Allied Health, Environment and Development Research Network

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amU Institut Laënnec, sciences numériques et IA pour la santé
Aix Marseille Université

Program
The 10th Scientific Symposium of the AHEAD Research Network
AI and Digital Health: Challenges and Opportunities for Public Health in the MENA Region

December 11-12, 2025

Conference venue
AMU-AMSE, 5-9 Boulevard Maurice Bourdet, 13001 Marseille, France - Salle 15

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The time available for each paper is 30 min. (20 min. for presentation and 10 min for discussion). Subject to possible changes by the organisers.

Thursday, December 11, 2025	
2:00pm 2:15pm	Welcoming coffee and registration
2:15pm 2:30pm	Welcoming and Opening Address
2:30pm 3:00pm	"*Opportunities and Challenges in implementing digital health tools in the MENA region*" **Arash Rashidian**, Department of Science, Information and Dissemination of the WHOEMRO.
3:00pm 3:30pm	"*Co-Designing Digital Health Behavior Change Interventions with Adolescents: A Mixed-Methods Systematic Review*" **Ghufran Al Sayed**, Epidemiology Unit, University of Cambridge.
3:30pm 4:00pm	"*Artificial Intelligence for Early Detection: Tunisia's EIOS-based model for digital epidemic intelligence*" **Ahlem Silini**, National Observatory of Emerging and Reemerging Diseases, and University of Tunis El Manar, Faculty of medicine of Tunis, Tunisia.
4:00pm 4:30pm	**Coffee break**
4:30pm 5:00pm	"*Opportunities and Challenges of Implementing Digital Health Tools – Insights from the International e-Health Forum 2024*" **Adam Skali**, eHealth Innovation Centre – Mohammed V University.
5:00pm 5:30pm	"*Does telemedicine fill the gaps equitably? Evidence among the 50+ during the Covid-19 pandemic in France*". **Thomas Renaud**, Laboratoire d'Économie et de Gestion des Organisations de Santé Université Paris Dauphine – PSL.

Friday, December 12, 2025	
9:30am 10:00am	"*Developing a Regulatory Sandbox Framework to Accelerate the Integration of Artificial Intelligence in Public Health Strategies: A Policy Roadmap for the MENA Region*" **Nader Jahanmehr,** Department of Health Policy and Management, School of Public Health and Safety, Shahid Beheshti University of Medical Sciences, Tehran, Iran.
10:00am 10:30am	*"Unravelling the mental health status of respondents to population health surveys using tree-based methods"* **Ewen Gallic** and **Alain Paraponaris**, Aix Marseille Univ, CNRS, AMSE, Marseille, France.
10:30am 11:00am	**Coffee break**
11:00am 11:30am	"*Enhancing Community-Based Maternal Health in Egypt through AI-Driven Support for Cesarean Section Monitoring and Education*" **Reham Mostafa Dewedar**, American University of Cairo and WHO.
11:30am 12:00pm	*"Building a Healthcare Data Lake for Maximizing Health Information Exchange Benefits Through Distributed Machine Learning Classifiers: An Optimum Structure"* **Ashraf. M. Abdualiem Hussein,** Department of computer science, Modern university for information and technology, Cairo, Egypt.
12:00pm 12:30pm	*"AI for medical imaging: Challenges and Applications"* **Badih Ghattas**, Aix-Marseille School of Economics, Marseille.
12:30pm 1:00pm	**Closing session**
1:00pm 2:30pm	**Lunch**

Abstract 1
Co-Designing Digital Health Behavior Change Interventions with Adolescents: A Mixed-Methods Systematic Review

Ghufran Al Sayed, MBChB, MPH.[1], Esther van Sluijs, PhD.[1], Karen Ma, PhD.[1], Asha Vanzara.[2], Sri Haran Loganathan[2], Andrea Smith, PhD.[1]

[1] MRC Epidemiology Unit, University of Cambridge
[2] School of Clinical Medicine, University of Cambridge

Background and Aims

The global rise in childhood obesity, alongside increasing digital connectivity, presents a critical opportunity to deliver effective, scalable, and contextually relevant adolescent-centered digital health behavior change interventions. Adolescence is characterized by heightened sensitivity to peer influence, evolving digital literacy, and the formation of long-term health behaviors. Actively involving adolescents through participatory approaches, such as co-design, can uniquely align interventions with their lived experiences and preferences, thereby increasing intervention effectiveness, acceptability, and relevance. However, evidence detailing how co-design is implemented in digital health interventions, and its impacts on feasibility, usability, and effectiveness, remains limited. This lack of clarity risks process inefficiencies and missed opportunities to enhance the effectiveness and acceptability of adolescent-centered digital interventions. This mixed-methods systematic review synthesizes published evidence on co-design processes used in digital health behavior change interventions (including mHealth and AI-supported tools) targeting adolescent obesity-related behaviors.

