appendages. We humans have historically invented and utilized the exoprosthetic sensory appendages (artificial replacements) and these can be considered extended phenotypes. Examples include the uses of glasses (contact lenses), dentures, and hearing aids. Perhaps we could also include electronic devices such as e-glasses inspired by the visual information device known as “Scouter”, often used in science fiction media.

Next, let's examine STAGE 1 of the extended phenotypes. The keyword here is “internalization.” That is, they are invisible from the outside but are implemented inside the human body as invisible exoprosthetic sensory appendages (aka implants/implantation). Therefore, the characteristic of the extended phenotypes at this stage can be called Internalized and hidden.

As the examples of Stage 1 extended phenotypes, we first list the common implants. These include dental implant placement, such as titanium posts for tooth replacement. Cardiovascular implants include cardiac pacemaker implantation, which regulates heart rhythm. There is also the implantable cardioverter defibrillator (ICD), whose implantation detects and corrects life-threatening arrhythmias. Artificial heart valve replacement technology replaces damaged valves (mechanical or bioprosthetic). Furthermore, coronary stent implantation is an extended phenotype supporting the circulatory system, designed to function by keeping arteries open (often drug-eluting). As an extended phenotype contributing to improved cardiac function and functional supplementation, left ventricular assist device (LVAD) implantation can be

listed. This is a mechanical pump for heart failure. Vascular graft implantation is used to replace damaged blood vessels.

Next, we list the cases related to orthopedic implants. First, we highlight the knee replacement (total knee arthroplasty). This is also called an artificial knee joint. Similarly, there are numerous cases of shoulder, elbow, ankle, or finger joint replacements. These can also be called prosthetic joints. Even without joints, bone plates, screws, rods, or pins are also used for implantation. This is for fracture fixation. Similarly, in the process called spinal fusion hardware implantation, rods, screws, and cages are used for spine stability, much like mechanical parts. An extension of this approach is interspinous spacer implantation, which enables spinal stenosis treatment. In this way, the author wants the readers to remember that many mechanical parts can be replaced with artificial materials.

Next, let's look at examples of neurological implants. Deep brain stimulator (DBS) implantation is applied for Parkinson's, epilepsy, or depression. Next, vagus nerve stimulator (VNS) implantation is performed for epilepsy or depression, while spinal cord stimulator implantation is performed for chronic pain. Furthermore, responsive neurostimulator implantation is performed to detect and stop seizures.

Next, we examine the examples of urological/gastrointestinal implants. Examples include artificial urinary sphincter implantation, penile implant implantation (for erectile dysfunction), and gastric stimulator implantation (for gastroparesis).

Other noteworthy examples include surgical mesh implantation (for hernia repair or pelvic organ prolapse) and LINX reflux management system implantation (for GERD).

Of particular interest are drug delivery and monitoring implants. These include insulin pump implantation (fully implantable versions), drug-eluting implants (e.g., subcutaneous rods for contraception or pain relief), and implantable loop recorder (monitors heart rhythm long-term) – all implants designed to control biological functions.

Next, we examine the examples of sensory implants. Intraocular lens (IOL) implantation is a procedure aimed at replacing the natural lens (e.g., cataract surgery or refractive lens exchange). Cochlear implant implantation achieves restores hearing. Retinal implant implantation improves certain types of blindness. Tympanostomy tube (ear tube) implantation solves middle ear drainage problems.

Then, we need to consider the improvement of sensory functions using electronic devices from the perspective of human-machine interface exchanging the roles for sensory organs. As a representative example, the device to use tongue as an eye as a treatment for patients who have lost their vision was discussed (Stronks e t al., 2016). By displaying image

information via electrical stimulation on the tongue—a sensory organ with excellent spatial resolution—the device allows the wearer to perceive images captured by a digital camera without relying on vision. Converting this image information into real-time video enables activities like walking and running, facilitating daily life (Stronks e t al., 2016). In contrast, the author has preliminarily proposed a system that while the above approach is to provide a mean for a visual task in the blind, a different attempt to project images onto the retina without a cornea was proposed (Kawano 2020). This approach was also discussed at the symposium as a novel approach to possible human-machine interface application in the future.

Next, we examine STAGE 2 of the expanded phenotypes. The key phrase here is the "internalization of AI and robotics." In the scientific fiction novel "The Green Cat called Schrödinger" (Ochi, 2025), which the author helped create, a near-future society is depicted where 98% of the world's population has AI chips implanted in their bodies. Such attempts are by no means a distant future scenario; even now, we hear stories on social media of influencers who have had AI chips implanted. While it's impossible to tell from outward appearance whether someone has an AI chip implanted, attempts to utilize them for electronic authentication and similar purposes have begun. The current functionality of AI chips doesn't actually involve significant computational power, but in the future, they could potentially become widespread as tools that support or even replace human thought.

As the extended phenotypes evolve further, humanity advances to the stage 3 of extended phenotypes. In stage 3, intelligent environments become the elements of the extended phenotypes of future humans. Even today, automobiles and electronic vehicles (EVs) are computer-controlled vehicles, and their control largely functions within an intelligent environment. For example, by actively acquiring information from intelligent traffic systems to avoid congestion and prevent accidents, or by transmitting information to the environment, traffic becomes optimized. While such a society is already emerging today, simply replacing the role of intelligent vehicles described above with individuals equipped with intelligent AI reveals a new vision for future society. A future where humans equipped with intelligent AI chips and intelligent environments mutually exchange information to operate an optimal society—this is stage 3 of the extended human phenotype.

The extended phenotype of humans to be attained by 2040 and a society free from falls due to gravity-defying technology.

Humans are expected to make significant progress toward this stage 3 of extended phenotypes (intellectually enhanced individuals positioned within an intelligent environment) within this century. However, by 2040, we humans will likely still be in a transitional phase, with few examples of AI or artificial devices being implemented in humans. However, the seeds of such technologies can be found in current research examples. For instance, at MIT, researchers are developing an eldercare robot to assist people in sitting and standing independently during daily life. They are also developing a device that, if a person is about to fall, supports the body at a speed of 0.2 seconds to prevent the fall (Chu, 2025). These devices constantly monitor human balance and mechanically prevent the falls. Outside such emergencies, individuals can live as independently as possible. This represents an extended future human phenotype thus, aging individuals can live safely within an intelligent environment. Such effort can be manifested by the functions and AI-powered networking of sensors detecting the falls of people. In fact, Intelligent accommodation for elderly care today is already equipped with AI-powered sensing networks (Band et al., 2025; Nahian et al., 2026).

Here, it is worth recalling that many of our joints and other moving parts can already be replaced with artificial components. If AI-powered fall-detection technology were to synchronize with the movements of artificial joints, our bodies could correct their balance and avoid falls without external assistance. Meanwhile, robotic research focused on preventing falls in bipedal robots is actively underway (Gu and Zhao, 2025; Zu et al., 2025; Xiao et al., 2025). These technologies involve orchestrating posture control at each joint while constantly monitoring the robot's posture. Therefore, if AI-powered sensing for robotic control simultaneously achieves artificial joint drive control, humans equipped with this extended phenotype might be freed from fall accidents.

The Need to Reexamine Philosophy and Worldviews?

Thus far, we have discussed humanity's "evolution" inspired by insights from the two distinct volumes of *Homo Deus*. Champsaur's vision from 1924 was pure science fiction at the time, yet it already contained concepts like the Elixir of Long Life (immortality drug), floating cities (Paris in the sky), anti-gravity belts, and telepathy via electrical brain extensions. Harari's 2015 prophecy (already underway) compels a conceptual shift: aging becomes a "treatable disease." This describes an approach fusing genome editing, AI, and nanotechnology. Harari predicts this will cause a major divide in human society. While genome editing technology will contribute to editing information on DNA, the major contribution will likely come from updating extended phenotypes through action of memes, not of genes. Specifically, Harari

views that a few humans may upgrade to “god class” while the rest risk becoming the “useless class.” Is this a desirable future? We have to ask by ourselves.

Regarding liberation from gravity by 2040

Will the realization of Personal anti-gravity devices to be commercialized, Sky Cities housing over 100 million people, the resulting Surface land prices crash, and Space elevators becoming daily commuting tools by 2040 still be a distant future? Could living on the ground become a symbol of poverty?

Regarding the degree of societal division Harari envisions by 2040

Will a new social hierarchy emerge out as Harari views? Specifically, will the advent of gene-edited, brain-augmented, immortal upgraded humans—the “God class” (Homo Deus)—render ordinary natural humans a lower class or minority? Will such inequality, starting from economic disparities, lead to a gap between species: Homo sapiens and Homo Deus?

In advancing the above reasoning, the conclusion is that 100-year-old science fiction has arrived “late.” Specifically, immortality or the elixir of life appears achievable through telomere extension and senolytics eliminating aging cells. The concept of the floating cities has materialized as Sky Cities, clusters of buildings defying gravity, and these structures will grow even taller. Anti-gravity belts are available for purchase as personal anti-gravity backpacks, and the telepathy is also becoming feasible through brain-computer interfaces (BCI).

Before ending this article, the author would like to pose questions to ourselves. Namely, Questions for 2040.

(1) What does it mean to be human?

(2) Does immortality lead us to happiness?

(3) Where do god-like humans go next?

(4) Is the future of Homo Deus a matter of choice, not technology?

What is our choices?

Regarding to the last question what choices do we have? Some see the future driven by high tech as cyberpunk, while others reject it as dystopia. But should we really view it so negatively? After all, we already walk with canes, see through glasses, chew with dentures,

hear with hearing aids, and move in wheelchairs—strictly speaking, none of these are "natural." Preventing falls with future technology is no different. This isn't a challenge to nature, but simply surviving by our instinct to extend human capabilities—precisely the way of evolution Richard Dawkins described. Creating tools that augment our abilities is what has made us human. High-tech solutions are being developed to overcome the inconveniences of aging and illness, dramatically improving quality of life (QOL).

To realize this future, we may first need to overcome the psychological barrier many people feel toward "a life dependent on machines"—even if it seems unnatural at first glance. A crucial step might be cultivating the mindset to try high-tech products without hesitation the moment they become affordable. However, there is absolutely no need to rush. Waiting for society to progress step by step, holding off on action until new systems and technologies are verified and tested for safety, is also a valid choice. In any case, one thing is certain: the future will inevitably arrive.

Declarations

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Implementation of M-IFRAT (Modified Indonesian Fall Risk Assessment Tools) to Predict Fall Risk for Indonesian Older Adults

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Abstract

Background: Indonesia is projected to become a super-aging society by 2045, with the elderly population reaching approximately 20%. This demographic shift increases the prevalence of non-communicable diseases and fall-related injuries, which primarily occur in the home environment. Falls are preventable events but often lead to a loss of independence and decreased the quality of life. This study aimed to develop the Modified Indonesia Fall Risk Assessment Tool (M-IFRAT) to effectively detect fall risk among Indonesian older adults.

Methods: This study involved 214 functionally independent older adults aged over 60 years in Jakarta, Bandung and Yogyakarta. The M-IFRAT was developed by adapting components from JHFRAT and STEADI (Jannah, Nursalam, & Kristiawati, 2025), incorporating factors such as medical history, depression, and functional capacity. Validity and performance were assessed using Confirmatory Factor Analysis (CFA) and Receiver Operating Characteristic (ROC) analysis.

Results: Univariate analysis showed that 83.18% of participants were at risk of falling (M-IFRAT >=11). The majority were aged 60-69 years (61.21%), female (80.84%), and urban residents (96.26%0. The M-IFRAT demonstrated strong predictive power with an Area Under the Curve (AUC) of 77%, a sensitivity of 69%, and specificity of 70.8%.

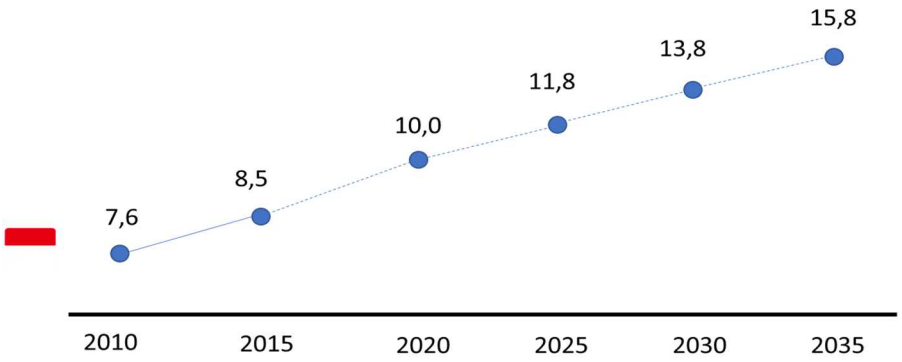
Conclusion: The M-IFRAT is a reliable and valid tool for identifying fall risk. Prevention intervention must be provided comprehensively to both frail and physically active elderly individuals.

***Keywords*:** Fall Risk, Elderly, M-IFRAT, Indonesia, Screening Tool

Introduction

Based on data from Indonesian Statistics in 2020, the percentage of Indonesian elderly population estimate will increase in following year. The classification of old age is starting from 60 years and above. Recently, the elderly population is about 12% but it will be reach around 20% in the 2045, its mean Indonesia will become a super aging society. This demographic shift creates serious challenges for our health system (Statistik, 2020).

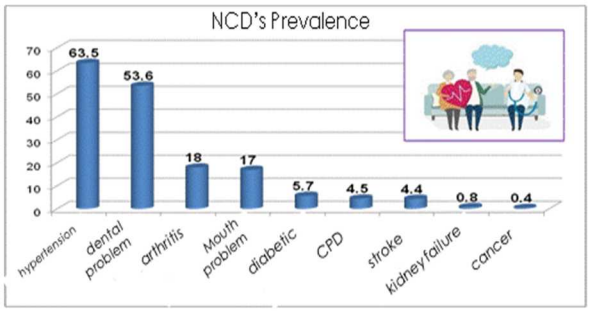
Figure 1.1 Estimation of Indonesian Elderly Population



Source: Statistics Indonesia, 2020

The major health problems among older adults in Indonesia, showing a complex mix of chronic, nutritional, infectious, and mental health conditions. Non-communicable diseases dominate the burden, with hypertension and dental problems affecting more than half of the elderly, followed by arthritis and diabetes, highlighting the need for long-term chronic care.

Figure 1.2 NCD's Prevalence

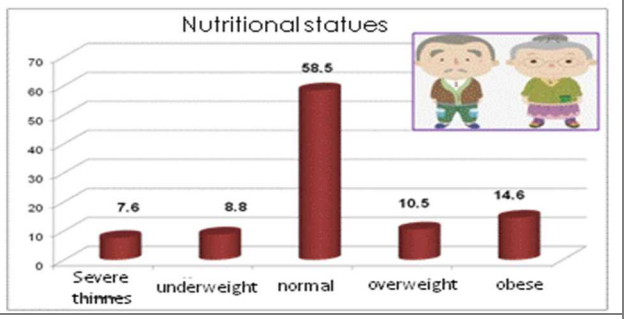


Source: National Basic Health Survey 2018

Nutritional problems persist, as a notable proportion of older adults' experience undernutrition, overweight, or obesity, all of which increase the risk of functional decline and disease complications.

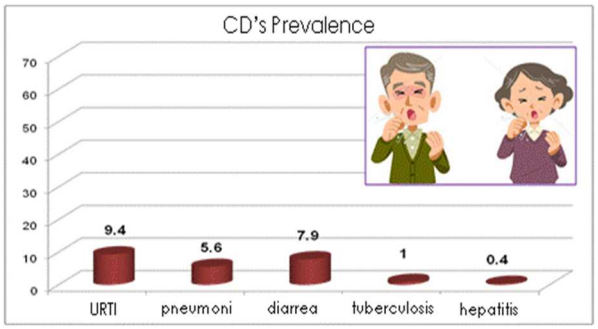
Figure 1.3 Nutritional Status

Source: National Basic Health Survey 2018



Communicable diseases such as upper respiratory tract infections, pneumonia, and diarrhea remain present, indicating ongoing challenges in prevention and primary healthcare services.

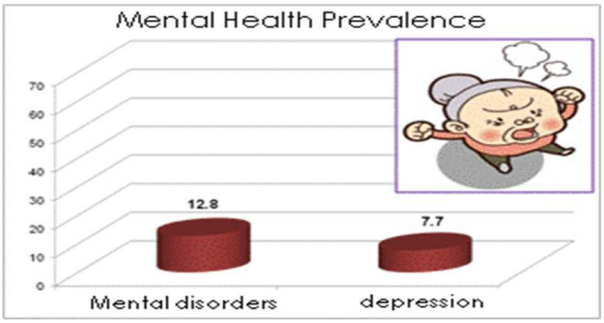
Figure 1.4 CD's Prevalence



Source: National Basic Health Survey 2018

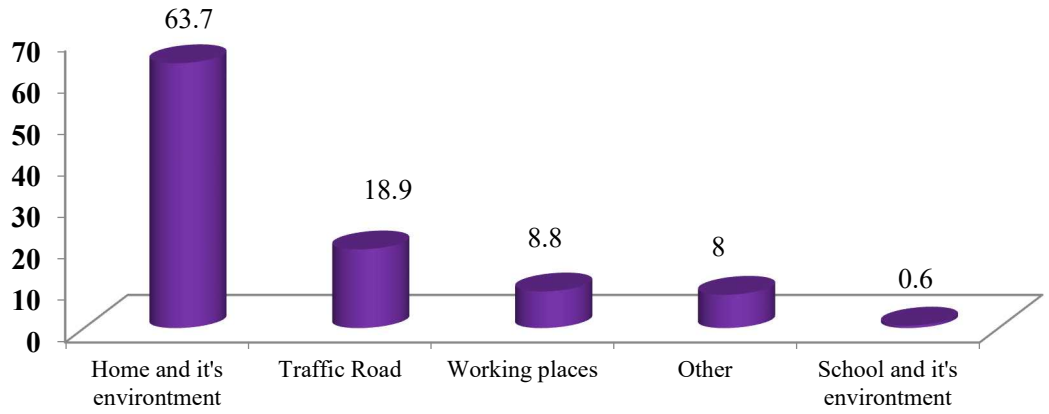
In addition, mental health issues, such as mental disorders and depression, affect a significant proportion of the elderly, underscoring the importance of integrated physical and mental health services for ageing populations (Indonesia, 2018).

