

Abstract

Motor vehicle traffic is an important source of particulate pollution in cities of the developing world, where rapid growth, coupled with a lack of effective transport and land use planning, may result in harmful levels of fine particles (PM_{2.5}) in the air. However, a lack of air monitoring data hinders health impact assessments and the development of transportation and land use policies that could reduce health burdens due to outdoor air pollution. To address this important need, a study of traffic-related PM_{2.5} was carried out in the city of Nairobi, Kenya, a model city for sub-Saharan Africa, in July 2009. Sampling was carried out using portable filter-based air samplers carried in backpacks by technicians on weekdays over two weeks at several sites in and around Nairobi ranging from high-traffic roadways to rural background. Mean daytime concentrations of PM_{2.5} ranged from 10.7 at the rural background site to 98.1 $\mu\text{g}/\text{m}^3$ on a sidewalk in the central business district. Horizontal dispersion measurements demonstrated a decrease in PM_{2.5} concentration from 128.7 to 18.7 $\mu\text{g}/\text{m}^3$ over 100 meters downwind of a major intersection in Nairobi. A vertical dispersion experiment revealed a decrease from 119.5 $\mu\text{g}/\text{m}^3$ at street level to 42.8 $\mu\text{g}/\text{m}^3$ on a third-floor rooftop in the central business district. Though not directly comparable to air quality guidelines, which are based on 24-hour or annual averages, the urban concentrations we observed raise concern with regard to public health and related policy. Taken together with survey data on commuting patterns within Nairobi, these results suggest that many Nairobi residents are exposed on a regular basis to elevated concentrations of fine particle air pollution, with potentially serious long-term implications for health.