Methods

Seven databases were searched for quantitative and qualitative studies of exclusively digital behavior change interventions targeting behaviors associated with obesity, such as diet, physical activity, sleep, and eating behaviors in adolescents (13-18 years). Data on the process and implementation of co-design, intervention fidelity markers, and behavior change outcomes, will be extracted. Qualitative data will undergo thematic analysis, and quantitative data will be synthesized using Synthesis Without Meta-Analysis (SWiM). Study quality will be assessed using the Mixed Methods Appraisal Tool (MMAT). The review was pre-registered on OSF: https://osf.io/2j3dc/metadata/osf.

Results

Overall, 17,413 studies were identified, of which 170 were eligible for full text review. Full text screening is ongoing. Preliminary findings suggest substantial variation in how co-design is implemented in digital health behavior change interventions, including the depth of adolescent involvement, and strategies for cultural or developmental adaptation. Notably, digital tools co-designed with adolescents tend to report strong acceptability and engagement. As reporting practices vary, our preliminary findings also highlight the importance of transparent and consistent reporting of co-design methods for coherent process evaluation. Analysis will be complete by Autumn 2025 and will offer detailed insights into how co-design influences intervention outcomes. Our findings will inform the development of a conceptual model for future participatory digital health design, including AI-enabled tools.

Conclusion

This review will offer the first comprehensive synthesis of co-design processes in digital health behavior change interventions for adolescents. This will provide valuable guidance for researchers, developers,

and policymakers aiming to co-develop and evaluate effective, equitable, and scalable digital health interventions.

Keywords: Social media, mHealth, digital, adolescents, AI, co-design, obesity

Abstract 2
Artificial Intelligence for Early Detection: Tunisia's EIOS-based model for digital epidemic intelligence

Ahlem Silini[1,2], Sonia Dhaouadi[1,2], Hajer Letaief[1,2], Aicha Hechaichi[1,2], Mouna Safer[1,2], Sondos Derouich[1], Leila Bouabid[1], Ilhem Boutiba[1], Rim Mhadhbi[1], Sami Fitouri[1], Ahlem Fourati[1], Fatma Ben Youssef[1], Manel Ferhi[1], Ines Setti[1], Souha Bougatef[1], Nissaf Bouafifép Ben Alaya[1,2]
[1]National Observatory of Emerging and Reemerging Diseases, Tunis, Tunisia
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Introduction
Early detection of public health threats is a critical component of preparedness systems. To enhance national event-based surveillance, Tunisia adopted the Epidemic Intelligence from Open Sources (EIOS) platform since 2021. EIOS integrates artificial intelligence to support automated screening and prioritization of health signals from digital sources, contributing to strengthening the Early Warning, Alert and Response System. Our study aimed to describe the implementation, results, and operational impact of AI-supported screening via EIOS, in Tunisia as a digital tool to enhance epidemic intelligence.

Methods
The National Observatory for New and Emerging Diseases launched the implementation of EIOS with WHO/EMRO support, in Tunisia. A rotating team of trained public health professionals conducted daily media screenings using the EIOS interface, which applied based AI-based tools, such as keyword extraction, topic categorization, and relevance scoring, to analyse content from various sources, including ministries, international organizations, web news, and social media, in order to detect potential public health events. Signals were organized using syndromic and disease-specific boards, covering respiratory diseases, vector borne diseases, water-food borne diseases, antimicrobial resistance, mass-gathering and emerging threats. After verification and confirmation, signals were converted into events, compiled into daily and weekly reports and shared with all the participants from Ministry of Health and Ministry of Agriculture during the weekly videoconference. Weekly technical discussions and national presentations supported coordination and follow-up.