Figure 1.5 Mental Health Prevalence



Source: National Basic Health Survey 2018

Figure 1.6 Proportion of Elderly Injury Based on Places



Source: NIHRD, NBHS 2018

While the proportion of injuries in the elderly is 8.2%, and most of them occur at home and the environment (63.7%), on the highway (18.9%) and the workplace (8.8%). Injury is one of the risk factors that cause disability in the elderly. Injuries can increase health funding, especially for elderly health care services, therefore, it is important to make efforts to create an environment which elderly friendly, especially at home where the elderly live in communities or in the elderly home (Odasso, et al., 2022).

Injuries among older adults in Indonesia remain a significant public health issue (Susilowati, Nugraha, Sabarinah, Pengpid, & Peltzer, 2020), with an of 8.2% in 2018. The majority of injuries occur at home and in the surrounding environment, counted for nearly two-thirds of all cases, highlighting the home as the most critical setting for injury prevention (Nugraha, Prasetyo, Susilowati, & Rahardjo, 2021). Injuries on traffic roads and in workplaces are at much lower proportions, while incidents in other locations and school environments are relatively rare. These findings emphasize the importance of improving home safety, environmental modifications, and fall-prevention strategies to reduce injury risk among the elderly population.

A fall is defined as a person collapsing to the ground or to a lower level (World Health Organization, 2021). It's not a simple accident but it's a preventable event (Giovannini, et al., 2022). A fall is generally a combination of several risk factors that can affect and threaten a person's ability to continue daily routine activities or to work (Claire, et al., 2024). The ageing leads to an increased risk of falls through a complex interaction of physical, sensory, and psychological factors. As people age, declines in physical and neuropsychological capacity are accompanied by degenerative and musculoskeletal diseases, sensory impairments, and cognitive or emotional problems such as dementia and depression (Ibrahim & Gaafar, 2024).

These conditions often result in pain, instability, immobility, and increased medication use, all of which contribute to balance disorders. Balance disorders act as a critical pathway leading to falls, which in turn can have serious consequences, including physical injuries and fractures, mental health impacts such as loss of confidence and depression, reduced mobility due to decreased activity and muscle loss, and social consequences such as isolation and reduced participation in daily life (Wu-xiao, Xin-gui, Hong-qiao, & Ming-li, 2025).

Fall related with Quality of Life. Because of fall, it could change older people from independency person become dependency even total or semi care and could be disability. Therefore, the objective of study was to develop the screening instrument to detect fall risk among Indonesian elderly.

Methods

The study design and analytical approach used in the research. The study involved 214 older adults aged over 60 years, recruited from three provincial capital cities on Java Island—Jakarta, Bandung, and Yogyakarta—representing urban elderly populations in Indonesia. Participants met specific inclusion criteria, including being functionally independent, having good communication ability without hearing loss, and having no history of mental disorders.

JHFRAT (John Hopkins Fall Risk Assessment Tools) develop by John Hopkins University and STEADI (Stopping Elderly Accidents, Deaths, and Injuries) is a fall prevention initiative developed by the U.S. CDC. Both tools were first analyzed and their results compared to determine whether there were significant differences, allowing relevant components to be adapted into the Indonesian Fall Risk Assessment Tool (I-FRAT).

Data analysis was conducted using Confirmatory Factor Analysis (CFA) with the direct oblimin method to examine construct validity, followed by Receiver Operating Characteristic (ROC) analysis to assess diagnostic performance, including the area under the curve (AUC), sensitivity, and specificity.

Results and Discussion

The six-domain assessed in the Indonesian Fall Risk Assessment Tool (I-FRAT). The first is balancing domain evaluates daily movement and postural control, including walking habits at home, transitions between sitting and standing, fear of falling, and the need for walking assistance. The second domain is history of fall that captures previous falls within the past year and whether injuries occurred, reflecting established predictors of future fall risk. The physical and mental health factor is the third domain addresses underlying conditions that may increase vulnerability to falls, such as depressive symptoms, foot numbness, and the use of medications that cause dizziness or fatigue, providing a comprehensive and multidimensional assessment of fall risk among older adults.

The fourth domain is Urination and Defecation; it identifies how often the person needs to go to the toilet and whether they tend to hurry when doing so. Frequent or urgent urination can increase fall risk, especially at night when the floor might be slippery or lighting is poor. The fifth domain is medicine history that may cause dizziness, drowsiness, or affect balance — for example, sedatives, painkillers, or blood pressure drugs. The last one is the Cognitive aspect, it alertness and decision-making ability. Cognitive decline or confusion can make it harder to recognize hazards and maintain balance.

However, it found the AUC score is 0,74 which this score is right on the requirements (0,7)

that state the ability of the test is good in explaining the possibility of a fall but it not strong enough.

Then, It modified IFRAT which added not only environment risk factors, but we also added some other factors, such as history of chronic illness, depression, sensory impairment and functional capacity. The conducted trial M-IFRAT instrument test and follow up every months during 6 months for 415 older adults. This slide shows the ROC curve for M-IFRAT diagnostic accuracy. The AUC of 77% shows strong predictive power. With sensitivity of 69% and specificity of 70.8%. It means the M-IFRAT improve the balance between sensitivity and specificity. These results confirm that M-IFRAT is reliable, valid, and accurate in identifying elderly individuals at risk of falling.

Then, the M-IFRAT implemented to 214 elderly person in Depok City, West Java. The result presented 178 persons (83,18%) have high risk and the detailed can be seen on the below tables.

Table 1.1 Descriptive Analysis (Univariate)

Variable	**n = 214**	**%**
Fall Risk (Dependent Variable)		
High Risk (M-IFRAT >=11)	**178**	**83.18**
Low Risk (M-IFRAT<11)	36	16.82
Age		
Aged >= 70 Years	83	38.79
Aged 60-69 Years	**131**	**61.21**
Variable	**n = 214**	**%**
Gender		
Male	41	19.16
Female	**173**	**80.84**
Residence		
Rural	8	3.74
Urban	**206**	**96.26**
Fall History		
Have Fallen (>=1 Time)	64	29.91
Never Fallen	**150**	**70.09**
Medical History		

Has Medical History	**177**	**82.71**
No Medical History	37	17.29
Walk Imbalance		
Has Cognitive Issues	99	46.26
No Cognitive Issues	**115**	**53.74**
Urinary Incontinence		
Has Urinary Incontinence	34	15.89
No Urinary Incontinence	**180**	**84.11**

Based on Table 1.1, the frequency distribution of each studied covariate variable is as follows. It is known that the majority of the elderly are at risk of falling (83.18%), where characteristically, they are aged 60-69 years old (61.21%), female (80.84%), reside in urban areas (96.26%), have never fallen (70.09%), have a medical history (82.71%), do not have cognitive issues (53.74%), and have never felt rushed to the toilet or experienced incontinence (84.11%).

Table 1.2 Distribution Data of Fall Risk

Individual Factor	**Fall Risk**			
	High		**Low**	
	n	**%**	**n**	**%**
Age				
Aged >= 70 Years	51	61.4	32	38.6
Aged 60-69 Years	127	96.9%	4	3.1
Gender				
Male	30	73.1	11	26.9
Female	148	85.5	25	14.5
Residence				
Rural	4	50.0	4	50.0
Urban	174	84.4	32	15.6
Individual Factor	**Fall Risk**			
	High		**Low**	
	n	**%**	**n**	**%**
Fall history				

Have Fallen (>=1 Time)	40	62.5	24	37.5
Never Fallen	138	92.0	12	8.0
Medical History				
Has Medical History	142	80.2	35	19.8
No Medical History	36	97.3	1	2.7
Walk imbalance				
Has Cognitive Issues	67	67.6	32	32.4
No Cognitive Issues	111	96.5	4	3.5
Urinary Incontinence				
Has Urinary Incontinence	15	44.1	19	55.9
No Urinary Incontinence	163	90.5	17	9.5

Based on Table 1.2 The distribution of fall risk proportions reveals several unexpected trends where individuals without traditional clinical indicators often fall into the high-risk category more frequently. Demographically, the 60-69 age group exhibits a significantly higher high-risk proportion (96.9%) compared to those over 70 (61.4%), while females (85.5%) and urban residents (84.4%) also show elevated risk levels. Notably, those with no prior fall history (92.0%), no medical history (97.3%), and no cognitive issues (96.5%) paradoxically represent a higher proportion of the high-risk group than those who do possess these symptoms. This pattern continues with urinary health, where individuals without incontinence are classified as high risk at a much higher rate (90.5%) than those with the condition (44.1%), suggesting that in this population, high-risk status is heavily concentrated among the generally "healthy" or asymptomatic majority.

Conclusion

This study demonstrates that the Modified Indonesian Fall Risk Assessment Tool (M-IFRAT) is a valid, reliable, and practical screening instrument for identifying fall risk among community-dwelling older adults in Indonesia. By integrating multidimensional factors—including medical history, mental health, functional capacity, sensory impairment, and environmental risks—M-IFRAT shows improved diagnostic performance compared to the original I-FRAT, with acceptable sensitivity and specificity and a strong predictive value (AUC = 77%). The high proportion of older adults classified as high risk highlights the pervasive nature of fall vulnerability, even among individuals who are relatively young-old, physically

active, and without a prior history of falls.

Importantly, the findings suggest that fall risk is not limited to frail or clinically impaired elderly individuals but also affects those who appear functionally independent. This underscores the need for comprehensive, population-based fall prevention strategies that extend beyond traditional high-risk groups. The implementation of M-IFRAT in primary care and community settings may facilitate early identification and targeted interventions, ultimately contributing to the reduction of fall-related injuries and the promotion of healthy ageing in Indonesia.

Declarations

Ethical Statement:

This research had ethical clearance from Ethic Committee of Faculty Public Health, Universitas Indonesia with no: Ket- 326/UN2.F10.D11/PPM.00.02/2020 issued on 27, June 2020.

Data Sharing Statement:

The data could be sharing but with institutional agreement.

Conflict of Interest:

The authors report no conflicts of interest related to this study.

Data availability statement:

The data is available with institutional agreement.

Author Contribution Statement:

Indri Hapsari Susilowati and Susiana Nugraha contributed to the study conceptual framework, methodology development, data collection, and manuscript preparation.

Sabarinah contributed to the study conceptual framework, methodology development, and manuscript preparation.

Irma Ismiyanti contributed to data collection and data analysis.

Hanna Audila contributed to data analysis and manuscript revision.

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The Future of Occupational Health – What Can We Expect

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Abstract **(183 words):**
The future of occupational health is undergoing unprecedented transformation driven by five global macrotrends reshaping the landscape of work: technological acceleration, economic uncertainty leading to cost pressures, climate change, demographic shifts in the workforce and geopolitical and geoeconomic fragmentation. Emerging occupational safety and health areas of concern include managing issues relating to the aging workforces, psychosocial risks and mental health, diversity, equity and inclusion initiatives, comprehensive workplace wellbeing programmes, climate-related heat stress, pandemic preparedness, novel occupational diseases, and gig economy workers. The integration of occupational health into Environmental, Social, and Governance frameworks elevates occupational health from a compliance function to a strategic organisational priority, as occupational health professionals take on the responsibilities to become data stewards and strategic advisors for the organization.
Technological convergence across artificial intelligence, biotechnology, and sustainability domains heralds Industry 5.0, fundamentally reshaping work and introducing novel hazards alongside unprecedented opportunities. Occupational health professionals must proactively embrace change and advocate for regulatory frameworks that protect worker health while enabling innovation. This transformation in the future of occupational health demands a strategic, forward-looking approach to ensure sustainable, healthy, and equitable workplaces.

Keywords**:** Future of Work, Occupational Health

INTRODUCTION

The future of occupational health (OH) is undergoing an unprecedented transformation with the rapid development and evolution of the landscape of work. The World Economic Forum estimated that by 2030, 170 million new jobs will be created, and 92 million jobs will be displaced. While this translates to a 7% net global employment growth, the estimates reflect a reality in which up to 22% of today's existing jobs will be disrupted (World Economic Forum,

2025a).

Based on the perspectives of more than 1,000 global employers representing over 14 million workers across 22 industries and 55 economies (World Economic Forum, 2025a), the rapid development of the landscape of work is driven by five global macrotrends that will impact jobs and skills and transform the labour market in the coming decade.

First, the most transformative macrotrend anticipated by 60% of the surveyed employers is the extensive broadening of digital access catalysed by technological acceleration, including artificial intelligence (AI) and information processing technologies, robotics and autonomous systems, and advanced energy generation and storage systems (World Economic Forum, 2025a). Unlike previous technological transitions that primarily automated manual tasks, these technological acceleration and developments are redesigning cognitive work, decision-making processes, and creative functions.

The second macrotrend is the global economic uncertainty driving the rising cost of living, which is expected to impact up to 42% of employers (World Economic Forum, 2025a). There is pressure for businesses to control costs in order to remain competitive while managing employees' demands for higher wages to cope with inflation. This will create a transformative imperative for businesses and employers to redesign jobs, focusing on creative thinking and resilience, flexibility, and agility and cross-cutting skills, to maximise workers' productivity.

Third, with rising temperatures and sea levels, climate change has reached a critical juncture in which both climate mitigation (i.e. slowing the future impact of climate change) and climate adaptation (i.e. preparing and adjusting to the current and future effects of climate change) will become more urgent. For up to 47% of employers (World Economic Forum, 2025a), the narrowing window of opportunity translates into a need for an increased focus on environmental stewardship and demand for technical skills in green roles such as renewable energy engineers and environmental engineers.

Fourth, demographic shifts in the workforce of both developed and developing economies will create divergent challenges (World Economic Forum, 2025a). Developed countries face an aging workforce that increases the demand for healthcare due to the rise in prevalence of non-communicable diseases and rise in associated healthcare costs, coupled with a declining proportion of working-age workers in the labour market. Conversely, developing countries will observe an expanding working-age population that will lead to a push for demand and growth of education infrastructure to train up skilled workers within the workforce. Despite the divergent demographic realities of the workforce, both developed and developing countries converge on strategic prioritisation on skills in talent and employee retention, management and

mentoring (World Economic Forum, 2025a).

The last and fifth macrotrend is the global political volatility that has recently led to a shift from an era of globalisation to increasing geopolitical tensions and geoeconomic fragmentation, expected to affect up to 34% of the employers. Restrictions on free trade, borderless supply chains and investment are resulting in the restructuring of businesses' operations. Employers are more likely to offshore operations, moving from single-source to multi-source production to geographically hedge against concentrated geopolitical risk, and at the same time, reshore operations to ensure supply chain resilience and manage increasing cybersecurity concerns domestically. Network and cybersecurity skills, leadership and social influence, and flexibility and agility are skills which will be in demand to cope with these changes in operations (World Economic Forum, 2025a).

TRANSFORMATION OF WORK AND THE WORKFORCE

The five macrotrends, individually and in combination, result in both occupational expansion and contraction across various industries and sectors. Frontline roles (e.g. farmworkers, delivery drivers, construction workers, salespersons, and food processing workers) and care and education roles (e.g. healthcare workers, social workers, and teachers), are expected to grow significantly with the largest absolute increases in number of jobs. Technology-related jobs (e.g. big data specialists, AI specialists, and software developers) and green transition roles (e.g. electric vehicle specialists, environmental engineers and renewable energy engineers) will observe the fastest growth rates. Conversely, sharp declines are projected in clerical and administrative roles (e.g. cashiers, postal clerks, bank tellers, data entry clerks, executive secretaries, and graphic designers). Overall, an estimated 39% of the currently required skill sets will progressively be displaced, reflecting how skill sets involving manual precision, endurance and dexterity will become outdated and obsolete, with a shift towards technological and human-centered skills (World Economic Forum, 2025a).

Given the evolving skill demands, the scale of the upskilling and reskilling is expected to be significant to prepare the workforce to be able to adapt to the transformation of the labour market. Within the next decade, employers estimated that approximately 59% of workers will require upskilling or reskilling interventions to keep pace with the transformation. While this reflects employers' sentiment that majority of workers need to be reskilled or upskilled, employers foresee only 29% will be able to receive training interventions within existing current roles and 19% can undergo redeployment to new job positions. The remaining 11% will not be able to receive any upskilling or reskilling training, for which without organisational

support, their employment remains precarious (World Economic Forum, 2025a). Furthermore, employer intentions reveal mixed approaches to workforce adaptation. Although 85% of employers indicate plans to invest in reskilling and upskilling programmes, 40% anticipate staff reductions through automation, 50% intend to transition staff into growing roles and 70% plan to hire workers with new skills. This tension between investment in current workforce and technological and manpower replacement reveals realities and practical considerations such as resource constraints, job redesign limitations, and lack of organisation infrastructure, expertise or culture to support the workforce transformation for the employers.

EMERGING OCCUPATIONAL SAFETY AND HEALTH AREAS OF CONCERNS AND THE ROLE OF OCCUPATIONAL HEALTH PROFESSIONALS

Given the rapid transformation and changes in work roles, the nature of work, and the work environment, new and emergent occupational safety and health (OSH) risks will be present. The following OSH areas of concern and the role of the OH professionals will be increasingly pertinent in the coming decade.

