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## Linking administrative data with modelled pollution fields to improve estimates of population exposure to air pollution in major Scottish urban areas

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**Abstract:** Exposure to air pollution has been identified as a major risk to human health. Epidemiological studies investigating the impact of human exposure to air pollution have largely ignored the spatio-temporal variability of air pollution within urban areas and population mobility. This approach may lead to exposure misclassification and, consequently, a bias in the associated health effects. By accounting for time spent at the place of work/study in addition to the time spent at the place of residence we attempt to improve estimates of exposure to ambient air pollution (nitrogen dioxide, particulate matter, ozone) of populations and population subgroups living in Scotland's two largest urban areas – Glasgow and Edinburgh. We also investigate how considering exposure at the place of work/study affects air pollution exposure inequality between population subgroups with high and low socio-economic status. For our analysis we link at the post code level anonymised personal data of members of the Scottish Longitudinal Study (SLS), a representative sample of the Scottish population, with air pollution concentrations generated by the Gaussian plume dispersion model ADMS-Urban. We calculate traffic related emissions from available traffic data and input them alongside gridded emissions data from other sources in the National Atmospheric Emission Inventory (NAEI) into the model to obtain concentrations in each post code (median area approximately 4000 m<sup>2</sup>) in the studied areas at 1 hour temporal resolution for the period of 1 year. The personal data are based on UK Census 2011 and besides home and work address post codes and deprivation score include information on occupation and hours per week worked, which we utilize to estimate the working pattern of each SLS member for a more realistic distribution of time spent in each of the two microenvironments.

**Keywords:** air pollution exposure modelling, dynamic population