

Editorial

# MODERNET: Charting New Frontiers in Occupational Health Surveillance

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## 1. Introduction

In the rapidly evolving landscape of occupational health, the need for robust, responsive, and internationally coordinated surveillance systems for the identification of new and emerging risks has never been more apparent. The MODERNET network, short for Monitoring trends in Occupational Diseases and tracing new and Emerging Risks in a NETwork, stands as a testament to the power of collaboration and innovation in this vital field. Since its inception, MODERNET has played a pivotal role in enhancing our understanding of occupational diseases, improving early detection of emerging risks, and fostering a culture of prevention across Europe and beyond. This editorial traces the history of MODERNET, highlights its scientific achievements, and considers its promising future.

## 2. From Fragmented Efforts to Unified Action

The genesis of MODERNET can be traced back to the early 21st century, a period marked by heightened awareness of the importance of occupational health surveillance [1]. Traditionally, the surveillance of occupational diseases was a fragmented endeavour, with significant disparities between countries in terms of data collection, reporting systems, and preventive strategies. While some countries maintained comprehensive registers and mandatory reporting systems, others relied on voluntary reporting or lacked systematic approaches altogether [2].

Recognizing these disparities, a group of occupational health experts from various European countries began to advocate for a more harmonized and collaborative approach. Their efforts culminated in the establishment of MODERNET in 2009, initially as a COST Action (European Cooperation in Science and Technology, Action IS1002) [3]. The aim was clear: to create a network that would facilitate the exchange of information, methodologies, and best practices in the surveillance of occupational diseases, with a particular focus on new and emerging risks.

This shift from fragmented efforts to unified action was transformative. By creating a shared platform, MODERNET provided an infrastructure that enabled scientists, clinicians, and policymakers to align their work, reduce duplication, and build upon collective expertise. It signalled the beginning of a new era in which occupational health surveillance could be truly transnational, responding not only to established risks but also to those emerging from a rapidly changing world of work [2,4].

## 3. A Mission Grounded in Surveillance, Early Detection, and Prevention

MODERNET's mission revolves around three interrelated pillars: surveillance, early detection, and prevention. Each is crucial on its own, but their integration within a single framework is what makes MODERNET distinctive [1].



Surveillance, in the MODERNET context, goes beyond traditional health surveillance of individual workers. It encompasses the systematic collection, analysis, and interpretation of data on occupational diseases, exposures, and emerging risks across sectors and countries. This broader perspective allows early identification of new hazards and facilitates timely preventive actions at both workplace and policy levels. Unlike traditional surveillance, which often relies on well-established disease categories and reporting structures, sentinel systems are designed to pick up anomalies—cases that do not fit established patterns but may indicate the emergence of a new hazard or a new type of exposure to an established hazard [1].

MODERNET has operationalized this concept by developing guidance for sentinel reporting, refining evaluation criteria, and embedding expert review into the workflow. These elements combine scientific rigor with clinical insight, making early warning both credible and actionable [2,5–7]. This requires different expertises working together: epidemiologists, occupational physicians, statisticians, toxicologists, industrial hygienists, and public health experts.

By linking surveillance data with early detection and research on causal pathways, the network MODERNET directly supports evidence-based prevention. Shared methodologies and the exchange of case-based signals across countries have led to improved recognition of preventable occupational diseases (such as those linked to new chemical agents or work practices) and to the design of targeted preventive measures. In this way, MODERNET has contributed to shifting the focus of occupational health from reactive disease management toward proactive risk prevention.

#### 4. Achievements and Scientific Outputs

The diverse body of scientific outputs fall into several interconnected domains:

**Early warning frameworks and methods.** MODERNET pioneered approaches for signal detection in occupational disease data, including time-series analysis, comparative rates, and expert-triggered signals. The creation of structured processes for expert evaluation of suspected risks has been critical, ensuring that emerging threats are scrutinized rigorously before being elevated to the level of policy concern [5–8].

**Harmonization and data infrastructure.** By conducting cross-country comparisons of occupational disease registries and coding practices, MODERNET identified discrepancies and best practices [2]. It issued guidance on harmonized case definitions and coding systems, which has laid the groundwork for an EU-wide vigilance framework. The long-term impact of this work lies in enabling meaningful cross-national comparisons and ensuring that Europe speaks a common language in occupational disease surveillance.

**Thematic reviews and position pieces.** The network has produced influential reviews on emerging risks, including chemical carcinogens and sector-specific exposures such as construction dust [4,9]. Consensus papers have articulated the contributions of clinicians and registries to early detection, clarifying their indispensable roles in identifying and validating signals. These outputs represent a bridge between research and practice, guiding how the scientific community can work hand in hand with clinical stakeholders [1].