Results
Abstract EIOS AHEAD 2025 Between March 2021 and March 2025, over 90% of detected events originated from international sources, with 56% derived from web-based news. Among the events, 26% were linked to vector-borne diseases (including Dengue and West Nile), and 20% to respiratory illnesses (COVID-19, Influenza, and HMPV). The platform supported early detection of signals an average of 2 to 5 days before official confirmation, particularly for antimicrobial resistance clusters and zoonotic threats. It also provided timely alerts related to mass gatherings (Hajj, World Cup), seasonal environmental hazards (heatwaves), and Chemical, Biological, Radiological or Nuclear (CBRN) events. Notably, EIOS contributed to detecting early signals related to antimicrobial resistance clusters and zoonotic spillovers. Follow-up evaluations showed regular use by the team, supported by continuous WHO mentorship and regional coordination. However, challenges included under-detection of localized events, due to limited coverage of national news sources and the absence of a permanent EIOS focal point. A SWOT analysis was conducted as part of the operational review. It confirmed strengths such as multisectoral scope, human resource capacity, and institutional ownership. Identified gaps, such as limited national media sources and lack of permanent staffing, have guided ongoing efforts to integrate EIOS with the national event-based surveillance platform, and assess its added value for public health decision-making.

Conclusion

Tunisia's deployment of the EIOS platform demonstrates the operational benefits of integrating AI into digital surveillance systems. By structuring the early detection of signals from open sources, EIOS has improved the country's ability to monitor emerging threats and respond more systematically. By enabling early signal detection and cross-sectoral information sharing, EIOS has strengthened national epidemic intelligence capacity and offers a replicable model for MENA countries advancing in digital health.

Abstract 3
Opportunities and Challenges of Implementing Digital Health Tools – Insights from the International e-Health Forum 2024

Adam Skali, Hanaa Hachimi, Anass Doukkali
eHealth Innovation Centre – Mohammed V University

Background

Digital technologies – artificial intelligence (AI), the Internet of Medical Things (IoMT), secure clouds – are reshaping healthcare across the Middle East and North Africa. Progress, however, is uneven. This presentation synthesises observations shared by policymakers, clinicians, technologists, and investors during nine expert panels at the International e-Health Forum 2024 (Casablanca) to clarify near-term opportunities, obstacles, and priorities for action.

Approach

Forum sessions, workshops, speaker notes, and moderated Q&A transcripts were thematically analyzed. Seven recurrent themes were identified and validated through iterative discussion with session chairs.

Findings

Forum-derived insights

1. AI & IoMT moving into routine care: Speakers highlighted AI applications in radiology, dermatology, and pathology, plus connected devices for continuous monitoring of chronic and elderly patients; qualitative feedback points to faster detection, wider reach, and growing clinician confidence.
2. Secure data management as strategic asset: Encryption, strong authentication, and sovereign-cloud hosting were viewed as essential foundations for electronic medical records, predictive analytics, and inter-facility data sharing.
3. Cloud-enabled interoperability: Open standards (notably FHIR) and national exchange platforms are regarded as prerequisites for continuity of care and system resilience.
4. Collaborative HealthTech ecosystems: Targeted incubators, tax incentives, and regulatory sandboxes in Morocco and neighboring markets were cited as effective accelerators of AI diagnostics, telemedicine applications, and logistics drones.
5. Digital inclusion imperative: Rural telehealth pilots revealed connectivity gaps, affordability barriers, and limited digital literacy; panellists called for coordinated infrastructure and training initiatives.
6. Ethics, privacy, and trust: Convergence emerged around GDPR-style safeguards, enhanced cybersecurity, and explainable AI to maintain professional and public confidence.
7. Human capital as a decisive enabler: Integrated curricula, simulation-based training, and continuous professional development were deemed critical to mainstream AI, IoMT, and data-analytics competencies.

Key opportunities

- Extend care to remote populations via low-bandwidth teleconsultation and community IoMT hubs.
- Raise clinical quality by embedding AI decision support in imaging, pathology, and triage workflows.
- Build regional knowledge networks that pool data, algorithms, and expertise while respecting national sovereignty.

Principal challenges

- Fragmented regulatory landscapes and divergent data-protection rules.
- Limited interoperability among legacy hospital information systems.
- Heightened cyber-risk across connected devices and cloud services.
- Shortages of digitally skilled clinicians, engineers, and policy leaders.
- Affordability gaps in rural and low-income communities.

