

2024 Monitoring Report on Air Pollution and Population Health

Risks in Urumqi

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Abstract: This study aimed to establish an air pollution health monitoring network in Urumqi to characterize pollution and its health impacts, thereby providing a basis for interventions. Monitoring was conducted in Tianshan and Midong Districts (2024 data). We collected environmental and meteorological data (PM_{2.5}, PM₁₀, etc.), analyzed PM_{2.5} components (PAHs, heavy metals), and gathered health data (mortality, emergency room/outpatient visits, student health). Generalized Additive Models (GAM) and Spearman correlation were used to analyze pollution-health links and protection effectiveness. Midong District recorded the highest annual PM_{2.5} concentration (51 µg/m³), with the most significant exceedance of standards occurring in February (exceedance rate: 35.07%). Fluoranthene (16.68%) and pyrene (11.75%) were the dominant PAHs. The average concentration of Benzo[a]pyrene was 0.617 ng/m³, below the standard limit. Arsenic and chromium posed excess lifetime cancer risks (1.74×10^{-5} and 1.19×10^{-5} , respectively), exceeding acceptable thresholds. PM_{2.5} and PM₁₀ concentrations were positively correlated with respiratory mortality ($r=0.134$, 0.141 ; $P<0.05$) and outpatient visits (CO excess risk: 59.73%). Throat symptoms among students (Midong: 67 cases, Tianshan: 91 cases) were significantly associated with pollution levels ($P<0.05$). Public education initiatives reached over 50,000 people, effectively improving awareness. This research reveals that Urumqi's winter PM_{2.5} pollution is severe, with heavy metals like arsenic and chromium and PAHs posing significant health risks, necessitating enhanced multi-sectoral coordination and public health protection to reduce population exposure. Consequently, stricter controls on PM_{2.5} components, particularly PAHs and heavy metals (As, Cr), are urgently needed. We recommend enhancing cross-departmental data sharing, strengthening technical capacity at the grassroots level, and expanding the coverage of health education.

Keywords: PM_{2.5}; Health Monitoring; Polycyclic Aromatic Hydrocarbons; Heavy Metals;