



A Systematic Review of Particulate Matter (PM_{2.5}) Exposure from Charcoal Production and Lung Function Decline in Malawian Adult Workers: An African Perspective, 2005

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Published: 07 October 2005 | **Received:** 25 July 2005 | **Accepted:** 20 September 2005

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DOI: [10.5281/zenodo.18528761](https://doi.org/10.5281/zenodo.18528761)

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Abstract

Charcoal production is a significant economic activity in Malawi, particularly in rural districts such as Mchinji. The process emits fine particulate matter (PM_{2.5}), a recognised respiratory hazard. A specific evidence gap exists regarding the impact of this occupational exposure on the lung function of adult workers within the Malawian and wider African context. This systematic review aimed to synthesise existing evidence to determine the association between occupational PM_{2.5} exposure from charcoal production and lung function decline among adult workers in Mchinji District, Malawi. A systematic literature review was conducted according to established guidelines. Multiple electronic databases were searched for relevant peer-reviewed articles and grey literature. Included studies focused on PM_{2.5} exposure from charcoal production or biomass burning and measured lung function in adult populations, with priority given to evidence from Malawi and comparable settings. Data were extracted and synthesised narratively due to heterogeneity in study designs. The search identified a limited number of studies directly addressing the review question. The available evidence consistently indicated a negative association between exposure to biomass smoke, including from charcoal production, and lung function parameters. A common finding was reduced forced expiratory volume in one second (FEV₁) and forced vital capacity (FVC) among exposed workers compared to unexposed controls. The synthesised evidence suggests a probable association between occupational PM_{2.5} exposure from charcoal production and impaired lung function in Malawian adult workers. The current evidence base remains limited, underscoring a need for further primary research. Implementing occupational health interventions, such as improved kiln designs and personal protective equipment, is advised. Longitudinal studies are required to establish causality and dose-response relationships. Future research should prioritise direct exposure assessment and standardised lung function testing in this occupational group. Particulate matter, PM_{2.5}, occupational exposure, charcoal production, lung function, forced expiratory volume, forced vital capacity, Malawi, systematic review. This review consolidates the available evidence on a significant occupational health issue in a resource-limited setting. It highlights the specific risk to lung function from charcoal production and identifies critical gaps to guide future research and public health action in Malawi and similar contexts.

Keywords: *particulate matter, occupational exposure, respiratory function tests, Sub-Saharan Africa, charcoal, environmental health, cross-sectional studies*

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