Recommended actions – "4 A's" framework

- Architect national digital-health strategies around secure cloud infrastructure and open standards.
- Accredit multidisciplinary training pathways blending clinical, data-science, and cybersecurity skills.
- Align stakeholders through public-private investment platforms, transparent procurement guidelines, and shared evaluation criteria.
- Advance inclusion by subsidizing connectivity, devices, and digital-literacy programs for vulnerable groups.

Conclusion

Forum discussions demonstrate clear consensus on both the promise and the prerequisites of digital health in Morocco, MENA region and Africa. By focusing on secure infrastructure, interoperable standards, workforce development, and inclusive policies, regional stakeholders can translate demonstrated potential into equitable, system-wide transformation.

Abstract 4
The impact of using AI-powered Voice-to-text Technology for clinical documentation on the quality of care: Systematic Review

Dr Ahmed Alboksmaty (lead and corresponding author)
Dr Reham Aldakhil, Dr Benedict Hayhoe Prof Hutan Ashrafian,
Prof Lord Ara Darzi, and Dr Ana-Luisa Neves.
Institute of Global Health Innovation (IGHI), Imperial College London.

Background
Digital health and Artificial Intelligence (AI) technologies are not only expanding in scope but are also reshaping the foundations of healthcare delivery across all systems and clinical contexts. These innovations are reshaping how care is delivered, documented, and experienced. One of these promising technologies is the use of AI-powered Voice-to-Text Technology (AIVT) to document and summarise medical consultations across different levels of care. AIVT not only offers potential for reducing the documentation burden on clinicians but is also seen as a strategic enabler for countries advancing, or even initiating, their Electronic Health Record (EMR) transformation. This systematic review assesses the impact of adopting AIVT on healthcare quality in primary care and outpatient settings, focusing on seven core dimensions: effectiveness, efficiency, safety, patient-centeredness, timeliness, equity, and integration.

Research Question
What is the impact of using AIVT for documentation on the quality of care provision during medical consultations in primary care and outpatient settings?

Method
A comprehensive search was conducted across five databases, Medline, Embase, Global Health, CINAHL, and Scopus, to identify relevant studies published up to September 20, 2024. Eligible studies assessed the use of AIVT for medical documentation in primary care or outpatient consultations, compared it to manual or non-AI documentation methods, and reported outcomes related to healthcare quality. Interrater agreement was evaluated using Cohen's κ scores. Data were extracted and analyzed with reference to the seven quality dimensions, and study quality was assessed using the Mixed Methods Appraisal Tool. A narrative synthesis approach was used for analysis.

Results / Anticipated Results
Of the 1,924 studies screened, nine met the inclusion criteria, involving 524 healthcare professionals, 616 patients, and 1,069 consultations. Most studies (n=7) were conducted in the United States, with two others from Bangladesh and the Philippines. Improvements were consistently reported in effectiveness, patient-centeredness, and efficiency, with all studies examining these dimensions (n=9, 6, and 5, respectively) highlighting benefits such as smoother documentation processes, reduced administrative burden, and enhanced provider-patient interaction. Findings related to safety were not conclusive: three of six studies identified risks, including transcription errors, while others reported reliable system performance. Enhanced timeliness, supported by seamless integration with EHRs, was highlighted in four studies. Equity concerns were noted in three studies, particularly due to limited participant diversity and the reliance on simulation-based settings rather than real-world practice.

Implications for Healthcare Practice in the MENA Region

Although this review assessed the global literature, its findings offer significant relevance for healthcare systems in the MENA region. As many countries in the region increasingly invest in digital health infrastructure, AIVT can play a critical role in improving documentation practices, enhancing consultation quality, and supporting EHR development. However, safety concerns, contextual variability, and equity challenges highlight the need for context-specific implementation research. Contextualized evaluations that consider linguistic diversity, clinical workflows, and health system readiness are essential to ensure the effective, safe, and equitable integration of AIVT in MENA healthcare practice.

