



# A Meta-Analysis of Traffic-Related Air Pollution and Asthma Exacerbation in Schoolchildren Proximate to Major Roads in an African Urban Setting: Johannesburg, 2024

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## Abstract

Asthma is a significant public health concern among children in rapidly urbanising African cities. Johannesburg, as a major economic hub, experiences high traffic volumes and elevated ambient air pollution. Schoolchildren living near major roads are a vulnerable group for asthma exacerbation due to prolonged exposure. This meta-analysis aimed to quantify the association between exposure to traffic-related air pollution (TRAP) and the risk of asthma exacerbation in schoolchildren residing near major highways in Johannesburg. A systematic search was conducted across multiple electronic databases for observational studies reporting on TRAP exposure and asthma exacerbation in school-aged children in Johannesburg. TRAP exposure was defined by proximity to major roads or measured pollutant levels. Study quality was assessed using standard tools. Pooled odds ratios were calculated using a random-effects model. The pooled analysis demonstrated a statistically significant positive association. Children with higher TRAP exposure had approximately 1.4 times higher odds of asthma exacerbation compared to those with lower exposure. Heterogeneity among the included studies was moderate. Exposure to traffic-related air pollution is associated with an increased risk of asthma exacerbation in schoolchildren living near major roads in Johannesburg. This underscores TRAP as a modifiable environmental risk factor for child respiratory health in this urban setting. Public health strategies should consider stricter vehicle emission standards, promotion of cleaner public transport, and enforced buffer zones between major highways and schools or residential areas. Further longitudinal studies are required to establish causality and inform targeted interventions. air pollution, asthma, children, traffic, urban health, South Africa, meta-analysis This study provides a quantitative synthesis of

evidence on TRAP and asthma exacerbation in schoolchildren within a representative African urban setting, informing local public health policy.

**Keywords:** *traffic-related air pollution, asthma exacerbation, schoolchildren, urban Africa, meta-analysis, environmental epidemiology, Johannesburg*

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