

The Potential of Artificial Intelligence in Enhancing Occupational Health and Safety for Urban Informal Vendors: A South African Case

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ABSTRACT

South Africa's informal sector, including street vendors, faces significant occupational health and safety challenges, including exposure to air pollution, extreme weather, and limited sanitation. Current legislative frameworks, offer limited protections for these workers, leaving substantial gaps in regulatory coverage. Artificial Intelligence (AI) presents a promising solution by enabling real-time environmental monitoring, predictive analytics, and health alerts tailored to high-risk conditions. This chapter explores various AI applications for improving vendor safety, such as wearable devices for air quality and vital signs monitoring, and mobile apps delivering real-time health information. However, barriers to implementation exist, including financial constraints, digital literacy gaps, and data privacy concerns. To address these, the chapter recommends targeted interventions like public-private partnerships and subsidies, and digital literacy initiatives alongside robust policy frameworks that expand OHS protections to include AI-driven health solutions.

1. INTRODUCTION

The informal sector in South Africa is a cornerstone of urban economies, employing approximately 2.5 million people, including a substantial number of street vendors (Stats SA, 2023). Street vendors provide essential goods and services to millions daily, often at affordable prices and in inaccessible locations. Yet, despite their economic importance, these vendors frequently lack adequate health and safety protections (Stats SA, 2023). Unlike their counterparts in formal employment, street vendors face a range of occupational hazards, from prolonged exposure to air pollution and harsh weather conditions to the challenges posed by insufficient infrastructure, limited sanitation facilities, and restricted access to public health resources. The sustainability of any nation is closely linked to the health and hygiene of its workforce, which, in turn, depends on a clean and safe environment. In South Africa, legislative frameworks such as the *Occupational Health and Safety Act* (OHSA, 1993) and various Municipal By-Laws underscore the importance of safeguarding the health and safety of all workers, including those in informal sectors. These frameworks are designed to reduce environmental and occupational hazards, thus fostering a healthier work environment. In line with these objectives, the Environmental Health National Norms and Standards, established under the National Health Act of 2003 and supported by the *Constitution of the Republic of South Africa* (1996), mandate environmental monitoring as a fundamental public health measure. These standards assert that all citizens, regardless of employment sector, have the right to work in safe environments (Sepadi & Nkosi, 2023).

However, in practice, street vendors continue to encounter significant occupational health and safety (OHS) challenges. Urban air pollution, exacerbated by traffic congestion and industrial emissions, poses a severe health risk to vendors stationed in high-traffic zones. Prolonged exposure to pollutants such as particulate matter (PM_{2.5}) and nitrogen dioxide (NO₂) has been shown to increase respiratory illnesses, a risk amplified by the lack of protective infrastructure around vending areas. Studies indicate that vendors in these settings are disproportionately affected by respiratory ailments, cardiovascular diseases, and other pollution-related health issues (Sepadi & Nkosi, 2023; Salamone et al., 2021). Beyond air pollution, vendors also endure exposure to extreme weather conditions, ranging from intense summer heat to cold winters, further compounded by the absence of shelter or shaded areas. In addition to environmental hazards, street vendors face substantial challenges due to inadequate sanitation facilities. Many operate without access to clean water or proper waste disposal systems, which raises the risk of foodborne illnesses and exacerbates public health concerns in densely populated trading areas. These conditions not only impact vendors' personal health but also pose a risk to the broader public, especially in urban centers where informal vending contributes significantly to daily food consumption.

Noise pollution and psychosocial stressors add further complexity to the OHS landscape for street vendors. The nature of informal work is often marked by economic uncertainty, lack of legal protection, and social stigma, contributing to heightened levels of stress among vendors. In light of these multifaceted challenges, innovative solutions are imperative. Emerging technologies, particularly Artificial Intelligence (AI), offer transformative potential for addressing these issues. AI has the capacity to revolutionize OHS for street vendors by providing real-time monitoring of environmental conditions, predictive analytics for anticipating health risks, and tailored training programs to equip vendors with essential health and safety knowledge. This chapter explores the potential of AI to enhance the OHS landscape for street vendors in South Africa.

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