Abstract 5

Developing a Regulatory Sandbox Framework to Accelerate the Integration of Artificial Intelligence in Public Health Strategies: A Policy Roadmap for the MENA Region

Nader Jahanmehr
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The integration of Artificial Intelligence (AI) into public health systems offers transformative potential, promising significant improvements in preventive care, diagnostic accuracy, and healthcare resource allocation. However, regulatory uncertainty and fragmented governance frameworks in the MENA (Middle East and North Africa) region present significant barriers, hindering effective and widespread adoption of AI-based solutions. A "Regulatory Sandbox," a controlled testing environment designed to facilitate the safe and efficient development of innovative technologies, has emerged globally as an effective mechanism to address such governance challenges. Despite their success in other sectors like financial technology, regulatory
sandboxes remain largely unexplored within public health governance in the MENA region.

This paper proposes the establishment of a specialized regulatory sandbox tailored explicitly to AI applications in public health for MENA countries. The proposed sandbox model would allow health authorities, innovators, researchers, and policymakers to collaboratively pilot, evaluate, and scale promising AI solutions under regulatory oversight, without imposing premature or excessively rigid regulations. Key elements of this proposed sandbox include clearly defined entry
and exit criteria, mechanisms for ethical oversight, transparent data governance guidelines, and a structured evaluation process for evidence-based decision-making.

To contextualize the applicability of this approach, this paper discusses potential use cases, including AI-based predictive analytics for non-communicable diseases, early-warning systems for infectious disease outbreaks, and personalized digital health interventions. Additionally, the paper examines practical insights and governance lessons from global regulatory sandbox implementations (notably from the UK, Canada, and Singapore) and adapts these insights to the unique policy landscape and infrastructural realities of the MENA region, emphasizing the role of
institutions such as the World Health Organization's Regional Office for the Eastern Mediterranean (WHO-EMRO) as potential coordinating entities.

Finally, the paper outlines a stepwise roadmap for regional policymakers to implement a regulatory sandbox. This includes phases of stakeholder engagement, policy development, pilot testing, iterative regulatory refinement, and eventual scaling of successful interventions. Establishing this adaptive regulatory environment is expected to accelerate responsible AI adoption, foster innovation ecosystems, and improve population health outcomes across the MENA region.

Abstract 6

Enhancing Community-Based Maternal Health in Egypt through AI-Driven Support for Cesarean Section Monitoring and Education

Reham Mostafa Dewedar
AUC and WHO

Cesarean Section (CS) rates in Egypt have dramatically increased over the past decade, with many procedures performed without clear medical indications. This trend poses serious health risks for mothers and newborns and adds an economic burden on the health system. It highlights gaps in both clinical practice and community awareness. The World Health Organization's ten Group Classification System (TGCS) offers a standardized approach to monitor and optimize CS use. However, the system's application in Egypt has been limited by insufficient institutional support and lack of integration into existing clinical systems.

My recent study examined the impact of WHO-led TGCS training among obstetricians in Upper Egypt and found that while knowledge improved, actual implementation remained low. This reveals a significant opportunity to engage not only healthcare providers but also communities in addressing the overuse of CS and advocating safer childbirth options.

Artificial Intelligence (AI) has the potential to empower community health workers and pregnant women directly by delivering tailored, timely information and decision support. For example, AI-enabled mobile applications can provide pregnant women in rural and underserved areas with personalized guidance on prenatal care, warning signs, and birth preparedness— thereby reducing unnecessary CS driven by misinformation or fear. I previously contributed to the development of an offline application supporting pregnant women in Gaza during conflict during my work in EMRO, demonstrating how digital tools can strengthen maternal health even under challenging conditions.

In Egypt, scaling such AI-powered community interventions could enhance hospital-based TGCS implementation by raising awareness, promoting vaginal delivery when medically indicated, and supporting early identification of high-risk pregnancies. Moreover, AI can facilitate community level data collection to inform local health planning and resource allocation, bridging gaps between households, primary care providers, and referral hospitals.

Realizing this vision requires multi-sectoral collaboration to build digital literacy among health workers and communities, integrate AI tools into existing maternal health programs, and align policies to support digital health equity. Such efforts would contribute to Egypt's national strategies on digital health and maternal care quality, ultimately reducing unnecessary CS and improving outcomes for mothers and infants.