1. The Aging Workforce. The ageing workforce brings about unique OSH challenges (Health and Safety Executive Network, 2025), including but not limited to, decreased physical and cognitive capacity from age-related conditions, increased prevalence of chronic conditions, longer recovery and downtime from workplace injuries, and potential age discrimination at the workplace. OH professionals must increasingly address the needs of aging workers, and the associated OSH risks and recognise that they also bring valuable experience, mentorship capabilities, and often demonstrate strong work ethic and reliability. OH professionals must balance these factors in their practice and develop and implement age-appropriate workplace accommodations and health promotion strategies to protect the health and safety of the ageing workforce.
2. Workplace Mental Health and Psychosocial Risks. The psychosocial impacts of potential economic uncertainty and job insecurity on workers are profound. They can arise from workplace stress and anxiety, potential discrimination at the workplace, and the constant worry about the precarity of their employment. Psychosocial health management of workers will become central to OH practice as this becomes an increasingly emergent OSH concern. The publication of International Organization for Standardization (ISO) standards 45003:2021 on OSH management for psychological health and safety at work (International Organization for Standardization, 2018) provides guidelines for workplaces to manage psychosocial risks affecting mental health, including but not limited to, work-

related stress, burnout, workplace harassment, and other organisational factors. This represents formal recognition of psychosocial risks as a critical OH domain that OH professionals must address**.**

3. Diversity, Equity, and Inclusion in the Workplace. The culture of the organisation affects the workers as much as the job task they perform (American Industrial Hygiene Association, 2021). Discrimination, and inequitable treatment create psychosocial risks at the workplace, affecting workers' mental and physical health. Incorporating workplace diversity, equity and inclusion (DEI) are increasingly emphasised as critical OH initiatives (Canadian Centre for Occupational Health and Safety, 2025) in order to promote a "psychological safety culture" of fair treatment and full participation of all workers, regardless of background, identity, or other characteristics of the workers. OH professionals must take on the proactive role in promoting inclusive workplaces, identifying health disparities across worker populations, and ensuring equitable access to OH services and workplace accommodations.
4. Wellbeing at the Workplace. Comprehensive workplace wellbeing programmes augment efforts to address physical health, mental health, social connections, financial security, and purpose and meaning in work (World Economic Forum, 2025b). Organisations increasingly recognise that worker wellbeing drives productivity and engagement, reduces absenteeism and turnover, and enhances the organisational reputation and ability to attract and maintain talent. OH professionals must shift from merely responding to occupational injuries and illnesses to integrating workplace wellness as a key organisational strategy through the designing of work environments and systems that support wellbeing, in order to promote positive health outcomes. Encouragingly, 64% of surveyed employers identify employee wellbeing and mental health as key strategies for talent attraction and retention, with 83% planning DEI initiatives (World Economic forum, 2025b) These trends suggest a focus on OH from a compliance function to a strategic organisational priority, potentially increasing available resources and organisational influence for OH initiatives.
5. Climate Change**.** Climate change presents a critical OSH challenge as rising global temperatures and frequent heatwaves creates dangerous work conditions for workers, in particular outdoor workers in agriculture, construction and delivery services. In response, the World Health Organization and World Meteorological Organization had issued reports and guidance (World Health Organization, 2025). OH professionals can adapt these guidance to develop and implement heat illness prevention programmes within the organisation to prepare the workforce for the expanding geographic and occupational exposure to dangerous heat conditions.

6. Emerging Infectious Diseases and Pandemic Preparedness. The Coronavirus disease 2019 pandemic had highlighted the importance for organisations to understand the health and safety impacts of pandemics and demonstrated the important role that OH professionals take on during outbreaks (Global Reporting Initiative, 2020). OH professionals must be able to help organisations develop robust and sustainable workplace pandemic preparedness, readiness and capabilities and response, in order to prepare for the next pandemic. These may include, but not limited to, infection prevention and control protocols, business continuity plans, vaccination strategies, workplace exposure assessment, and initiatives to support workers' physical and mental health.
7. Novel Occupational Diseases**.** Innovative technologies with new work processes and materials will introduce novel OH hazards at the workplace. As part of the emerging field of green transition, climate change mitigation and adaptation efforts within the renewable energy and the circular economy may present new and emerging OSH risks. This requires ongoing vigilance and research (Turner et al., 2025) for which OH professionals must have a greater focus and investment on OH research to fill the knowledge gaps and research needs to take on a proactive approach to implement preventive actions to protect the health and safety of the workers before the onset of disease.
8. Gig Economy. Platform work and fissured workplaces that fragment traditional employment relationships will continue to grow in the upcoming decade. Workers are generally classified as "independent", which excludes them from existing OSH protections (e.g. work injury compensation, employer-provided health benefits). Furthermore, digital surveillance, algorithmic management, and just-in-time scheduling - key features of the type of work within the gig economy - create psychosocial stressors while limiting worker autonomy. This puts workers in the gig economy in an extremely precarious and vulnerable situation within society. As noted by Kawachi (Kawachi, 2024), society must question whether this 21st-century form of capitalism is sustainable to protect worker health. Some countries have taken the step in the right direction with legislative approaches to ensure adequate OSH protection for these workers. The landmark Platform Workers Act 2024 in Singapore (Ministry of Manpower Singapore, 2024), which came into force on January 1, 2025, ensures protection for platform workers in the event of any work-related injuries, improves their housing and retirement adequacy, and provides for enhanced representation by allowing platform workers and operators to form their own platform work associations for collective negotiations. There will be increasing tension between labour market flexibility and OSH protection for the workers, that requires OH professionals to continue

to advocate for regulatory frameworks that balance these competing interests.

FUTURE OCCUPATIONAL HEALTH OPPORTUNITIES AND CHALLENGES

Incorporation of OH into the Environmental, Social, and Governance

Corporate Social Responsibility (CSR) was a popular management concept for organisations to integrate social and environmental concerns into their business strategy and interactions with stakeholders to improve their branding or reputation (United Nations Industrial Development Organization, n.d.). Although CSR strives to achieve a balance with both managing stakeholders' expectations and positively impacting society's economic, environmental and social imperatives, it was viewed as a self-regulated business strategy which was difficult to quantify or measure.

Environmental, Social, and Governance (ESG), first introduced in 2004 by the United Nations (UN) Global Compact in the "Who Cares Win" report (World Bank Group, 2004), was then a step forward that further expands on CSR. Comprising a set of measurable metrics that can be referenced by investors and stakeholders to measure a company's sustainability and societal influence (United Nations, 2006), ESG was a comprehensive framework that encouraged investors to consider non-financial factors of responsible business practices (e.g. environmental impact, labour practices, corporate governance) when evaluating long-term corporate value of businesses. More importantly, ESG emphasises on the need for structured, verifiable communication of the business's sustainability and societal influence. Under the "Social" dimension of ESG, organisations are expected to demonstrate how they manage various societal responsibilities, including the domain of workplace OSH, workers' well-being and labour rights, and make this information publicly available and accessible to investors and stakeholders. This also runs complementary to the UN Sustainable Development Goal (SDG) 3 on Good Health and Wellbeing and SDG 8 on Decent Work and Economic Growth (United Nations, 2015), highlighting employers' responsibility to ensure safety, healthy and equitable working conditions for all workers.

ESG, SDG 3 and SDG 8 are strategic elevations of OH as they signal to organisations that the domain of OH is both a social obligation and governance priority. This was further highlighted with the introduction of the Global Reporting Initiative 403 (GRI 403) in 2018 (Global Reporting Initiative, 2018), that provides organisations the specific framework to integrate OSH into their ESG reporting standards.

Fundamentally, the integration of OSH into ESG has further positioned OH professionals beyond the "clinical role" that traditionally only focuses on clinical diagnosis,

treatment and hazard control, which now extends to strategic contributors to organisational governance and transparency. OH professionals now have the potential to take on the role of data stewardship for corporate accountability (i.e. collection, analysis, interpretation, and communication of health-related data of workers, and ensuring the information presented in ESG reports is scientifically accurate, ethically grounded, and relevant to stakeholders). OH professionals can contribute to strategic advisory functions by advising organisational leadership on how OSH performance affects corporate reputation, investor relations and regulatory compliance, through the positioning of OH as a visible, accountable, and integral pillar of ethical, sustainable, and socially responsible business practice.

Technological Convergence and the Fifth Industrial Revolution

Acceleration in technological innovations focusing on the concept of digitalisation (e.g. artificial intelligence, machine learning, robotics, industrial Internet of Things, automation and immersive technologies) had brought about the fourth industrial revolution (Industry 4.0) and the emergence of the era of OSH paradigm that adopted these innovations to address traditional OSH-related risks (e.g. ergonomics and safety-related risks) (Koh & Tan, 2024)

With the push and mainstream adoption of technological innovations in recent years, it had resulted in a technological convergence across multiple domains, particularly AI, biotechnology, and sustainability technologies. Examples of successful technology convergence outcomes include, but are not limited to (World Economic Forum, 2025c):

1. Red biotechnology (medical and pharmaceuticals innovations). AI has been used for natural compound identification that allowed for the precise detection, isolation and characterisation of bioactive molecules from natural sources to enable novel drug discovery and development. Additionally, organ-on-chip technology allows for the replication of human organ functions using cultured human cells, thereby reducing the reliance and need for animal testing
2. Green biotechnology (agriculture sustainability and renewable energy). The use of AI-powered synthetic biology has been used to engineer micro-organisms to convert waste materials into valuable products. An example includes LanzaTech's process of using genetically modified bacteria to create cost-effective, sustainable aviation fuels.
3. White biotechnology (industrial applications). The deployment of deep learning to support enzyme development has enabled companies like Enzymit to use AI to design novel enzymes that can break down plant biomass for biofuels at greater efficiency.
4. Blue biotechnology (marine applications). The use of AI and synthetic biology allowed for

the development of biodegradable plastics to minimise pollution, as well as other environmentally focused innovations.

Some have posited that this synergistic convergence and intersection of digital, physical and biological technologies have heralded the emergence of the fifth industrial revolution (Industry 5.0) (World Economic Forum, 2025c). Industry 5.0 is characterised as the cooperative working between humans and advanced technologies, with man and machines working together to deliver bespoke value-added services and products for end-users through personalisation and the use of collaborative robots (TWI Global, n.d.). Furthermore, Industry 5.0 goes beyond just the optimisation of manufacturing; it also focuses on the aim to deliver a human-centric, resilient and environmentally aware and sustainable future, similar to the goals of the ESG framework.

Collaborative AI robots, AI-based humanoids and generative AI systems have already positively reshaped the field of OSH (Koh & Tan, 2024). Current AI capabilities and development projections suggest that such AI and information processing technologies will continue to be the predominant technology trend driving business transformation in the coming decade (World Economic Forum, 2025a), reshaping work and impacting OSH more profoundly than any previous technology. By 2030, there may potentially be a future that AI systems will be able to code autonomously and improves itself, and by 2032, AI systems will have 80% to 90% of the ability of a human expert across industries (World Science Festival, 2024). This can result in disruption and displacement of professional and technical jobs requiring complex decision-making, which were previously considered to be resistant to automation.

Some have cautioned the risk of the development of agentic AI systems - systems that can adapt, learn, pursue complex goals in dynamic environments, leverage large language models to train complex reasoning - which act autonomously, make decisions, and take actions to achieve specific goals with limited or no human supervision. Beyond the OSH risks of job displacement and other potential novel hazards, explicit concerns on existential risks posed by AI have been expressed by AI developers (Pearse, 2024; Russell, 2025) and most notably by technology leaders of major AI companies (e.g. OpenAI, Anthropic, DeepMind Technologies) and leading AI scientists (Center for AI Safety, 2023), with a global call for action to prioritise mitigating the risk of humanity extinction from AI alongside other catastrophic events and disasters such as pandemics and nuclear wars.

Developments in software (e.g. large language models, small language models, Generative and Agentic AI, Artificial General Intelligence, Artificial Super Intelligence) and hardware (e.g. quantum computing, biological computers, photonic chips, neural links,

nanobots) will continue to accelerate exponentially. Regulatory OSH legislation, policies and frameworks must be able to keep pace with the rapid technological development to close the governance gap exposing workers to OSH risks. OH professionals must be able to embrace change, keep updated with new technological uses and implications of such technologies, and remain resilient and adaptable. This includes developing interim guidance when formal regulations are absent, proactively engaging in OSH policy development processes and contributing to the translation of technical OH knowledge into practical regulations to mitigate the associated OSH risks. This ensures that OSH risks associated with these technologies can be mitigated, and still serve workers, employers and organisations to effect positive productivity outcomes.

CONCLUSION

The future of work and OH will be shaped by various global macrotrends which present profound challenges in the next decade. The role of the OH professionals is increasingly important, and there is a need to take on a more proactive and strategic lens in the OH approach to mitigate OSH risks for the workers. Opportunities to harness the potential of the role of OH will require OH professionals to be prepared and ready to accept and embrace change. By responding to these changes responsibly and proactively, it is with the view that existing and new OSH risks can be mitigated while reaping the benefits of technological advances that improves the safety and health of workers at the workplace.

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UOEH International Symposium 2025

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AI: AI/Digital, CH: Chemical, ME: Mental Health, PH: Physical

Five abstracts (CH-4, CH-9, ME-28, PH-46 and PH-56) were excluded due to withdrawal or presenter no-show.

AI-1

A Shot After the Shock: An Interrupted Time Series on Influenza Vaccination Uptake in a Singapore Tertiary Hospital

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Introduction: News of celebrity illness or death can shape vaccination uptake, with anecdotal reports of influenza vaccine shortages in Singapore following news of Taiwanese celebrity Barbie Hsu's death from influenza-related complications in February 2025.

Objective: This is a natural experiment exploring whether the death of a celebrity from influenza-related illnesses have any impact in influenza vaccine uptake amongst healthcare workers (HCWs) in a Singapore's tertiary hospital.

Methods: Interrupted time-series analysis was performed using weekly influenza vaccine uptake data from the 2023/2024 and 2024/2025 Northern Hemisphere (NH) influenza vaccination exercise over 14 weeks, with the publicized celebrity's death on Week 8 of the 2024/2025 vaccination exercise as the primary exposure. Segmented linear regression model was fitted to examine changes in baseline trend in uptake prior to the event, immediate level change following the event and post-event trend in weekly uptake.

Results: An average of 31 vaccinations per week occurred during Week 1 to 7 of the 2024/25 NH season, before rising sharply beginning Week 8. The peak occurred in Week 9 with 86 vaccinations, more than triple the corresponding week in the prior season (+230.8%). Uptake remained elevated for several weeks before gradually tapering off. Segmented regression (R^2=0.66) showed a statistically significant immediate increase in uptake of +61.7 doses in the week of the event (p=0.001), with no significant change post-event compared to the baseline slope (–2.25 doses/week, p=0.53).

Discussion and Conclusion: Pronounced but transient surge in HCW's vaccine uptake

following the celebrity's death was consistent with a media-driven behavioural response, suggesting heightened public concern and responsiveness to vaccination uptake when framed through emotionally resonant narratives. To sustain behaviour change, such efforts must be embedded within broader, continuous community engagement and trust-building.

Keywords: Influenza, vaccination, public health, celebrity

AI-2

Greener and Smarter: Boosting Productivity through Digitalisation of Occupational Health Medical Reports in a Singapore's Tertiary Hospital

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Introduction: Upon completion of an occupational health medical examination in the assessment for fitness to work of prospective employees across different institutions in a Singapore's tertiary hospital, physicians had to print Occupational Health Medical Reports (OHMR) for collection by the institutional Human Resources (HR) staff. Thereafter, the physical copies of the OHMR had to be digitalised and filed by HR into individual employees' profiles in a secured cloud-based database.

This required time and effort from the various stakeholders involved, given the laborious nature of the end-to-end process of the creation of the OHMRs.

Objective: The hospital's adoption of Microsoft Teams in Microsoft 365 as the primary communication application provided a secured messaging platform with the functionality of creating private channels with authorized users participating in the channels' conversations and files.

This project describes a work process improvement process with the objective of digitalizing the OHMR, in alignment with the hospital's transformation at work initiative.

Methods: The work process improvement programme involved the encryption and upload of the OHMRs digitally by physicians to specific channels in Microsoft Teams, sorted by institutions within the hospital campus.

An automated email would be triggered to the relevant HR staff with access rights to the institution's channels, for their retrieval of the digital OHMRs. Any anticipated delays with the OHMRs would also be communicated within the specific channels to HR.

Results and Conclusion-Operationally, OHMRs were processed in a faster and timelier manner, removing the need for physical collection and digitalisation of the reports by HR. This translated to faster hiring processes and onboarding of new hospital employees. In addition, the carbon footprint arising from the printing of the OHMR was significantly reduced with the use of digital document management and collaboration. This helped to improve productivity and to ensure environmental sustainability.

Keywords: Digitalisation, Medical Report, Productivity, Environmental sustainability

CH-3

Megakaryocyte Potentiating Factor (MPF) as a Biomarker for Malignant Pleural Mesothelioma (MPM) in Asbestos-Exposed Workers: A Literature Review

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Introduction: Mesothelioma is a highly aggressive cancer primarily caused by prolonged asbestos exposure. Despite global bans, asbestos use still persists particularly in the construction and manufacturing sectors, placing millions of workers at risk. Mesothelioma's long latency period, often spanning decades, underscores the importance of early detection, which is currently hindered by the invasiveness and cost of traditional diagnostic methods such as imaging and biopsies. This literature review investigates the potential of Megakaryocyte Potentiating Factor (MPF) as a diagnostic tool for early detection of malignant pleural mesothelioma (MPM) among asbestos-exposed workers.

Methodology: A systematic literature review was conducted across PubMed, JSTOR, and Scopus to evaluate the diagnostic performance of MPF for MPM, using the Centre for Evidence-Based Medicine (CEBM) diagnostic criteria. The review followed the PICO framework: Population: asbestos-exposed workers; Intervention: MPF detection; Outcome: diagnostic value of MPF. Studies were included if they were peer-reviewed, involved human subjects with asbestos exposure, assessed MPF as a diagnostic tool for MPM, and reported diagnostic outcomes such as sensitivity and specificity.

Results: A total of 26 studies met the inclusion criteria. Most studies reported elevated levels of the MPF34–288 fragment in patients with mesothelioma compared to asbestos-exposed individuals without malignancy. The pooled sensitivity and specificity of MPF as a single biomarker were approximately 70% and 82%, respectively. Notably, combining MPF with other biomarkers such as mesothelin improved diagnostic accuracy, supporting the utility of a multi-marker approach. However, MPF alone has limited sensitivity, and its clinical use would benefit from integration into a broader diagnostic panel.