**Methods and tools.** MODERNET has championed the application of Geographic Information Systems (GIS) and visualization techniques to map work-related health patterns and enhance spatial surveillance. The creation of practical toolkits for clinicians and registries has provided standard operating procedures for reporting and accelerated the validation of suspected signals. These resources empower practitioners at the frontline, ensuring they can contribute effectively to the network [10,11].

**Case signals and sentinel reports.** Documented clusters and sentinel events illustrate the network's workflow in practice. These real-world examples, moving from the first clinician report through expert evaluation to validated signal, demonstrate the effectiveness of MODERNET's methods and showcase how theory is translated into action [6].

**Capacity building and dissemination.** MODERNET has consistently invested in the next generation of occupational health professionals. Training schools, workshops, and multi-country collaborations have strengthened expertise across Europe. Its special sessions at international conferences have reinforced MODERNET's visibility and ensured that its methods and findings reach broad audiences of researchers, policymakers, and practitioners alike.

Together, these outputs have cemented MODERNET's role as both a scientific engine and a convening hub. They ensure that early detection of occupational risks is not left to chance but grounded in robust methods, harmonized infrastructure, and a culture of shared vigilance.

## 5. International Reach and Global Relevance

Although MODERNET began as a European initiative, its work has resonated internationally. Occupational health challenges do not stop at national borders, and new risks—from globalized supply chains to the spread of hazardous materials—are inherently transnational. MODERNET's partnerships with organizations and experts outside Europe highlight the network's recognition of this reality.

By engaging globally, MODERNET not only shares its innovations but also learns from other contexts. The exchange of methodologies and experiences across continents enriches its capacity to anticipate risks. For instance, collaborations on the monitoring of carcinogenic exposures or psychosocial risks benefit from perspectives shaped in diverse economic and cultural settings. Such engagement strengthens both MODERNET and the broader global occupational health community.

## 6. Looking Ahead: Future Horizons for MODERNET

Looking to the future, MODERNET is uniquely positioned to expand its role in shaping occupational health policy and practice. Several key priorities stand out:

**Leveraging digital tools and big data.** Advances in data science, artificial intelligence, and machine learning provide opportunities to enhance signal detection and prediction. By embracing these technologies, MODERNET can complement expert evaluation with computational methods, making surveillance both faster and more comprehensive.

**Expanding cross-sectoral collaboration.** Emerging risks are not confined to traditional occupational settings. Climate change, digitalization, and evolving work arrangements create new challenges. MODERNET can strengthen collaborations with sectors such as environmental health, ergonomics, and social sciences to anticipate and respond to these changes.

**Deepening global partnerships.** By building stronger ties with networks and agencies beyond Europe, MODERNET can contribute to the development of a truly global vigilance system. This would ensure that emerging risks are recognized and addressed wherever they arise, protecting workers in a connected world.

**Sustaining capacity building.** As the workforce and nature of work evolve, continuous training and mentoring will remain essential. MODERNET's investment in schools, workshops, and expert groups provides a foundation, but future capacity building must also adapt to online and hybrid formats that expand reach and inclusivity.

Besides collaboration with experts globally and across sectors, MODERNET are actively engaging with policy makers, social partners and other stakeholders to address the challenge and motivate them to take action to prevent, monitor and follow-up emerging risks.

Ultimately, the promise of MODERNET lies in its ability to combine scientific rigor with collaborative spirit. Its legacy will be measured not only by the articles published or tools developed, but by the healthier, safer workplaces it helps to create.

## 7. Conclusions

MODERNET has transformed occupational health surveillance from a fragmented and nationally bounded effort into a collaborative, innovative, and internationally relevant enterprise. By producing early warning frameworks, harmonizing infrastructure, publishing thematic reviews, developing new tools, documenting sentinel cases, and investing in capacity building, the network has made a lasting scientific contribution. Its achievements stand as a model of how collective expertise can be mobilized to protect workers' health.

As occupational health risks continue to evolve, MODERNET remains a beacon for what is possible when science, practice, and policy align. The next decade offers the opportunity not only to sustain but to expand this impact—integrating new technologies, broadening collaborations, and ensuring that the lessons of the past guide us toward a safer and healthier future of work.

## Conflicts of Interest

The authors declare no conflict of interest.

## Use of AI and AI-Assisted Technologies

During the preparation of this work, the authors used Chat RIVM beta v2.4 to make an initial draft of the paragraphs 1 and 2. After using this tool/service, the authors reviewed and edited the content as needed and take full responsibility for the content of the published article.

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