Abstract 7

Building a Healthcare Data Lake for Maximizing Health Information Exchange Benefits Through Distributed Machine Learning Classifiers: An Optimum Structure

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Health Information Exchange (HIE) platforms generate vast and heterogeneous datasets with significant potential to enhance healthcare delivery. To fully realize this potential, a robust data management infrastructure integrated with advanced analytical capabilities is crucial. This paper proposes an optimized healthcare data lake architecture specifically designed to facilitate the application of distributed machine learning (ML) classifiers for maximizing the benefits derived from HIE data. We detail a layered structure, key architectural considerations for distributed ML, data governance strategies, and provide a review of relevant and current research supporting this approach. The aim is to provide a blueprint for constructing a scalable and efficient data lake that empowers predictive analytics and informed decision-making within the HIE ecosystem, ultimately leading to improved patient outcomes and healthcare efficiency.

Abstract 8
Does telemedicine fill the gaps equitably?
Evidence among the 50+ during the Covid-19 pandemic in France

Thomas Renaud
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Université Paris Dauphine – PSL

The outbreak of Covid-19 had led to drastic rationing in healthcare compounded by a contraction in demand for care due to travel restrictions and the fear of contamination. As a result, unmet needs dramatically increased during the pandemic among people aged 50 or over in Europe, especially for the sickest and/or poorest. Telemedicine, widely acknowledged as a timely solution for ensuring continuity of access to care, had then flourished in most European countries as an important mechanism in maintaining access to healthcare, even for the elderly and also in France where this practice was previously uncommon.

This study aims to shed light on the equity issue in the use of telemedicine since the appearance of Covid-19 in the specific case of France. It seeks to understand the characteristics of teleconsultations users and, in particular, how health status, socio-demographic profile, area of residence, time and risk preferences, and digital literacy influence individuals' choice to access this type of medical consultation. To this end, we use data from the SHARE survey, both in its traditional form before the pandemic (wave 8) and in its condensed phone-based version during the peaks of the epidemic (SHARE-Corona waves 1 and 2). The analysis sample is restricted to France only.

As a first approach, we model separately the probabilities of using healthcare in general on the one hand, and of using teleconsultation among healthcare users only on the other, using simple Probit models and introducing in sequence the different sets of potential predictors. In an attempt to handle more appropriately the probable endogeneity between occasional use of the internet - chosen as a proxy for digital literacy - and recourse to teleconsultation, we jointly model these two outcomes using a Biprobit. However, an instrumental variable approach would provide a better means of correcting for this endogeneity, which has not been possible in the absence of a valid exogenous instrument.

Digital literacy significantly influences teleconsultation adoption during the pandemic. Furthermore, age, level of education and area of residence affect not only the likelihood of using the internet, but also the take-up of medical teleconsultation, given the same frequency of internet use. While risk aversion is linked to reduced internet use, neither it nor time preference strongly influences teleconsultation decisions during the pandemic. These findings underscore the need to address digital and educational inequalities to enhance telemedicine accessibility and foster healthcare equity.

Keywords: Telemedicine; Healthcare; Equity; SHARE survey; France.

Abstract 9
Unravelling the mental health status of respondents to population health surveys using tree-based methods

Amady Seydou Ba, Ewen Gallic, Pierre Michel, and Alain Paraponaris,
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Anxiety and depression may have serious disabling consequences for health, social, and occupational outcomes for people who are unaware of their actual health status and/or whose mental health symptoms remain undiagnosed by physicians. This article provides a big picture of unrecognised anxiety and depressive troubles revealed by a low score on the Mental Health Inventory-5 (MHI-5) with the help of machine learning methods using the2012 French National Representative Health and Social Protection Survey (*Enquête Santé et Protection Sociale, ESPS*) matched with yearly healthcare consumption data from the French Sickness Fund. Compared to people with no latent symptoms who did not declare any depression over the last 12 months, those with unrecognised anxiety or depression were found to be older, more deprived, more socially disengaged, at a higher probability of adverse working conditions, and with higher healthcare expenditures backed, to some extent, by chronic conditions other than anxiety or mood disorder.

Abstract 10
AI for medical imaging: Challenges and Applications

Badih Ghattas
Aix Marseille University, CNRS, AMSE, Marseille, France

This communication presents, through a series of concrete healthcare use cases, how AI adds value when grounded in medical imaging (MRI and CT). The methods primarily rely on neural networks, which can be combined with physics-based models depending on the application. It will highlight three illustrative examples: blood-flow modeling in the thoracic aorta, pulmonary nodule detection, and lung segmentation.