Conclusion: MPF represents a promising, less invasive, and potentially cost-effective

biomarker for early mesothelioma detection in asbestos-exposed workers. While MPF alone demonstrates moderate diagnostic performance, its use in combination with other markers may significantly enhance early detection efforts.

Keywords: megakaryocyte potentiating factor (MPF), mesothelioma, biomarkers, asbestos exposure, early cancer detection

CH-5

Environmental Air Quality Assessment During Naval Gun Firing

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Objective: Naval gun engagements generate significant smoke and fumes during each salvo. While gun bays are ventilated with fume extractors, this is the first known instance of an environmental air quality assessment during a naval gun firing. This study assesses occupational exposure to toxic substances generated during naval gun firing.

Methods: Environmental monitoring was conducted within the Gun Bay for an 8-hour shift during a routine live-firing exercise onboard a Singapore Navy frigate. A total of 15 rounds were fired in rapid succession. A survey was administered to screen for potential exposures at the workplace.

6 sensors were deployed with sampling duration and flow rate ranging from 240 – 480 minutes and 0.2 – 2.0 L/minutes to derive the 8-hour Time-Weighted-Average concentration (Conc TWA 8hr).

Potential toxic substances monitored include metal fumes, components of smoke (ammonia, hydrogen chloride, sulphur dioxide), toxic oxides of nitrogen and volatile organic compounds.

Results: None of the gun crew surveyed reported having neurological or respiratory symptoms. All samples were within the permissible exposure levels (PEL) as set by Ministry of Manpower, Singapore and established standards such as OSHA, NIOSH and ACGIH. Copper, Lead and Nitric Oxide were detected but less than 2% of the permissible exposure limits of local and international standards.

Conclusion: The study demonstrated that the air quality within the gun bay was within the permissible exposure levels during a live-firing exercise. Greater exposures would be expected with more rounds fired at the maximum rate of 120 rounds per minute in an actual naval gun engagement.

The preliminary insight would guide future studies on potential toxic substances that may accumulate during prolonged gun firing. More studies could be conducted with environmental and biological monitoring to determine the occupational impact to gun crew during firing of naval ammunition.

Keywords: Navy, Environmental monitoring, Naval gun firing, Exposure levels

CH-6

Health Implications of Nanoparticles and PM2.5 Emissions from a Decade-Old Diesel Vehicle

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Decade-old diesel pickup trucks remain prevalent in Thailand and represent a major source of fine particulate matter (PM2.5) and nanoparticles. These particles can penetrate deep into the lungs and bloodstream, creating severe health risks. Diesel exhaust is also classified as a Group 1 carcinogen by the International Agency for Research on Cancer. This study aimed to characterize particle emissions from an aging diesel vehicle under simulated urban driving conditions.

A diesel vehicle older than 10 years was evaluated on a chassis dynamometer following the UN R83 urban driving cycle. Particle number concentration and size distribution were measured using a Scanning Mobility Particle Sizer with a Condensation Particle Counter (SMPS+C) and a Photoelectric Aerosol Sensor (PAS). A Nanoparticle Sampler equipped with a polycarbonate filter collected samples for elemental and morphological characterization using Field Emission Scanning Electron Microscopy coupled with Energy-Dispersive X-ray Spectroscopy (FESEM-EDS).

The simulation demonstrated that acceleration phases produced the highest particle emissions, with number concentrations peaking at ~2.5 × 10^6 particles/cm^3 during the 0–50 km/h stage, greatly exceeding background levels. PM2.5 mass concentrations ranged between 20–28 μg/m^3. Elemental analysis showed that particles were mainly composed of carbon (54.07%) and oxygen (26.31%), indicative of incomplete combustion, with additional metals such as aluminum (8.05%) and iron (3.83%). Morphological analysis revealed ultrafine primary particles (<100 nm) aggregated into larger structures.

These results confirm that urban driving, particularly rapid acceleration, significantly increases emissions of harmful fine and ultrafine particles. With the high prevalence of aging diesel vehicles, stringent regulations and mandatory Diesel Particulate Filter (DPF) retrofitting are urgently required to mitigate emissions and protect public health.

Keywords: Diesel exhaust nanoparticles, Aging diesel vehicle particles, Driving emissions

CH-7

Type of Tobacco Farming and Cotinine Urine among Farmers Exposed to Tobacco Smoke Before and After Intervention

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Tobacco farming is a major agricultural activity in many low- and middle-income countries, including Indonesia. During cultivation and harvesting, farmers are directly exposed to nicotine through dermal contact with tobacco leaves and inhalation of tobacco smoke. Previous studies have mostly focused on the health consequences of active and passive smoking, yet there is limited research addressing the relationship between specific types of tobacco farming practices and urinary cotinine levels among farmers.

This study was analytic research using a prospective cohort design. It took place in Probolinggo district, which is one of the largest tobacco producers in East Java, Indonesia. Samples were obtained using purposive sampling. The total sample size was 120 farmers. The dependent variable was cotinine urine and the independent variables were the characteristics of farmers, activity during tobacco leaves exposure, and types of farming activities. Personal protective equipment (PPE) and personal hygiene were interventions during the following harvest time. Data analysis techniques were used to describe independent and dependent variables.

The results showed that cotinine urine measured before harvesting, during harvesting, and after harvesting among tobacco farmers following the intervention revealed the highest proportion of cotinine-positive cases in the active smoker group, the lowest in the passive smoker group, and about half of the cases in the non-exposed group before the intervention. No notable variation in positive urinary cotinine was observed among active smokers, passive smokers, and non-exposed groups before the intervention.

Environmental exposure to tobacco smoke contributes to inhalation-related nicotine uptake, further increasing overall body burden. These dual exposure pathways—through dermal contact with tobacco leaves and inhalation of smoke—may explain the elevated urinary cotinine concentrations observed during harvesting, particularly among active smokers compared with passive smokers and non-exposed farmers.

Keywords: type farming, tobacco farmer, tobacco smoke, intervention, cotinine urine

CH-8

Osteopontin as a Biomarker for Pneumoconiosis in Occupational Dusts-Exposed Workers : A Literature Review

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Introduction: Pneumoconiosis is a chronic lung disease resulting from prolonged inhalation of occupational dusts such as silica, asbestos, and coal dust, commonly found among high-risk workers. Diagnosis is often delayed due to its insidious onset and non-specific symptoms. Osteopontin (OPN), a glycoprotein associated with inflammation, tissue repair, and fibrosis, shows elevated expression in the lung tissue of pneumoconiosis patients, indicating its potential as a biomarker for early detection.

Methodology: This literature review was conducted using searches in PubMed, Scopus, and ProQuest to assess the diagnostic performance of OPN for pneumoconiosis based on CEBM criteria, following the PICO framework (Population: workers; Intervention: occupational dust exposure; Comparison: no occupational dust exposure; Outcome: diagnostic value of OPN). Eligible case-control studies involved human subjects, evaluated OPN as a diagnostic marker, and reported sensitivity and specificity.

Results: Out of 19 articles identified, two met the inclusion criteria for detailed analysis. Evidence demonstrates a strong correlation between OPN levels and disease presence. As a standalone marker, serum OPN exhibited a sensitivity/specificity of 85.5%/93.0% for Coal Workers' Pneumoconiosis (CWP) (cut-off: 10.58 ng/mL), plasma OPN 76.4%/92.7% for silicosis (86.6 ng/mL), and 81.5%/80.4% for asbestosis (58.3 ng/mL). When combined with other biomarkers, diagnostic performance improved significantly: serum OPN with KL-6 and Syndecan-4 achieved 96.5%/98.0% for CWP, while plasma OPN combined with CC-Chemokine Ligand 18 and CXC Motif 13 Chemokine reached 93.1%/89.1% for silicosis and 90.1%/89.3% for asbestosis.

Conclusion: OPN is a promising biomarker for pneumoconiosis, demonstrating high diagnostic accuracy, especially when used in combination with other biomarkers. However, further validation is necessary to support its application in early detection programs.

Keywords: Keywords: asbestosis, coal workers, occupational dust, osteopontin, pneumoconiosis, silicosis

CH-10

Targeting Work-Related Metabolic Risks: Thai Kratom Extracts Mitigate Fatty Liver Disease Through Multi-Pathway Modulation

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Metabolic dysfunction-associated fatty liver disease (MAFLD) is an emerging occupational and public health challenge strongly linked to modern work-related risk factors, such as sugar-sweetened beverage consumption in Thailand. These conditions exacerbate insulin resistance, lipid accumulation, and chronic inflammation among the working population. With the limited therapeutic options currently available, there is an urgent need to explore novel preventive and therapeutic interventions that can reduce the burden of MAFLD in occupational settings. This study investigated the effects of Thai kratom (Mitragyna speciosa) extracts (red and green veins) and their major alkaloid, mitragynine, on lipid metabolism, glucose homeostasis, and inflammation in an in vitro model of MAFLD. Human HepG2 cells were exposed to free fatty acids (FFAs) to induce a steatotic phenotype and co-treated with kratom extracts, mitragynine, or quercetin. Lipid accumulation was evaluated using Oil Red O staining. Protein and gene expression of metabolic and inflammatory markers were assessed using western blotting and RT-qPCR. Thai kratom extracts significantly attenuated FFA-induced lipid accumulation by activating AMP-activated protein kinase (AMPK) and suppressing key lipogenic enzymes, acetyl-CoA carboxylase (ACC) and fatty acid synthase (FAS). Both extracts enhanced glycogen synthesis by promoting AKT and GSK3 phosphorylation, thereby limiting the glucose flux into de novo lipogenesis. Furthermore, kratom extracts exerted anti-inflammatory effects by reducing p38 MAPK phosphorylation and downregulating inflammatory mediators, including TLR4, c-Jun, CCL2, and CCL21 expression. While mitragynine contributed to these effects, kratom extracts exhibited stronger efficacy, suggesting the synergistic actions of multiple phytochemicals. This study provides novel mechanistic insights into the multifaceted effects of Thai kratom extracts on hepatic steatosis. By simultaneously targeting lipid accumulation, insulin signaling, and inflammation, kratom shows promise as a potential natural therapy for MAFLD. Future in vivo and clinical investigations are warranted to establish its safety, efficacy and translational potential.

Keywords: Mitragyna speciosa, kratom extract, mitragynine, MAFLD, AMPK, hepatic lipid metabolism

CH-11

Haze in the Workplace: Seasonal Indoor Air Quality and Health Effects among Office Workers in Chiang Mai

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Background: Indoor air quality (IAQ) in office environments can affect workers' health in regions with severe seasonal air pollution such as Chiang Mai, Thailand—ranked among the world's most PM2.5 polluted cities.Objective: This study examined the relationship between indoor environmental exposures and physical symptoms among office workers. Methods: A cross-sectional study was conducted among 27 office workers in enclosed offices. Completed self-administered questionnaires on demographics, work conditions, and weekly symptom occurrence. Environmental parameters—PM2.5, CO_2, temperature, humidity, and formaldehyde—were monitored continuously 8 hours/day, five consecutive workdays for 8 weeks, covering haze and non-haze periods (4 weeks each). Room layouts and ventilation were recorded. Associations between exposures and symptoms were analyzed using multivariable binary logistic regression with cluster-robust standard errors. Results: Demographic characteristics did not differ between seasons, except for lower N95 mask use during the non-haze season. Symptom prevalence was higher during haze season—nasal irritation (83.3%), eye irritation (76.0%), and dry throat (80.0%). PM2.5 concentrations during haze exceeded Thailand's updated standards(15 μg/m³ annual average; 37.5 μg/m³ 24-hour), and sharply declined during non-haze periods ($p < 0.001$). Higher PM2.5 exposure was significantly associated with skin symptoms (adjusted odds ratio [aOR] = 2.00, 95% confidence

interval [CI]: 1.06–3.78, p = 0.03) and marginally associated with nasal symptoms (aOR = 2.26, 95% CI: 1.00–5.07, p = 0.05). Elevated CO_2 levels were marginally associated with eye symptoms (aOR = 1.10, 95% CI: 0.99–1.22, p = 0.06). Conclusion: Seasonal PM2.5 exposure may adversely affect skin and nasal health, while elevated CO_2 may contribute to eye symptoms.These findings, supported by high-resolution environmental monitoring, underscore the need for targeted workplace IAQ policies and preventive measures during haze season.

Keywords: Indoor Air Quality (IAQ), PM2.5, Office Workers, Physical Symptoms, Haze season

CH-12

Antitumor Activity of Isalpinin from Paphiopedilum dianthum on Non-Small Cell Lung Cancer Cell Lines

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Lung cancer continues to be one of the leading occupational and public health challenges, with high mortality rates and limited treatment success due to drug resistance, tumor heterogeneity, and metastasis. Occupational exposure to carcinogens, such as asbestos, silica dust, and chemical pollutants, remains a critical risk factor for lung cancer among workers worldwide. This study explored the potential of isalpinin, a natural flavonoid extracted from Paphiopedilum dianthum, as a safer and sustainable candidate for lung cancer prevention and treatment. Using non-small cell lung cancer (NSCLC) cell models A549, H23, and H460, isalpinin demonstrated significant anticancer effects, reducing viability in a dose- and time-dependent manner, with higher sensitivity observed in H23 and H460 cells. Beyond inhibiting cell proliferation and migration, isalpinin triggered apoptosis through enhanced oxidative stress and suppression of pro-survival signaling pathways, confirmed by its molecular interaction with AKT1. These findings highlight isalpinin's potential as a plant-derived compound that could serve as part of green, sustainable strategies for occupational cancer prevention and management. By integrating natural product research into occupational health frameworks, this work reflects how diversity in biomedical innovation can advance well-being while aligning with global goals of environmental sustainability and green transformation. Future directions include in vivo validation and potential incorporation into integrative occupational health practices that protect vulnerable populations at higher risk of lung cancer due to workplace exposures.

Keywords: Paphiopedilum dianthum, isalpinin, flavonoid, anti-proliferation, anti-migration, anchorage-independent growth, non-small lung cancer cells

CH-13

Prediction of Pulmonary Toxicity of Organic Polymers Using Cultured Cells

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Background: Recently, cases of lung disorder caused by organic polymers have been reported in Japan and Korea, highlighting the need to evaluate their pulmonary toxicity. However, the wide variety of organic polymers makes it impractical to assess the toxicity of all compounds through animal testing. Therefore, in this study, we investigated a screening method for predicting lung toxicity using cultured lung-derived cell lines.

Methods: Based on previously published animal exposure studies, nine organic polymers were classified into low- and high-toxicity groups. For the cell-based assay, four cultured cell lines were used: mouse immortalized alveolar macrophages (IMAM19sc), mouse alveolar epithelial cells (MLE12, MLE15), and fibroblasts (MLg). Each cell type was exposed to nine organic polymers differing in polymer type, crosslinking structure, and molecular weight, and cell viability was measured every 12 hours. Discriminant analysis was performed using the mean cell viability (MCV) of the four cell lines to evaluate the predictive accuracy for pulmonary toxicity.

Results / Discussion: In IMAM19sc, exposure to high-molecular-weight acrylic acid polymers resulted in a dose-dependent and significant reduction in MCV. In contrast, exposure to low-molecular-weight acrylic acid polymers, polyethylene glycol, and polyethylene oxide caused only a mild reduction in MCV. MLE12, MLE15, and MLg generally exhibited milder decreases in MCV compared with IMAM19sc. In discriminant analysis using five of the nine compounds as training data and four as validation data, the MCVs of the four cell lines accurately distinguished between high- and low-toxicity groups without misclassification.

Conclusion: This cell-based assay using multiple cultured cell lines demonstrates the potential for accurately predicting the pulmonary toxicity of organic polymers.

Keywords: Prediction, Pulmonary Toxicity, Organic Polymers, Cultured Cells, discriminant analysis

CH-14

Non-cancer health effects of exposure to municipal solid waste incinerators in Asia: a meta-analysis based on residential proximity and biomonitoring

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Objective: Municipal solid waste incinerator emissions release complex mixtures of pollutants that may adversely affect human health. In Asia, high population density, close siting of incinerators to homes, occupationally exposed workers, and variable emission controls raise concerns about environmental and occupational exposures. This meta-analysis synthesized epidemiologic evidence on non-cancer health effects of exposure to incinerator in Asia, incorporating residential proximity and biomonitoring data.
Methods: We systematically searched PubMed, Web of Science, and Embase from 1980 to August 1, 2025, for epidemiologic studies conducted in Asia that assessed non-cancer health outcomes in relation to exposure to municipal solid waste incinerators. Eligible assessments included (1) residential proximity (≤4 km vs. >4 km or minimal exposure) and (2) biomonitoring data (e.g., concentrations of dioxins in blood) among residents or workers. Pooled odds ratios (ORs) and 95% confidence intervals (CIs) were calculated for outcomes with at least two independent studies, using a random-effects model with restricted maximum likelihood in R version 4.5.0.
Results: Four studies met the inclusion criteria. Two large population-based studies (5 study groups covering n = 354,396) assessed wheezing among residents ≤4 km versus >4 km from incinerators, yielding a pooled OR of 1.04 (95% CI = 1.00–1.08). For hypertension, two studies (4 study groups covering n = 627) combining residents and workers and using biomonitoring data produced a pooled OR of 1.36 (95% CI =1.01–1.84). For diabetes, two biomonitoring-based studies (4 study groups covering n = 538) showed OR of 3.61 (95% CI = 1.59–8.18).
Conclusion: Evidence from Asian studies suggests that exposure to municipal solid waste incinerators, assessed through residential proximity or biomonitoring, may increase the odds of wheezing, hypertension, and diabetes. Future research should rigorously address health risks for both residents and workers.

Keywords: Non-cancer health outcomes, odds ratio, municipal solid waste incinerator, Asia, meta-analysis

ME-15

Long Working Hours and Major Depression with Suicidal Ideation: Case Report and Evidence Review in a Bank Community Officer

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Introduction

Major depressive disorder (MDD) is a disabling psychiatric condition increasingly reported in high-demand occupations. Bank community officers, responsible for community education, door-to-door lending, loan collection, and late meetings, are exposed to long working hours, which may contribute to mental health deterioration. This case report evaluates an occupational relationship between long working hours as a bank community officer and MDDs with suicidal ideation, supported by a focused literature review.

