Associations between urban road-traffic emissions, health risks, and socioeconomic status in Ho Chi Minh City, Vietnam: a cross-sectional study

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Abstract

Background Tailpipe emissions from road vehicles are an important cause of mortality in low-income cities. $PM_{2·5}$ concentrations in Ho Chi Minh City (HCMC), Vietnam, are dangerously high, with mean annual concentrations of 17 230–560·88 μg/m³ (acceptable concentrations are 300 μg/m³ for 1 h a day maximum). Many studies have considered the health effects of air pollution. However, few studies have assessed the socio-spatial equity and health burden of traffic air pollution. Proximity to traffic has been associated with greater mortality. However, populations with lower socioeconomic statuses are more likely to be exposed to high concentrations of air pollution than are populations with higher socioeconomic statuses. We aimed to investigate whether the public health burden is associated with urban road-traffic emission in HCMC, and whether reducing air pollution will decrease hospital admissions, premature deaths, and years of life lost. We also explored the association between air pollution and socioeconomic status in HCMC.

Methods In this cross-sectional study, we used the damage function approach in the Benefits Mapping and Analysis Program (BenMAP-Community Edition version 1.3) to estimate mortality risk and economic health burden resulting from $PM_{2·5}$ emissions in HCMC. 2010–14 data from General Statistics Reports and the Vietnam Household Living Standard Survey, covering 19 districts and five suburban districts in HCMC, were analysed and mapped. A sensitivity analysis was also done to estimate the effects of air pollution reduction under different scenarios.

Findings We estimated that emission of $PM_{2·5}$ from on-road vehicles contributes to 780 (95% CI 340–1180) hospital admissions, 320 (240–570) premature deaths, and 4600 (3600–7600) years of life lost in HCMC each year. Motorcycles, trucks, and buses are the main sources of $PM_{2·5}$ emission, associated with 210 (160–320) deaths each year. Populations with lower socioeconomic statuses are at higher risk of adverse health outcomes than are populations with higher socioeconomic statuses. Sensitivity analysis showed that reducing $PM_{2·5}$ exposure by 5%, 10%, or 15% would result in fewer premature deaths and hospital admissions and a gain in life-years.

Interpretation We have developed a rapid and efficient method for estimating traffic air pollution risk, which can be applied to cities with similar settings to HCMC. The findings suggest that reducing motor vehicle emissions, particularly from motorcycles, trucks, and buses, could produce substantial health benefits. These findings call for better land-use and transport planning. Shifts in mode of transport from motor vehicles to public or active transport are urgently needed for urban areas in low-income countries.

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Declaration of interests

We declare no competing interests.