Methods

This case report examined a 19-year-old female bank community officer, which includes a focused literature review to contextualize the findings. Occupational history, job tasks, and working conditions were recorded, encompassing average daily working hours, psychosocial demands, and available support. Stress levels were evaluated through the Survey Diagnosis Stress (SDS) and the New Brief Job Stress Questionnaire (NBJSQ). Literature searches were performed in PubMed, ScienceDirect, Scopus, ProQuest, EBSCOhost, JSTOR, and Google Scholar utilizing the terms “community officers,” “bank workers,” “long working hours,” “depression,” and “suicidal ideation.” The inclusion criteria encompassed human studies published in English, and the eligible studies underwent critical appraisal.

Results

The patient indicated a work schedule of 14 hours daily, characterized by a high workload, emotional demands, and insufficient support, as indicated by SDS and NBJSQ scores. There were three articles met the inclusion criteria. Only Guruprasad et al. (2024) showed a significant association between depression and working more than eight hours each day (OR 2.23, 95% CI 1.18–4.23). Lin et al. (2020) and Kim et al. (2018) reported no statistically significant association, highlighting emotional labor, workplace violence, family stress, night shifts, and job type as more robust associations.

Conclusion

This case highlights the potential role of long working hours in severe mental health outcomes among bank community officers. Prevention strategies should address psychosocial hazards comprehensively, including workload, emotional demands, and workplace support.

Keywords: long working hours, major depression, suicidal ideation, bank officer, psychosocial hazards

ME-16

Confirmatory Factor Analysis of the Indonesian Version of the Flying Anxiety Situations Questionnaire

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Background: Flying anxiety is a frequent problem among passengers and crew, with potential impact on safety and well-being. The Flying Anxiety Situations (FAS) questionnaire by Van Gerwen has been widely applied internationally, but no validated Indonesian version has been available. This study aimed to adapt the FAS culturally and examine its psychometric properties in Indonesia.

Methods: We conducted a cross-sectional validation with 360 participants. The 32 FAS items underwent cross-cultural adaptation following ISPOR guidelines, including forward–backward translation, expert review, and cognitive debriefing. After adaptation, Confirmatory Factor Analysis (CFA) with a Diagonally Weighted Least Squares estimator was used to test the three-factor model (Generalized, Anticipation, In-flight anxiety). Model fit was assessed using CFI, TLI, RMSEA, and SRMR. Internal consistency was evaluated with Cronbach's alpha and McDonald's omega.

Results: The 32-item version showed excellent incremental fit indices (CFI = 0.995; TLI = 0.995; IFI = 0.995), with all loadings above 0.70, but RMSEA was high (0.085), suggesting limited overall fit. Excluding three items (19, 21, 26) produced a 29-item model with more balanced fit (CFI = 0.967; TLI = 0.964; RMSEA = 0.067; SRMR = 0.062), while maintaining strong loadings (>0.70). These findings support the three-factor structure described by Van Gerwen. Reliability was excellent across subscales (α and ω > 0.90). Based on a cutoff score of 70, 13.1% of respondents were identified as experiencing flying anxiety.

Conclusion: The Indonesian FAS is valid and reliable for assessing flight anxiety. While the 32-item version may be used clinically, the 29-item model offers stronger psychometric support and is recommended for research. This adaptation broadens the cross-cultural use of the FAS in aviation medicine and provides preliminary data on the prevalence of flying anxiety in Indonesia.

Keywords: flight anxiety, questionnaire validation, CFA, reliability, aviation medicine

ME-17

Anger and Irritability as Components of Mental Health Challenges Among Workers in Indonesian State-Owned Enterprise Banks: Determinants and Their Impact on Job Satisfaction and Work Engagement

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Bank workers are increasingly vulnerable to mental health challenges, especially amid ongoing economic instability. Compared to those in the private or other sectors, employees of state-owned enterprise (SOE) banks in Indonesia face higher managerial demands and workloads. This study utilized the Short Version of the Brief Job Stress Questionnaire (SV-BJSQ) to assess the prevalence and profile of anger and irritability among SOE bank workers in Indonesia. The analysis further explored associated determinants and their effects on job satisfaction and work engagement.

A total of 3,471 respondents were included, proportionally sampled to represent both Java and non-Java regions as well as diverse individual and occupational characteristics across Indonesia. The prevalence of significant anger symptoms was 13.3%, which was strongly associated with lower job satisfaction (OR 6.2; 95% CI: 4.8–7.9) and diminished work engagement (OR 9.6; 95% CI: 6.9–13.2).

Higher levels of irritability were more prevalent among workers with the following characteristics: younger age, Java-based locations, extended working hours, elevated job demands (e.g., interpersonal conflict), and insufficient job resources—including individual-level factors (e.g., lack of meaningfulness at work), workgroup-level factors (e.g., perceived lack of interactional justice from supervisors), and organizational-level factors (e.g., poor work–life balance).

These findings underscore the need for targeted psychological training programs focused on anger and irritability management among bank workers—particularly those in state-owned enterprises—to better prepare for future economic volatility at both regional and global levels.

Keywords: Anger, Work Engagement, Job Satisfaction, Bank Workers, SV-NBJSQ

ME-18

Work Demands, Work–Self Balance, and Social Support as Predictors of Depression among Employees in an Indonesian Holding Company

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Introduction: Depression in the workplace is a critical occupational health issue that may be influenced by job demands, work–life balance, and psychosocial support. Understanding these relationships is important for developing preventive workplace mental health strategies. This study examined the association between work demands, work–self balance, and social support with depression among employees of a holding company in Indonesia.

Methods: A cross-sectional survey was conducted during stress check program in a holding company. There were 6,737 employees participated. Variables were assessed using Short-Version New Brief Job Stress Questionnaire (SV-NBJSQ) Indonesian version. Depression was defined as a binary variable (0 = no, 1 = yes). Predictors included quantitative overload, interpersonal conflict, emotional demands, role conflict, and poor work–self balance. Protective factors included supervisor support, family/friend support, and monetary reward. Associations were analyzed using logistic regression, adjusting for demographic and work-related factors.

Results: Overall, 2.9% of employees reported depression. Significant associations were found between depression and quantitative overload (aOR = 1.37, 95% CI 1.01–1.86), interpersonal conflict (aOR = 3.88, 95% CI 2.69–5.60), emotional demands (aOR = 1.49, 95% CI 1.06–2.10), role conflict (aOR = 1.51, 95% CI 1.08–2.11), and poor work–self balance (aOR = 2.13, 95% CI 1.53–2.96). Conversely, supervisor support (aOR = 0.68, 95% CI 0.49–0.96), family/friend support (aOR = 0.52, 95% CI 0.37–0.73), and monetary reward (aOR = 0.70, 95% CI 0.50–0.99) significantly reduced the likelihood of depression.

Discussion: These findings highlight that high job demands and poor work–self balance substantially increase depression risk, while supportive supervisory relationships, strong family/friend support, and adequate rewards serve as protective factors.

Keywords: Keywords: depression, work demands, work–self balance, social support, occupational health, oil and gas workers

ME-19

Comparison of the Disclosure of Workplace Mental Health Measures and Facilitates Factors in Taiwan's Excellent Healthy Workplaces between Manufacturing and Non-Manufacturing Industries

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Award-winning enterprises in Taiwan's "Excellent Healthy Workplace" program are recognized for workplace health initiatives. Given the growing importance of workplace mental health, reports from these enterprises offer insights into measures and facilitating factors. This study aimed to (1) describe workplace mental health measures and facilitating factors, and (2) compare these between manufacturing and non-manufacturing enterprises, given higher case counts of occupational mental illness in the latter.

We reviewed 181 reports from award-winning enterprises (112 manufacturing, 69 non-manufacturing) covering 2014–2023, excluding 2015–2016 when no reports were issued. For enterprises with same awards, only the latest report was included. Seventeen binary indicators of mental health measures were developed from the Occupational Safety and Health Act and guidelines, grouped into training, support services, and risk assessment. Facilitating factors were identified from narratives. Disclosure rates for each measure and facilitating factors, calculated as the number of reports disclosing it divided by the total number of reports, were compared across industries using Fisher's exact test.

The most common mental health measures were health promotion activities (59%), counseling (22%), and employee assistance programs (20%); top facilitating factors were supervisor support (43%) and employee rewards (34%), with others under 10%. Three measures differed significantly: non-manufacturing enterprises reported higher disclosure of mental health courses ($p = 0.011$), counseling ($p = 0.026$) and assessment ($p = 0.028$), compared with manufacturing enterprises. No significant differences were found for facilitating factors.

Among award-winning enterprises, non-manufacturing enterprises disclosed mental health measures more often than manufacturing, while supervisor support and employee rewards were the most common facilitating factors in both. Despite a higher national burden of occupational mental illness in non-manufacturing industries, these enterprises may respond with more extensive initiatives, reflecting greater needs or work demands. Findings highlight shared strengths and sector-specific practices to guide workplace

mental health improvements.

Keywords: occupational health, mental health, facilitating factor

ME-20

Work Stress and Sleep Quality Among On-Call Elevator Maintenance Workers in Taiwan

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Background: On-call duties can increase work stress by requiring workers to respond at any time, disrupting rest and recovery. Elevated work stress can impair recovery and reduce sleep quality. Elevator maintenance workers face particularly demanding on-call schedules, often responding to malfunctions, with both Taiwan's hot summer climate and high elevator usage adding to their workload. This study examined the association between work stress and sleep quality in this population.

Methods: In July 2025, 56 elevator maintenance workers from northern and southern Taiwan (29 fault-repair, 27 duty center) completed the Chinese Job Content Questionnaire (JCQ) (five subscales: job control, psychological job demands, physical job demands, social support at work, work rewards) and the Chinese Pittsburgh Sleep Quality Index (PSQI). Group differences were analyzed with Mann-Whitney U, poor sleep prevalence (PSQI > 5) with Fisher's exact test, and within-group associations with Spearman's correlation.

Results: Fault-repair personnel were predominantly male (86%) and younger (mostly aged 30–49), while duty center staff were 48% male and mostly aged 40–59. Poor sleep quality was common in both groups (70% vs 72%; p= 0.2288), with no significant difference in mean PSQI scores (7.3 vs. 7.9; p=0.722).Job control was the only factor significantly different between groups(p = 0.019).Only physical job demands were significantly correlated with poorer sleep quality in fault-repair personnel (ρ=0.436, p=0.018); no significant associations were observed in duty center staff.

Conclusion: Poor sleep quality was prevalent in both groups of on-call elevator maintenance workers. Physical workload was the only work stress factor significantly associated with poorer sleep quality, and this relationship was observed exclusively in fault-repair personnel. These findings underscore the need for targeted interventions to reduce physical workload and improve sleep health among workers with physically demanding on-call responsibilities.

Keywords: Work stress, Sleep quality, On-call duties, JCQ, PSQI

ME-21

Work-Related and Organizational Predictors of Stress among Female Employees in A Holding Company

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Introduction: Stress remains a significant occupational health concern, particularly among women, who demands from work and family roles. Identifying contributing factors is essential for targeted interventions. This study aimed examining the prevalence of stress among female employees and associated factors.

Method: This is a cross-sectional study in a holding company in Indonesia. The study used Short-Version New Brief Job Stress Questionnaire (SV-NBJSQ) Indonesian version. Data was collected with convenience sampling during stress survey.

Results: Among 1,570 female employees included, 29.2% reported experiencing stress. Bivariate analyses showed significant associations between stress and multiple factors, including quantitative overload, interpersonal conflict, emotional demands, role conflict, poor work–life balance, low job control, limited career opportunities, lack of supervisor support, insufficient monetary and esteem rewards, and weak organisational justice ($p < 0.001$ across most factors). Logistic regression identified key predictors: emotional demands (OR 3.67, 95% CI 2.87–4.69), role conflict (OR 1.56, 95% CI 1.21–2.01), interpersonal conflict (OR 1.41, 95% CI 1.10–1.82), and low family/friend support (OR 0.55, 95% CI 0.41–0.74). Conversely, supportive leadership and workplace engagement showed protective effects against stress.

Discussion: Nearly one in three female employees experienced stress, largely influenced by psychosocial work environment and organisational support systems. Emotional demands emerged as the strongest predictor, highlighting the importance of addressing workload and emotional regulation in high-pressure settings. Enhancing career opportunities, strengthening supervisor support, and promoting fairness and recognition may reduce stress prevalence. These findings emphasise the need for comprehensive organisational strategies focusing on psychosocial risk management, with special attention to gender-related vulnerabilities.

Keywords: work stress, female employees, psychosocial factors, organisational support, Indonesia

ME-22

The Mediating Role of Personal Mastery in the Effect of Workload on Lecturers' Social Well-Being

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Social well-being is a vital yet often neglected aspect of lecturers' professional lives. While psychosocial environment shape how lecturers engage socially, personal mastery—the belief in one's ability to manage challenges—may enhance this connection.This study investigates the effect of the workload as part of psychosocial environment on lecturers' social well-being, with personal mastery as a mediator. Using a correlational quantitative approach, data were collected from 119 lecturers from 5 universities in Bandung, Indonesia and analysed using PLS-SEM. Results indicate that workload does not significantly affect social well-being directly but significantly influences personal mastery. Furthermore, personal mastery has a strong direct impact on social well-being and serves as a significant mediator in the relationship. These findings highlight the importance of supporting personal development to enhance the social well-being of academic staff.

Keywords: Lecturers, mediation, personal mastery, social well-being, workload

ME-23

Promoting Workplace Psychological Wellbeing: Evaluation of a Multidisciplinary Employee Assistance Programme at a Tertiary Hospital in Asia

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Background: The implementation and effectiveness of Employee Assistance Programmes (EAPs) has not been well described nor well studied in the literature. This study seeks to describe and evaluate an insourced, multidisciplinary EAP consisting of Occupational Medicine Physicians, Psychiatrists, Psychologists as well as Human Resource Professionals to promote psychological wellbeing among healthcare workers in a tertiary hospital in Singapore.

Methods: This study utilised a health service evaluation framework and analysed the implementation of the EAP across five dimensions, namely: Reach and Adoption, Effectiveness, Implementation and Maintenance. Anonymous longitudinal data of all participants enrolled into the EAP programme between 01 Jan 2024 to 30 April 2025 were collected for analysis.

Results: Data from a total of 39 EAP participants were analysed. Nursing staff formed the largest proportion of staff who utilised the EAP at 51.3%. The most common route of access to the EAP programme was through referral by the staff's department at 43.6%, followed by self-referral (23.1%) and referral by a peer-supporter (23.1%). The most common reason for EAP attendance was work-related stressors at 48.7%. A statistically significant decrease between the mean pre-EAP Patient Health Questionnaire-4 (PHQ-4) score (6.72) and mean post-EAP PHQ-4 score (2.76) was noted. 59% of participants were able to return to work. An estimated average running cost of $648.48 per participating staff was required to sustain the programme.

Conclusion: This is the first longitudinal study in Southeast Asia describing the evaluation of an EAP. Using an objective clinical questionnaire, an improvement in psychosocial wellbeing was noted for EAP participants. The evaluation methods and outcomes described provide a framework for companies and human resources department to review ongoing EAPs as the organisation and structure of EAPs continue to evolve.

Keywords: Occupational mental health, Occupational medicine, Employee Assistance Program

ME-24

Longitudinal associations between workplace inclusion and short- and long-term stability of employee mental health

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Objective: Inclusive workplaces, where employees' sense of belongingness and uniqueness are respected, are increasingly recognized as conducive to better mental health. However, prior studies have mainly examined between-person differences, often overlooking within-person stability and failing to consider both short- and long-term time lags. This study examined whether workplace inclusion contributes to short- and long-term stability of employees' psychological distress.

Methods: Two panel surveys were conducted using an online research company. The three-wave short-term survey involved 1,200 employees in February 2025 (time lag: one week). Of 1,159 retained respondents, 484 men and 383 women with valid responses were analyzed. The three-wave long-term survey involved 10,000 employees between February 2024 and August 2025 (time lag: 9 months). Of 2,891 retained respondents, 1,645 men and 722 women with valid responses were analyzed. Workplace inclusion was measured by the Japanese Work Group Inclusion Scale, and psychological distress by the Japanese K6 scale. Random-intercept cross-lagged panel models (RI-CLPM) stratified by gender were applied, controlling for time-varying covariates.

Results: For the short-term survey, between-person analyses showed negative associations between workplace inclusion and psychological distress for both men ($r = -0.51$ [−0.58, −0.43]) and women ($r = -0.41$ [−0.50, −0.31]). Furthermore, among men, the within-person negative autoregressive effect of psychological distress ($a = -0.46$ [−0.59, −0.37])—reflecting instability in mental health—was attenuated when between-person workplace inclusion was high ($a = -0.12$ [−0.27, 0.04]). This moderating effect was consistently observed in the long-term survey for both genders.

Conclusion: Workplace inclusion contributes not only to better overall levels of mental health across employees but also to greater stability of mental health within individuals over time. These findings provide new evidence supporting workplace inclusion as a potential target for organizational interventions to promote psychological well-being.

Keywords: Workplace inclusion, Mental health, Psychological distress, Longitudinal study, Random-intercept cross-lagged panel model

ME-25

Occupational Heat Stress and Quality of Life in Oil Palm Farmers: Evidence from a Cross-Sectional Study

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Global warming and rising temperatures have instantly affected outdoor occupations, particularly oil palm farmers, who are crucial to the economy but whose occupational health dangers are typically disregarded. This cross-sectional study aimed to investigate the factors related to heat exposure in the workplace and its effects on health and quality of life. Questionnaires and WBGT environmental heat evaluations were conducted on 135 registered oil palm farmers in Nakhon Si Thammarat Province, Thailand. Data was analysed using descriptive statistics, Pearson correlation, or Spearman rank correlation. Heat exposure affected 61.5% of participants, while 48.9% had heat-related diseases such as heat rash and exhaustion. Work variables, such as rest duration, were closely associated with health outcomes. Farmers adopted protection actions such as drinking water, seeking shade, bathing frequently, and wearing protective equipment. Regarding quality of life, the majority of participants indicated moderate stress levels but expressed apprehensions over income and expenditures, with 17.0% impacted by rising expenses and reductions in palm oil earnings. Environmental heat levels were linked to heart rate, income, costs, and healthcare access. Results revealed associations with sleep quality and a background of heat-related ailments. Notably, 68.9% of farmers operated at temperatures exceeding those authorised for moderate-to-heavy work. The maximum WBGT was 49.4°C, higher than the dry bulb temperature of 35.1°C, indicating substantial radiant heat sources. A higher subjective Heat Index of 40.6 ± 1.39°C was discovered, positively correlated with healthcare access, health outcomes, and mental stress. This study shows that occupational heat exposure negatively impacts oil palm farmers' health and quality of life, a vital but underserved occupational health population. This study guide preventive interventions, heat surveillance in workplaces, and farmer self-care education to ensure sustainable and equitable well-being across all occupational groups.

Keywords: Hot Weather, Health, Quality of Life, Oil Palm Farmers, Occupational Health Epidemiology

ME-26

Behavioral Determinants of ODGJ in Rural Communities: The Role of Stigma, Knowledge, and Attitudes in Informal and Socioeconomic Groups of Workers

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Background: People with Mental Disorders (ODGJ) still receive bad treatment in rural areas. Sociodemographic factors such as age, education, occupation, and income affect suboptimal behavior. This study aims to map the characteristics of respondents as well as identify the dominant factors that affect people's behavior towards ODGJ in at-risk populations.

Methods: This study employed a cross-sectional design involving 210 respondents in rural areas of Bandung Regency, Indonesia. This research was conducted in August 2023. Data collection used structured and validated questionnaires that included variables of stigma, knowledge, attitudes, and behaviors. Data were analyzed descriptively (age, education, occupation, and income) and inferentially (ordinal logistic regression to test the influence of stigma, knowledge, and attitudes on behavior).

Results: The majority of respondents are 30 – 49 years old (65%), have a high school/vocational education (60%), work as a farmer/breeder (32%) or self-employed (28%), and have a monthly income of less than Rp. 1,000,000 (45%). The results of the multivariate analysis showed that the variables Attitude (β=-0.60, p=0.01) and stigma (β=-0.45, p=0.02) significantly affected behavior, while knowledge did not (p=0.21).

Discussion: Health interventions need to prioritize attitude modification and stigma reduction, especially in informal working groups with economic limitations.

Keywords: People with Mental Disorders, Behavioral, Sociodemographics, Low Income, Informal Workers

ME-27

Association of Work-Family Conflict with Psychological Distress and Mental Disorder Among Japanese Working Women

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Objectives: The current study aimed (1) to examine the associations between bidirectional work-family conflict, comprising work-to-family conflict (WFC) and family-to-work conflict (FWC), and two mental health outcomes: psychological distress and mental disorder; and (2) to examine the associations between demographic variables and work-family conflict among Japanese working women.

Methods: A cross-sectional online survey was conducted among 19,652 Japanese working women in June 2024. Psychological distress was assessed using the Kessler Psychological Distress Scale, and mental disorder was identified using a screening question about medical consultation or treatment. Work-family conflict was measured using the Work and Family Conflict Scale. Multivariable logistic regression analyzed associations between work-family conflict and mental health outcomes, while univariate linear logistic regression examined the associations between demographic variables and work-family conflict.

Results: Among participants, 9.5% reported psychological distress, and 5.3% reported receiving consultation or treatment for mental disorder. Severe WFC and FWC were significantly associated with psychological distress (WFC: odds ratio [OR] 4.94, 95% confidence interval [CI]: 4.19–5.81; FWC: OR 3.44, 95% CI: 2.94–4.01; both $p < 0.001$) and mental disorder (WFC: OR 1.76, 95% CI: 1.46–2.12; FWC: OR 1.69, 95% CI: 1.40–2.04; both $p < 0.001$). Long working hours and caregiving responsibilities were strongly associated with WFC and FWC.

Conclusions: Work-family conflict is significantly associated with adverse mental health among Japanese working women. Organizations need to address this issue in the workplace, particularly regarding flexible work arrangements and caregiving support, to promote the mental well-being of working women.

Keywords: work-family conflict, mental health, women, workers

ME-29

Validity and reliability of the Thai version of the Work Functioning Impairment Scale (Thai WFun)

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Background: In Thailand's agricultural sector, physically demanding labor and a high prevalence of chronic health conditions present substantial challenges to maintaining work capacity. However, few tools are available to assess work capacity among farmers.
Objective: This study aimed to evaluate the validity and reliability of the Thai version of the Work Functioning Impairment Scale (Thai WFun).
Methods: The study involved 385 rice farmers from Prakhon Chai district, Buriram province, Thailand, during November and December 2023. The WFun was translated from Japanese to Thai using a standard translation procedure. Participants then completed questionnaires, including the Thai WFun and the Work Ability Index (WAI). The convergent validity between the Thai WFun and WAI was examined through analysis of variance with linear trend tests. The factorial validity was assessed through confirmatory factor analysis (CFA) based on a one-factor model. The reliability of the Thai WFun was assessed using Cronbach's alpha.
Results: A significant linear trend was observed, indicating that as WAI scores decreased, Thai WFun scores increased ($p < 0.001$). Sub-factor analyses revealed similar patterns, including the physical and mental demands of work, a comparison with highest work ability ever, and absenteeism in the past year (all $p < 0.001$). CFA results demonstrated a reasonable model fit. The scale exhibited moderate internal consistency, with Cronbach's alpha of 0.668.

Conclusions: The findings validate the Thai WFun as a reliable tool for assessing work capacity among rice farmers, with potential to guide tailored occupational health strategies in agriculture.

Keywords: Agriculture, Aging, Occupational health, Presenteeism, Work capacity

ME-30

Occupational Stress Among Urban Educators: Insights from ST-5 Screening in Bangkok Schools

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Background: Teacher stress is a growing concern in educational systems worldwide, with implications for both individual well-being and institutional performance. In Bangkok, school teachers often face multifaceted responsibilities—including instructional, administrative, and service-related tasks—which may contribute to elevated stress levels. Understanding the severity and distribution of stress among teachers is essential for developing effective support mechanisms and policy interventions. This study aims to assess the levels of job stress among school teachers in Bangkok and explore variations across demographic and occupational subgroups.

Methods: A cross-sectional study was conducted among 304 extra-large school teachers in Bangkok. Job stress levels were assessed using the ST-5 questionnaire developed by the Department of Mental Health, Ministry of Public Health, Thailand. This validated screening tool measures emotional distress and stress symptoms over the past two weeks. Descriptive statistics were used to classify stress levels (e.g., low, moderate, high), socio-demographic, health behaviors and data relating to work (e.g., grade level taught, classroom size and teaching hours per week)

Results: The results indicated that the participants had a mean age of 36 ± 7.73 years. The majority were female (69.7%) and single (66.1%). Most participants did not engage in regular physical activity (59.2%), did not consume alcohol (65.1%), and consumed caffeine (86.2%). On average, participants had 10 ± 6.82 years of teaching experience and spent 20 ± 5.74 hours teaching per week. Interestingly, while nearly half of the teachers experienced moderate stress (45.1%), a significant portion (11.8%) reported high stress levels, suggesting the need for closer attention to this vulnerable group.

Conclusion: The findings revealed that most teachers engaged in low levels of physical activity, which may contribute to elevated stress. These findings underscore the importance of integrating physical activity promotion into occupational health initiatives for educators. Providing regular and accessible opportunities for exercise—both during and outside of school hours—could play a vital role in enhancing teachers' physical and mental health, thereby improving their overall job performance and quality of life.

Keywords: Mental health, Physical activity, Stress, Teachers, Thailand

ME-31

Effectiveness of a Web-Based Mental Health Program among Secondary School Students in Bangkok

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Background: Stress is a natural response of the human body to external stimuli or changes in the environment. Prolonged or unmanaged stress can negatively affect both physical and mental health, leading to conditions such as depression, insomnia, infections, gastric ulcers, cardiovascular diseases, and certain cancers. The COVID-19 pandemic has further heightened mental health challenges among students.

Objective: This study aimed to evaluate the effectiveness of a web-based mental health promotion program in reducing stress levels among secondary school students in Bangkok and to develop appropriate approaches for mental health care and management through online learning.

Methods: A quasi-experimental one-group pretest–posttest design was employed. Participants included 9,722 students from 24 secondary schools in Bangkok who participated in the program between May and August 2023. Students completed a 20-item mental health risk assessment adapted from the Department of Mental Health's SPST-20 both before and after the intervention. The web-based program was delivered via the Moodle learning platform and consisted of five learning modules on psychological capital—covering overall psychological resources, hope, optimism, self-efficacy, and resilience—along with three supplementary videos on mental health self-care and career guidance.

Results: Before participation, 4,991 students (51.34%) demonstrated high stress levels (scores >19), while 4,731 students (48.66%) had normal stress levels. After the intervention, the number of students with high stress decreased to 4,000 (41.14%), while those with normal stress increased to 5,722 (58.86%), representing an improvement of 10.20%. The mean stress score significantly decreased from 20.28 ± 8.96 to 17.86 ±

10.32 ($p < 0.01$), analyzed using a paired-samples t-test. Female students and upper secondary students exhibited higher stress levels compared to other groups.

Conclusion: The web-based mental health program delivered through the Moodle platform was effective in reducing stress among secondary school students in Bangkok. The program enhanced students' awareness and self-management of their mental well-being. Establishing a sustainable network of collaboration among schools, teachers, and mental health professionals is recommended to strengthen mental health promotion and early intervention for students.Abstract starting from back ground…

Keywords: COVID-19, Mental health, Stress, Students, Thailand

ME-32

More Than Just Teaching: The Hidden Burden of Bangkok School Teachers

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Background: Teacher stress is a critical factor influencing the quality of educational systems. In Bangkok, teachers often face varied workloads, depending on the school's size, and are responsible not only for instructional duties but also for administrative and service-related tasks. These conditions may contribute to elevated stress levels and presenteeism where individuals attend work despite health issues, potentially compromising performance and well-being. The aim of this study was to determine the prevalence of job stress and presenteeism among school teachers in Bangkok, and to identify psychosocial and occupational factors associated with these conditions. The study also aims to explore how interpersonal relationships, coping mechanisms, and personal resilience influence presenteeism in educational settings.

Methods: A cross-sectional study will be conducted among 570 school teachers in Bangkok. Data will be collected using a structured questionnaire covering socio-demographic characteristics, health behaviors, work-related factors, bullying, student-teacher relationships, social support, coping strategies, core self-evaluations, optimism, resilience, job stress, and presenteeism. Validated instruments include the Short Negative Acts Questionnaire (SNAQ), Pianta Student-Teacher Relationship Scale (STRS), and Stanford Presenteeism Scale (SPS-6). Descriptive statistics will summarize the data, while multivariable logistic regression and multiple linear regression will be used to assess the associations among variables.

Results: Preliminary findings are expected to reveal the prevalence of job stress and presenteeism, along with key psychosocial and occupational factors. Patterns may

emerge across different school sizes and roles, highlighting the influence of bullying, social support, and personal resilience on presenteeism.

Conclusion: This study aims to provide insights into the determinants of job stress and presenteeism among school teachers in Bangkok. The findings may inform targeted interventions and policy recommendations aimed at enhancing teacher well-being and improving educational outcomes in urban school settings.

Keywords: Mental health, Presenteeism, Stress, Teachers, Thailand

ME-33

Workplace Stress and Productivity loss: Evidence from Formal Indonesian Workers

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Introduction: Workplace stress is a well-recognised risk factor for reduced productivity and overall organisational performance. This study examines the relationship between workplace stress and productivity loss among formal Indonesian workers.
Methods: A cross-sectional analysis was conducted on 6,737 employees of formal sector workers. Stress outcomes were assessed with SV-NBJSQ, samples with at least frequently or always complaining one or more listed symptoms were counted to have stress outcome. Productivity loss was measured using absolute presenteeism scores from WHO-HPQ. Mean differences were tested with independent t-tests, and regression analysis was performed adjusting for socio-demographic and work-related factors.
Results: Of the total respondents, 21.7% reported stress. Workers with stress had significantly lower absolute presenteeism scores (Mean = 76.39, SD = 15.15) compared with non-stressed workers (Mean = 85.39, SD = 10.08, $p < 0.001$). Regression analysis showed that stress was a significant negative predictor of productivity (B = -8.99, $p < 0.001$), even after adjustment.
Discussion: The findings confirm the evidence in Indonesian setting that stress is strongly associated with lower workplace productivity. From an occupational health perspective, integrating stress surveillance into workplace health programmes enables early identification of productivity-related risks. Preventing workplace stress not only benefits employees' psychological well-being but also sustains organisational performance and competitiveness. Evidence-based stress prevention strategies—such as workload management, supportive leadership, and mental health promotion—should therefore be prioritised in workplace health interventions.

Keywords: workplace stress, presenteeism, WHO-HPQ, NBJSQ, occupational health, productivity, Indonesia

PH-34

Is happiness related to chronic inflammation? A cross-sectional and prospective analysis among male workers in Japan

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Background: There is a long-standing idea that happiness causes people to live longer and healthier lives. A meta-analysis based on 24 studies estimated that happy people live 14% longer than unhappy people (Howell et al., 2007). Chronic low-grade inflammation may be a key mediator of this relationship. This study examined the cross-sectional and prospective associations with subjective happiness and inflammatory mediators among male workers in Japan.

Methods: A two-year prospective cohort survey was conducted from 2016 to 2018 at a Japan-based global chemical company as part of its annual health examinations. A total of 1,432 male employees aged 20–65 years (mean age 42 years) underwent blood draws to measure circulating inflammatory mediators (Interleukin [IL]-4, IL-5, IL-6, IL-8, IL-12/IL-23p40, Tumor Necrosis Factor [TNF]-α, Interferon [IFN]-γ, and high-sensitivity C-reactive protein [hs-CRP]) over three consecutive years. They also completed a questionnaire regarding global happiness. Global happiness was measured by a single item at the baseline: How would you rate your happiness on a scale of 1 (unhappy) to 10 (happy)? Pearson's correlation coefficients were calculated between global happiness at baseline (T0) and the inflammatory mediators (T0, one year later (T1), and two years later (T2)) after converting the non-Gaussian variables for normalization.

Results: Our preliminary analysis revealed that higher happiness scores were consistently associated with decreased IL-6 levels at T0 ($r = -0.066$, $p = .012$), T1 ($r = -0.057$, $p = .048$), and T2 ($r = -0.063$, $p = .037$). A higher global happiness score was also inversely related to a decrease in TNF-α ($r = -0.062$, $p = .038$) and IFN-γ ($r = -0.063$, $p = .035$) at T2.

Conclusion: Our findings suggest that subjective happiness may have a positive impact on inflammatory processes, which could explain why happier individuals tend to live longer.

Keywords: Happiness, Inflammation, Prospective study, Japanese, Workers

PH-35

Factors affecting seasonal flu vaccine uptake among healthcare workers in a tertiary public hospital

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Background: Given the nature of their work, healthcare workers (HCWs) are at increased risk of exposure to the seasonal flu. Historically, flu vaccine uptake rate among hospital HCWs was around 85%. Post-pandemic, the flu vaccine uptake rate dropped to 55%. We studied the factors affecting seasonal flu vaccine uptake among HCWs.

Methods: Based on the Health Belief Model and existing literature, a 44-question cross-sectional survey was disseminated to all HCWs in the healthcare institution, comprising demographics and knowledge, attitudes and practices towards the flu, flu vaccine, and workplace vaccination programme. Exploratory factor analysis was performed to classify factors, and logistic regression was performed to determine factors affecting vaccine uptake.

Results: 7% of the total HCW population responded (n=701). Respondents had a median age of 31-40 years, were majority female, nurses, and degree holders. The median duration of work in healthcare was 10 to <15 years. There was no significant association between demographics and vaccine uptake, except that those who had worked in healthcare for >25 years were 0.18 times (95% CI: 0.04, 0.92) as likely to get vaccinated compared to those who had worked <1 year in healthcare ($p<0.05$).

Previous vaccine behaviour was the main factor strongly associated with future vaccine uptake. Those who were vaccinated in prior years were 2 to 2.6 times likely to get vaccinated in the future ($p<0.001$).

Exploratory factor analysis classified attitudes and practices towards flu vaccination into 7 main factors. Of these, perceived barriers, promotional efforts, perceived susceptibility and perceived benefits and norms were significantly associated with vaccine uptake.

Conclusion: Building a consistent practice of flu vaccination can spur vaccine uptake during vaccination exercises. Targeting the factors in the Health Belief Model can improve vaccine uptake. Focused group discussions may be a useful next step.

Keywords: flu vaccine, workplace-based vaccination, health belief model

PH-36

Sports Therapists for RSAF Aircrew: A Single-Centre Pilot Interventional Study

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Background: The Republic of Singapore Air Force (RSAF) fighter aircrew population has the highest incidence of prolonged restriction (≥3 months) from vocational duties due to musculoskeletal (MSK) conditions. Occupational exposures such as high +Gz forces, heavy helmet/optical device weights, and unnatural non-ergonomic body postures/movements constitute risk factors for the development/exacerbation of MSK conditions in the military aviation environment.

Methodology: The RSAF Human Performance Maximisation Working Group initiated a non-experimental interventional study where sports therapists were forward-deployed to reduce barriers to initial assessment and care, shape positive health-seeking behaviours, and minimise absenteeism for mild MSK conditions. In the pilot phase, one sports therapist was assigned to provide timely access to pre-/rehabilitative services for five operational fighter squadrons across two air bases between 2 Jan and 31 Jul 2025. Data on service utilisation and participant demographics was collected. A post-intervention qualitative survey was administered, focusing on four key areas: (1) utilisation barriers, (2) therapy effectiveness, (3) service accessibility and (4) symptomatic recurrence/persistence.

Results: 256 therapy sessions were administered to 89 unique participants within this 7-month period. Sessions targeting the lower back had the highest frequency (114), followed by preventive maintenance (70) and the neck (69), indicating that the axial spine was most affected. 82.8% (53/64) of survey respondents utilised the sports therapy services, with majority providing excellent ratings for therapy effectiveness and service accessibility. Utilisation barriers included lack of awareness/understanding of the sport therapist's role, and schedule conflicts. 30.3% (17/56) of surveyed participants had symptomatic recurrence/persistence, with high chronicity in the majority.

Conclusion: Despite limitations of selection and reporting biases, high utilisation rates and positive feedback in terms of low utilisation barriers, excellent therapy effectiveness and service accessibility, and reduced symptomatic recurrence/persistence suggest that forward-deployment of sports therapists is an effective solution to addressing MSK-related issues in the fighter aircrew population.

Keywords: Sports therapy, Musculoskeletal conditions, Military aviation, Fighter aircrew, Ergonomics

PH-37

Occupational Hand Crush Injuries in Southern Taiwan: Descriptive Epidemiology from a Single-Center Retrospective Review

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Background

Hand injuries are among the most prevalent occupational injuries in industrial environments, resulting in considerable loss of labor productivity and increased healthcare costs. This study aimed to describe the epidemiological and demographic characteristics of occupational hand crush injuries, with the objective of identifying high-risk populations and common injury patterns to guide prevention strategies.

Methods

We conducted a retrospective, single-center chart review at Chi Mei Medical Center in southern Taiwan. Eligible cases involved hand crush, entrapment, or cutting mechanisms caused by machines or objects during work. Data were collected between January 1, 2024, and June 30, 2024. Demographic variables and injury characteristics were analyzed descriptively, including sex, age group, nationality, affected hand, and injured digit.

Results

A total of 85 cases were identified. The most frequently affected age group was 41–50 years. The majority of injuries occurred in male workers and domestic (local) laborers compared to foreign workers. Left-hand injuries were more common than right-hand injuries. The index finger was the most frequently injured digit.

Conclusions

This study shows that occupational hand crush injuries predominantly affect male and domestic (local) workers, with the left hand—particularly the index finger—at the greatest

risk. These findings highlight the need for targeted prevention strategies, including focused workplace safety training, engineering controls, process improvements, and personal protective equipment (PPE) policies tailored to high-risk groups.

Discussion

This study provides empirical evidence to inform regional occupational safety and prevention strategies. However, the findings are limited by its single-center design and relatively small sample size. Future research with larger, multi-center cohorts is warranted to identify definitive risk factors and develop more targeted preventive measures.

Keywords: Hand injury; Crush injury; Occupational injury; Epidemiology; Descriptive study

PH-38

Prevalence of non-communicable diseases and factors retated to occupational physical activity among workers in the Amata Nakorn Industrial Estate

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The prevalence of non-communicable diseases (NCDs) is increasing among the working-age population, with occupational conditions potentially contributing to this trend. This study aimed to assess the prevalence of NCDs among workers in the Amata Nakorn Industrial Estate and to examine associations with occupational physical activity levels.
A retrospective analysis was conducted using data from the medical statistics system of Vibharam Amata Nakorn Hospital. In 2019, 1,618 workers who underwent annual health checks were included. Descriptive statistics were used to report the prevalence of NCDs. A subgroup of 1,212 workers with complete job characteristic data was analyzed based on physical activity levels: 1,034 with light-level and 178 with moderate-level activity. Multivariate logistic regression was applied to assess associations between physical activity and disease risk, adjusting for age and gender.
The most common NCDs included obesity (28.67%), hypertension (13.91%), suspected diabetes mellitus (3.50%), abnormal triglycerides (27.69%), total cholesterol (53.74%), low HDL (10.31%), and high LDL (12.32%). Additional findings included abnormal electrocardiograms (11.50%), kidney function (8.05%), liver function (1.58%), and occupational vision tests (72.92%). Workers with light-level activity had a 1.5 times higher risk of obesity (AOR: 1.50, 95% CI: 1.07–2.10) and were 15 times more likely to show abnormal electrocardiograms (AOR: 15.22, 95% CI: 6.71–34.51) compared to those with moderate activity.
In conclusion, obesity, dyslipidemia, hypertension, and diabetes mellitus were common NCDs among industrial workers. Low occupational physical activity was significantly associated with increased NCD risk. Workplace health promotion and lifestyle modifications are essential to reduce NCD burden among Thai workers.

Keywords: Prevalence, Occupational physical activity, Non-communicable diseases, Workers, Amata Nakorn Industrial Estate

PH-39

Cross-Sectional Study on the Smoking Prevalence, Factors Influencing Smoking Initiation/ Cessation and Occupational Impact of Smoking in the Singapore Navy

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Literature had shown that smoking cessation conferred benefits in health, reduces healthcare cost and all-cause mortality.

Noting the unique occupational environment and physical fitness requirements of the military, the study aimed to determine smoking prevalence, level of awareness of smoking cessation programmes, factors influencing smoking initiation/ cessation and occupational impact of smoking on obesity and fitness levels.

The anonymised dataset obtained from a Navy-wide Smoking Cessation survey comprised responses on smoking status, awareness of smoking cessation programmes, reasons for smoking initiation and cessation. Demographic data included age, Body Mass Index (BMI) and fitness testing results.

The prevalence of smokers was 18.9%. Majority of smokers (97.2%) had awareness of available smoking cessation programmes. The top 3 factors for smoking initiation included “Out of habit”, “Stress reduction” and “Social bonding”. The top 3 factors for smoking cessation included “Health reasons”, “Family and friends” and “Cost of cigarettes”.

The “Obese” category for BMI and the “FAILED” category for fitness testing had the highest prevalence of smokers at 24.1% and 31.2% respectively. Multinomial logistic regression adjusted for age found that smokers had 53.4% higher odds of being overweight and 77.4% higher odds of being obese ($p<0.001$). Smokers were also 47% less likely to obtain a SILVER grade and 76% less likely to obtain a GOLD grade in fitness testing ($p<0.001$).

The association with increased obesity and reduced physical fitness demonstrated the negative impact of smoking on occupational fitness. These insights would guide future interventions to reduce smoking prevalence in the Navy.

Keywords: Smoking Prevalence, Smoking Cessation, Navy, Occupational Fitness

PH-40

Pre-shift exercise regime for nurses at a tertiary hospital in Singapore: A pilot study in preventing work-related musculoskeletal injuries

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Introduction: Nursing activities often contribute to work-related musculoskeletal injuries (WRMI), resulting in absences, inadequate staffing and high turnover.

Aim: To determine effectiveness of a 12-minute pre-shift flexibility and resistance training regime in preventing WRMI in nursing staff.

Methods: A 4-month pilot study was conducted on 167 nursing staff across 4 wards. All wards received posters on WRMI prevention. Participants from intervention wards participated in a pre-shift video-led exercise regime at and out of the workplace. An anonymised survey was conducted pre and post-intervention, and incident reports were analysed.

Results: 114 participants (68.2%) reported experiencing musculoskeletal symptoms in the last year. 77.1% attributed their symptoms to work and 50.9% occurred within the first year on job. Physical factors such as repetitive and forceful movements were the predominant cause. Commonly affected areas include lower back (79.8%), shoulder/upper limb (57.9%) and neck (30.7%). Most reported a low frequency strength training (73.6%) at baseline.

Over the study period, control wards had 3 cases compared to 4 in intervention wards. Compared over the same period the year before, control wards showed a reduction in cases, while intervention wards had slight increase.

Of the 50 nurses who participated in pre-shift exercises, 70% were keen to continue. Majority preferred the conduct of exercise at the workplace (68.9%) and during working

hours (50.9%). Of note, 62.7% supported mandating participation for those eligible. Conclusion: Pre-shift flexibility and resistance exercises may prevent WRMI and are well-received in healthcare workers. Further quantitative studies are recommended to determine its effectiveness.

Keywords: Work-related Musculoskeletal Disorders, Nurse, Pre-shift exercises

PH-41

Pharmacist Burnout: Prevalence, Determinants, and Interventions—A Narrative Review (2020–2025)

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Background & Objectives: Burnout, characterized by emotional exhaustion, depersonalization, and reduced personal accomplishment, adversely affects pharmacists' health, performance, and retention. This narrative review synthesized recent evidence (2020–2025) to examine the prevalence, determinants, and potential interventions for pharmacist burnout.

Methods: Systematic searches were conducted in Ovid MEDLINE, Embase, Cochrane Library, and CINAHL. Eligible studies included systematic reviews, meta-analyses, cross-sectional and cohort studies, and randomized controlled trials (RCTs). Findings were narratively synthesized.

Results: Burnout prevalence among pharmacists was high, with pooled estimates around 51% and subgroup rates up to 79% in early-career pharmacists. Specific populations showed higher risks: solid organ transplant pharmacists (63–65.9%), ICU pharmacists (38.1% overall; 64% meeting ≥1 domain), Canadian hospital pharmacists (61.4% with high emotional exhaustion), and U.S. health-system pharmacists (55.5% at risk). Key determinants included workload and staffing. In ICU settings, each additional patient assignment (OR = 1.03) and longer overtime hours (OR = 1.18) were significantly associated with burnout. Lack of protected administrative time (reported by 65.3% of U.S. clinical pharmacists) was identified as a modifiable organizational factor. Burnout strongly correlated with turnover intention (OR = 8.05). Organizational interventions included optimized staffing ratios, team-based and cross-coverage models, scheduling reforms, and protected administrative time. At the individual/team level, professional sabbaticals may promote recovery and retention, though pharmacist-specific evidence remains limited. A multicenter RCT of Death Cafés among ICU clinicians, including pharmacists, demonstrated no significant reduction in burnout at 6 months, limited by attrition and insufficient power.

Conclusions: Pharmacist burnout is prevalent and multifactorial, driven by excessive workload, organizational constraints, and poor work–life balance. Comprehensive strategies integrating organizational reforms (staffing, scheduling, protected time) with individual and team-based supports are recommended. Standardized measurement and further high-quality, large-scale RCTs are needed to evaluate long-term effectiveness

and guide sustainable workforce strategies.

Keywords: pharmacist burnout; workforce well-being; interventions

PH-42

Comparative Analysis of Multimodal Physiological Responses in Physical and HMD-Based Virtual Environments

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The prevalence of virtual reality (VR) environments has increased over the last decade, with growing use in occupational and educational settings. However, cybersickness, characterized by nausea, motion sickness, headache, and other discomforts, remains a major barrier to its wider adoption. The medium- to long-term health effects of VR use are still unclear. Since VR work can impose a higher mental fatigue than conventional information technology (Shen R, et al., 2019), extensive VR use during a standard 40-hour workweek may lead to mental health problems associated with chronic exposure to high cognitive demands. Psychological stress activates the sympathetic nervous system, including the hypothalamus, adrenal glands, and locus coeruleus.

Previous studies have considered increased heart rate and pupil dilation to assess psychological stress (Tao D, 2019). In addition, mood and depressive symptoms have been correlated with a forward-leaning torso posture (Miragall M, et al., 2020). Recent advances have enabled head-mounted displays (HMDs) to incorporate sensing technologies capable of tracking gaze, pupil size, facial expression, and head-torso movements. To date, however, these capabilities have been used primarily as input modalities rather than as tools for health monitoring. To leverage these sensors for physiological assessment, it is essential to establish measurement and correction methods that account for the unique characteristics of HMD use. Factors such as proximity and brightness of the display, being unable to look away from the screen, and device weight can alter sensing outputs, including pupil diameter, blinking, body posture, and voice characteristics, compared to conventional environments. Without appropriate correction, these HMD-specific influences could confound stress and workload estimation.

This study aims to enable accurate monitoring of physical and mental workload in VR-based work environments. This poster presents results from our comparative analysis of multimodal physiological responses in physical and HMD-based virtual environments.

Keywords: virtual reality, head mounted display, eye tracking

PH-43

Irregular Lifestyle Behaviors and Occupational Injury: New Insights from a Large-Scale Cross-Sectional Study in Japan

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Background: An irregular lifestyle—such as having different wake and bedtimes each day, or spending time on work and non-work days in an irregular manner—may disrupt circadian rhythms, leading to various occupational safety issues. This study aimed to examine the association between irregular lifestyle and occupational injury among Japanese workers.

Methods: Cross-sectional data were obtained from the Mental Health and Lifestyle Inventory, conducted between 2007 and 2012 in 227 workplaces across Japan. Of 120,978 participants, shift workers, those with histories of mental/physical disorders, and individuals with incomplete responses were excluded, leaving 64,355 participants for analysis. Lifestyle regularity was assessed using a self-administered questionnaire with three binary items: (a) I wake up at a regular time every morning, (b) I go to sleep at a regular time every night, and (c) I try to maintain a regular routine on holidays. The outcome was defined as an occupational injury during the past 12 months that required absence from work (yes/no). Multivariable logistic regression was used to calculate adjusted odds ratios (aORs) and 95% confidence intervals (CIs), controlling for demographic, lifestyle, occupational, and psychosocial factors.

Results: Workers with an irregular wake-up times had significantly higher odds of occupational injury than those with regular wake-up time (aOR = 1.28, CI: 1.04–1.57). However, irregular bedtime was associated with higher odds in men only (aOR = 1.32, CI: 1.05–1.64). Weekend irregularity was not significantly associated with occupational

injury.
Conclusions: An irregular wake-up time was the main factor associated with an increased risk of occupational injury. Therefore, waking up at a consistent time each morning may be an effective way to promote workplace safety and health.

Keywords: Irregular lifestyle, Occupational injury, Cross-sectional study, Japanese, Workers

PH-44

Comparative Analysis of Workers' Compensation Systems in Singapore and Japan

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Objectives: Singapore and Japan have well-established workers' compensation systems which defer significantly in their structure and approach. The objectives of the paper are to identify key differences between the two systems, highlight successful practices for consideration, and critically assess the advantages and disadvantages of each approach.
Methods: A comparative analysis of workers' compensation systems in Singapore and Japan was conducted in the form of a narrative review, drawing upon published data from official national sources, peer-reviewed scientific journals, and reports from international organisations.
Results: Singapore's workers' compensation system focuses on ensuring employer competitiveness while providing workers with basic financial protection and limiting spillover costs to society through tightly scoped compensation coverage. In contrast, Japan's workers' compensation system prioritises worker health with more comprehensive compensation benefits, coverage, and clearer insurance mechanisms to recognise the true costs of poor workplace safety and health. Both Singapore and Japan face similar challenges for workers' compensation in terms of apportioning attributability of occupational diseases, coverage of special groups of workers such as self-employed workers and freelancers, and underreporting of work-related incidents.
Conclusions: A better understanding of the underlying principles and trade-offs within each workers' compensation system allows for identification of opportunities to strengthen fairness and ensure more equitable outcomes for workers, employers, and society. Both Singapore and Japan can benefit from closer collaboration to share best practices, innovative solutions, and research efforts to address shared challenges.

Keywords: Workers' Compensation, Occupational Health, Legislation, Japan, Singapore

PH-45

Prevalence and Characteristics of Nail Disorders among Sanitation Workers in Ambon City, Indonesia

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Background: Sanitation workers are routinely exposed to waste, moisture, chemicals, and repetitive trauma, placing them at increased risk of nail disorders. Although often perceived as minor, such conditions can impair comfort and reduce work productivity.
Objective: To determine the prevalence and characteristics of nail disorders among sanitation workers in Ambon City.
Methods: A descriptive cross-sectional study was conducted involving 62 sanitation workers selected through consecutive sampling. Nail examinations were performed using dermoscopy and structured observational checklists. Data were analyzed descriptively to identify the distribution of nail disorders by type and associated occupational factors.
Results: Onychauxis was the most frequent contour change, affecting 66.7% of fingernails and 47.8% of toenails. Leukonychia was the most common color change, found in 45.9% of fingernails and 37.5% of toenails. Onycholysis, representing texture changes, was observed in 17.7% of fingernails and 17.6% of toenails. Nail disorders were generally more prevalent among workers with ≥8 working hours per day compared with those working <8 hours, except for onychauxis of fingernails. Workers with ≥5 years of service exhibited higher proportions of all nail disorders compared with those with shorter service duration.
Conclusion: Onychauxis, leukonychia, and onycholysis were the predominant nail disorders among sanitation workers in Ambon City. These disorders are strongly associated with occupational risk factors, including repetitive mechanical trauma, chemical exposure, and prolonged working hours. The findings underscore the importance of occupational health strategies such as hygiene education, routine nail screening, and the use of personal protective equipment.

Keywords: dermoscopy, onychauxis, leukonychia, onycholysis, sanitation workers

PH-47

Potential Zoonotic Transmission of Hepatitis B Virus to Veterinarians in Orangutan Conservation

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Abstract: Introduction: Veterinarians who specialize in wildlife conservation, particularly those who work with orangutans, may be susceptible to zoonotic exposure. A 35-year-old male veterinarian, without any identified non-occupational risk factors for hepatitis B virus (HBV), was diagnosed with chronic hepatitis B. In 2014, he sustained a needlestick injury while providing treatment to an orangutan in Borneo. This case study evaluates the potential zoonotic transmission of HBV from orangutans to veterinarians as an occupational disease.

Method: A case-based review was conducted using a PICO framework. Literature search was performed on April 24th, 2025, across multiple databases: PubMed, Scopus, ScienceDirect, Taylor & Francis, ProQuest, and JSTOR, yielding 613 records. After removal of duplicates and screening, 5 articles met eligibility criteria for critical appraisal. Inclusion criteria were full text availability, published in English, and directly addressing HBV in orangutans, other non human primates, or zoonotic transmission. Articles were appraised with Joanna Briggs Institute (JBI) Critical Appraisal Tools and Duke Evidence-Based Practice (EBP) harm/etiology instruments.

Result: Phylogenetic analyses indicate the existence of HBV-like viruses in orangutans, exhibiting genetic similarities to human HBV. Experimental evidence demonstrates the cross species infectivity of orangutan HBV in humanized mouse models. The link between the specific injury and subsequent HBV infection is suggestive but not proven, because no direct sequencing of the patient's HBV strain is reported.

Conclusion: This case adheres to the criteria for occupational disease. It is advisable to implement enhanced biosecurity measures, vaccination protocols, and continuous surveillance to mitigate transmission risks.

Keywords: Hepatitis B, zoonosis, veterinarian, orangutan, occupational disease

PH-48

Challenges in Assessing Fitness to Work in a Preschool Teacher with Borderline Lepromatous Leprosy and Claw Hand Disability: A Case Report

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Background: Leprosy remains a stigmatized disease despite effective multidrug therapy (MDT) and clear evidence that treated patients are not infectious. This case highlights the challenge in assessing work fitness in a preschool teacher with leprosy and occupational physician's role in supporting inclusive and save reintegration.

Case Illustration: A 22 year old preschool teacher had reddish skin patches and right hand numbness for a year. Initially misdiagnosed, she was later confirmed to have borderline lepromatous leprosy with grade 2 disability (claw hand) and high bacterial index. After five months of MDT, her morphology index improved. She remained clinically stable, with mild activity limitation (SALSA score: 27). A structured seven step fitness for work assessment was conducted. Job tasks included teaching, lesson planning, and assisting children activities requiring light physical effort (~ 3.75 METS), with regular hours and minimal ergonomic risk. She had mild grip weakness due to claw hand but retained overall physical capacity. Risk assessment confirmed she was noninfectious, though prolonged hand use without modification could worsen her condition. She expressed strong motivation to work. However, school management requested patient to complete the treatment and declared cured before returning to offline teaching primarily due to parental concern. So the patient was declared fit with note, the patient allowed to resume teaching remotely via online platforms for one month. Reassessment was scheduled after the sixth month BTA evaluation.

Discussion: Stigma remains a major barrier for people with leprosy, often rooted in fear of contagion and cultural myths. Study shows 69% of affected individuals face work related challenges. Occupational physicians must address both physical and psychosocial factors, promote education, encourage open communication, and recommend accommodations to support safe reintegration.

Conclusion: Fitness to work assessments must consider both physical and psychosocial factors to enable inclusive return to work for workers with leprosy.

Keywords: fitness to work, leprosy, occupational physician, stigma, teacher

PH-49

Irregular workday and non-workday routines/sleep-wake rhythms are associated with an increased likelihood of experiencing absence due to the common cold: A population-based cross-sectional study among 61,792 Japanese workers

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Background: Absences due to the common cold are a well-known cause of lost workplace productivity. Past studies have shown that irregular sleep-wake cycles, which are common among shift workers, may increase susceptibility to the common cold. This study examined how daily sleep-wake habits and workday and non-workday routines are associated with absences due to the common cold among day-shift workers.

Methods: This study used cross-sectional data from the Mental Health and Lifestyle Inventory, a survey conducted in 227 Japanese workplaces from 2007 to 2012. Of the initial 120,978 participants, we excluded shift workers, individuals with a history of mental or physical disorders, and those with incomplete responses. This resulted in a final sample size of 61,792. Daily sleep-wake habits and workday and non-workday routines were estimated using a self-administered questionnaire with three binary items: "I wake up at a regular time every morning," "I go to sleep at a regular time every night," and "I try to maintain a regular routine on holidays." The outcome was defined as having a common cold in the past six months that required absence from work. We used multivariable logistic regression to calculate adjusted odds ratios (aORs) and 95% confidence intervals (CIs), controlling for demographic, lifestyle, occupational, and psychosocial factors.

Results: Workers with irregular wake-up (aOR = 1.16, CI: 1.09–1.23) and bedtime habits (aOR = 1.22, CI: 1.18–1.27), as well as those with irregular weekend routines (aOR = 1.18, CI: 1.14–1.23), had significantly higher odds of having the common cold than their counterparts.
Conclusion: Irregular sleep-wake habits and inconsistent workday and non-workday routines were associated with an increased likelihood of experiencing absence due to the common cold.

Keywords: Irregular lifestyle, Common cold, Cross-sectional study, Japanese, Workers

PH-50

Occupational Risk and Seroprevalence of Human Toxocariasis: A Literature Review

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Background

Human toxocariasis, a neglected zoonotic parasitic infection, affects an estimated 19% of the global population, with particularly high seroprevalence in Southeast Asia (34.1%), including Indonesia (≥61%), far exceeding the global average. The infection is usually mild or self-limiting but may cause severe illness in immunocompromised individuals. Most existing data reflect general populations rather than workers, and evidence on occupational risk remains limited. Nevertheless, further research is needed, as seroprevalence assessment provides a basis for early detection strategies to mitigate risks for vulnerable worker populations.

Objectives

To evaluate and compare Toxocara seroprevalence among occupational groups and identify high-risk work environments.

Methods

A systematic literature search was conducted in PubMed, Scopus, and ProQuest for studies published between 2000 and 2025, using Boolean operators with keywords and MeSH terms: toxocariasis, seroprevalence, workers, animal handler. Eligible studies were peer-reviewed cross-sectional or seroprevalence investigations using ELISA or Western Blot. The methodological quality of included studies was assessed using the JBI Critical Appraisal Checklist for Studies Reporting Prevalence Data.

Results and Discussion

In total, 40 articles were identified, with 30 remaining after duplicate removal; nine studies

met inclusion criteria. The highest seroprevalence rates were reported in butchers (28.0%), animal caretakers (23.2%), farmers (25.9%), and veterinarians (24.0%). Strongest odds ratios were observed in farmers (OR 38.6, 95% CI: 5.20–286.99), veterinarians (OR 18.0, 95% CI: 2.14–136.05), and slaughterhouse workers (OR 16.0, 95% CI: 2.19–123.58). Occupations with animal, soil, or contaminated material exposure carried higher risk, exacerbated by inadequate hygiene.

Conclusion & Recommendations

Toxocara seroprevalence is notably elevated in farming, animal handling, and meat processing. Work-related exposure to animals, soil, and waste creates high-risk environments, highlighting the importance of workplace hygiene measures to reduce infection risk.

Keywords: Hygiene practices, Occupational exposure; Seroprevalence Toxocariasis; Zoonotic diseases

PH-51

Genetic Susceptibility to Dust-induced Lung Disease and Autoimmune Disease Risk: A Mendelian Randomization Study

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Background: Occupational and environmental dust exposure is increasingly recognized as a significant risk factor for respiratory diseases, potentially influencing systemic inflammation and autoimmunity. However, causal evidence linking chronic dust exposure to autoimmune diseases (AIDs) remains unclear.

Methods: We conducted a two-sample Mendelian randomization (MR) study utilizing genetic variants associated with lung diseases due to external agents as proxies for chronic dust exposure. Exposure data were sourced from the FinnGen consortium (n=500,348), and outcome data for various AIDs were obtained from the UK Biobank (n=53,831). MR analyses included inverse variance weighting (IVW), MR-Egger, and weighted median methods, complemented by sensitivity analyses to evaluate pleiotropy and heterogeneity.

Results: Genetically predicted susceptibility to dust-related lung diseases was generally not significantly associated with most autoimmune diseases assessed. However, consistent and significant associations were observed with ankylosing spondylitis (AS), yielding odds ratios of 1.39 (95% CI: 1.05-1.84), 1.59 (95% CI: 1.09-2.34), and 1.54 (95% CI: 1.03-2.28) in IVW, MR-Egger, and weighted median analyses, respectively. Sensitivity analyses supported the robustness of this finding.

Conclusions: This MR analysis provides genetic evidence supporting a causal link between susceptibility to dust-induced lung diseases and an increased risk of ankylosing spondylitis. These results highlight the potential role of environmental and occupational dust exposure in autoimmune pathogenesis, particularly in AS, and underscore the importance of preventive measures for dust-exposed populations.

Keywords: Mendelian randomization; Dust-related lung diseases; External Airborne Agent; Autoimmune diseases

PH-52

Age-standardized rates of occupational falls on the same level in Japan

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【Purpose】In Japan, the aging workforce is a growing concern, with an increasing number of work-related fall injuries resulting in 4 or more days of absence. However, no studies have reported the age-standardized rate (ASR) of occupational fall incidence. We aimed to estimate the ASR of occupational falls on the same level in Japan. 【Method】 Using the direct method, we estimated ASRs of occupational falls on the same level resulting in 4 or more days of absence across Japan from 2014 to 2021. Since no established standard population exists for the labor workforce in Japan, we adopted the 2015 employee population as the tentative standard population. Employee population data for each year were extracted from the Labour Force Survey obtained from the Ministry of Internal Affairs and Communications. Outcome data on occupational falls on the same level were obtained from a de-identified dataset in the Reports of Occupational Accidents and Diseases (also known as Reports of Worker Casualties) from the Ministry of Health, Labour and Welfare. Age categories were grouped into 5-year intervals for individuals aged 15 and older, with those aged 90 and above classified into a single category. 【Result】The estimated ASRs of occupational falls on the same level per 100,000 employees were as follows: 52.0 in 2014, 49.0 in 2015, 49.8 in 2016, 50.5 in 2017, 56.9 in 2018, 52.2 in 2019, 51.1 in 2020, and 55.0 in 2021, suggesting an increasing tendency over the observation period. 【Conclusion】This study is the first to estimate the ASR of occupational falls on the same level in Japan.

Keywords: Occupational fall, age-standardized rate, Japan

PH-53

The Impact of Different Chronotypes on Psychomotor Vigilance in 6th Year Medical Students with Shift Working

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Background: Shiftwork is a demanding component of medical training, often leading to sleep deprivation and reduced work performance due to circadian rhythm disruption and cognitive impairment. Individual chronotypes—biological preferences for sleep-wake timing—may affect performance during night shifts differently. This study aimed to assess the impact of chronotypes on psychomotor vigilance among 6th-year medical students and interns at Maharaj Nakorn Chiang Mai Hospital.

Methods: A two-phase observational study was conducted. In Phase 1, 80 participants completed the Thai Morningness-Eveningness Questionnaire (T-MEQ) and were categorized into Morning, Intermediate, or Evening chronotypes. In Phase 2, 24 participants (8 per chronotype) were randomly selected to perform the Psychomotor Vigilance Test (PVT) before and after a night shift. Reaction time and number of lapses (responses >500 ms) were recorded and analyzed, adjusting for gender and shift duration.

Results: Evening types showed the greatest decline in psychomotor vigilance post-shift, with a median reaction time increase of +13.5 ms and lapse increase of +1.0. Intermediate types slightly improved in reaction time (-11.8 ms) with a lapse increase of +0.5, while Morning types had minimal change in reaction time (-2.8 ms) and the same lapse increase (+0.5). Multivariable analysis showed a significant difference in reaction time (-32.4 ms, p=0.049) between Intermediate and Evening types, suggesting that Evening types experience the most cognitive impairment after night shifts.

Conclusion: Chronotype significantly influences nightshift performance in medical trainees. Evening chronotypes are more vulnerable to decline in psychomotor vigilance, underlining the need for personalized shift scheduling and support strategies to enhance performance and wellbeing in medical education.

Keywords: chronotype, shift work, psychomotor vigilance, medical students, circadian rhythm

PH-54

Pioglitazone Suppresses Urothelial Tumorigenesis In Vitro: A Potential Chemopreventive Agent

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Background/Aim: Pioglitazone (PIO), a peroxisome proliferator-activated receptor gamma agonist, is typically used to treat type 2 diabetes mellitus. In addition to its metabolic effects, PIO exhibits various biological activities, including potential anticancer effects. However, its efficacy and mechanistic relevance in the development and progression of cancer, including urothelial carcinoma induced by occupational chemical carcinogens, remain unclear. Herein, we investigated the functional impact of PIO on urothelial tumorigenesis.

Materials and Methods: An in vitro urothelial neoplastic transformation model was established by inducing SV-HUC-1 cells with a chemical carcinogen 3-methylcholanthrene. This model was used to investigate the effects of PIO on neoplastic/malignant transformation.

Results: PIO significantly inhibited the neoplastic/malignant transformation of SV-HUC-1 cells. Moreover, PIO treatment upregulated tumor suppressors, including p53 and phosphatase and tensin homolog (PTEN), as well as the epithelial marker E-cadherin, while downregulating the mesenchymal marker N-cadherin and the oncogenic factor nuclear factor kappa B (NF-κB), as confirmed by protein and mRNA expression analyses.

Conclusion: PIO has a chemopreventive effect on urothelial tumorigenesis, supporting its potential use as a preferred anti-diabetic agent for patients with a risk or history of urothelial carcinoma.

Keywords: Pioglitazone, bladder cancer, urothelial carcinoma, neoplastic transformation, peroxisome proliferator-activated receptor gamma.

PH-55

Return to Work After Moderate Burn Injury in Hot Work Environments: A Case Report and Evidence-Based Review

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Introduction: Return to Work (RTW) after extensive burn injuries presents significant medical and occupational challenges, particularly in high-temperature work environments. Burn injuries may impair thermoregulatory mechanisms—such as sweat gland function, cutaneous vasodilation, muscle strength, and contractures—ultimately reducing physical capacity and heat tolerance.

Case Report: A 42-year-old male boiler helper sustained second–third degree burns covering 25% of his Total Body Surface Area (TBSA) due to a fire door explosion. Following wound care, physiotherapy, and task modifications, he reported persistent heat sensitivity, itching over the scarred areas when exposed to high temperatures, and reduced grip strength. Fitness-for-work assessment was conducted through physical activity observation, grip strength measurement, and heat exposure tolerance testing in a work environment ranging from 44–60°C.

Results: A review of 13 articles—identified through PubMed, Scopus, and hand searching—revealed that increasing burn size is consistently associated with elevated core body temperature, cardiovascular strain, and fluid loss during physical activity in hot environments (>39°C). High-intensity exercise and workloads disproportionate to body size exacerbate thermal stress. Simple interventions, such as fan cooling and water misting, effectively reduce core temperature and perceived heat strain. Heat acclimation improves heat tolerance by enhancing plasma volume and sweat rate from unaffected skin. Predictive models incorporating TBSA, workload intensity, and environmental conditions show high accuracy in estimating hyperthermia risk. Psychosocial factors and job characteristics also significantly influence RTW success, with workplace support and task modifications playing a key role in sustainable reintegration.

Conclusion: Fitness-for-work evaluation after burn injuries in hot environments requires a multidisciplinary approach that considers medical status, physical capacity, ergonomics, and psychosocial aspects. Adjusting workload, implementing acclimatization protocols, monitoring thermal responses, and modifying the work environment are critical strategies to support safe and sustainable RTW.

Keywords: Burn Injury, Return to Work, Heat Tolerance, Thermoregulation, TBSA

PH-57

Work Hardening in Occupational Hand Crush Injuries: A Case Series at a Medical Center in Southern Taiwan

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Background

Occupational hand crush injuries often lead to long-term disability and persistent functional deficits despite rehabilitation. Work hardening, a goal-oriented program, replicates job-specific tasks to restore hand function and support workplace reintegration.

Aim

To describe the demographics, injury patterns, treatment courses, and work hardening interventions in occupational hand crush injury patients, and assess the role of work hardening in functional recovery.

Results

Nine patients met the inclusion criteria, aged 31–45 years; six were male and three female. Education levels were high school (n=6) and college (n=2); six were married and six had children. Most injuries involved the left hand. Affected digits included the thumb (n=3), index (n=6), ring (n=5), and middle (n=4) fingers. Injury types included muscle, tendon, and joint capsule injuries, phalangeal fractures, and traumatic amputations. All presented via the emergency department, underwent plastic surgery, completed standard rehabilitation, and subsequently entered targeted work hardening for persistent deficits.

Conclusion: In this case series, occupational hand crush injuries were complex, often involving multiple digits and diverse tissue damage. Standard rehabilitation alone was

insufficient to restore full function. Incorporating a goal-oriented work hardening program, prescribed by occupational medicine specialists, was a key intervention to address residual deficits and prepare patients for successful return to work.

Discussion

This case series highlights the vital role of work hardening in bridging conventional rehabilitation and workplace demands for complex occupational hand crush injuries. All patients were 31–45 years old, most married with children—factors likely contributing to strong motivation to return to work. This motivation, combined with targeted rehabilitation from occupational medicine specialists, may enhance engagement, adherence, and recovery. Large-scale studies are needed to further explore the optimal timing of work hardening interventions and long-term effectiveness of these interventions.

Keywords: Hand Crush Injuries, Work Hardening, Return to work

PH-58

Facing the Heat: Health Challenges of Female Corn Farmers in Thailand

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Background: Our previous investigation among female rice farmers revealed that all stages of rice cultivation entail exposure to physical, chemical, biological, and ergonomic hazards. Notably, no formal interventions had been implemented to mitigate these risks. The findings underscored the detrimental impact of agricultural activities on the health and safety of female rice farmers. Given the similarity in occupational tasks, female corn farmers are likely to encounter comparable challenges, including prolonged exposure to extreme heat and substantial physical exertion. Despite these risks, there are limited mechanisms within Thailand's rural healthcare infrastructure to address their specific health needs. This study was initiated to explore the health concerns of corn farmers, with the current poster presentation focusing specifically on the female perception of heat hazards. Therefore, this study aims to examine the general characteristics and assess heat hazard perception among female corn farmers in Nan and Saraburi provinces.

Methods: A structured questionnaire was developed to collect data on demographic characteristics and perceptions of heat hazards. Face-to-face interviews were conducted with over 200 female corn farmers. All interviewers underwent rigorous training to ensure consistency and reliability in data collection.

Results: The majority of participants were aged 45–59 years and exhibited signs of overweight or obesity. Most reported sleeping ≥8 hours per day. While protective measures such as wearing face masks and hats were commonly practiced, the use of sunglasses was notably low. A significant proportion demonstrated suboptimal body

water levels, and some reported consuming caffeine and alcohol. Heat hazard perception was categorized into three levels, with the majority of respondents in both provinces exhibiting a high level of awareness regarding heat-related risks.
Conclusion: The findings affirm that female corn farmers operate under extreme thermal conditions, with their occupational activities and behaviors posing considerable health risks. These insights underscore the pressing need for targeted interventions and policy considerations within Thailand's healthcare system to address the distinct vulnerabilities of this population.

Keywords: Agriculture, Female, Farmers, Heat, Thailand