A STUDY OF OZONE EXPOSURE ACROSS EUROPE: 2004-2010

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Summary
This study presents an assessment of exposure to ozone exceedences across Europe using a new methodology based around the Eurostat degree of urbanisation (DEGURBA) classification, which provides the ability to categorise exposure into 'Urban' ('densely populated'), Suburban ('intermediate density') and Rural ('thinly populated') areas. The study considers exposure to a range of regulatory standards for ozone as set out in the 2008 Ambient Air Quality Directive 2008/50/EC. It finds that although concentrations may be higher in rural areas, numbers of population exposed to exceedences of the standards are significantly higher in both urban and suburban areas.

Introduction
Ozone is a particularly problematic pollutant to manage effectively due to its complex chemistry and its transboundary nature. Concerns about exposure to high ozone concentrations have typically focussed on rural areas where, due to lack of fresh NOx emissions to break down the ozone, concentrations generally exceed those in urban areas. However, with much greater numbers of people living in both suburban and urban areas, and with growing evidence to suggest that urban ozone concentrations are increasing this work provides a timely reminder that if pollutant thresholds are to be taken seriously, then urban ozone management policies require much more serious attention.

Methodology and Results
The exposure analysis was based on three main data sources:

1: Hourly average ozone concentrations obtained from the EMEP Eulerian Photoxidant Model for the years 2004-2010.

2: 1km resolution gridded population data from Geostat representing 2006 populations for 26 Member States and the four EFTA countries.

3: Eurostat 'Degree of Urbanisation' (DegUrba) classifications for LAU2 administrative areas for EU-27 countries.

Due to data limitations, and to be able to clearly ascertain the differences in exposure caused by year-to-year variation in ozone concentrations only the modelled ozone data was varied, with population figures and DegUrba classifications remaining constant.

Exposure was assessed in terms of time series for the whole of the EU (or that part that was coincident with all three datasets), as well as estimates of total and percentage populations exposed for each individual country.

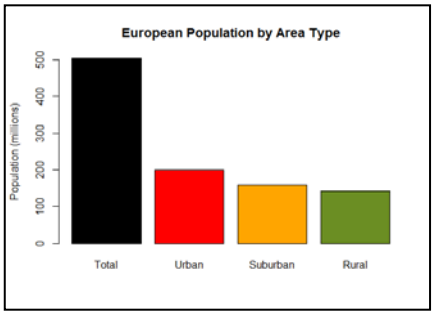

Fig.1 European Urban/Suburban/Rural population split 2006

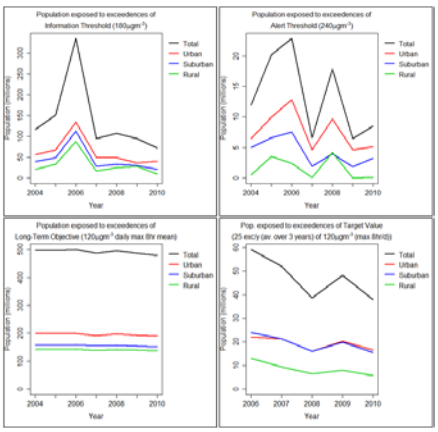

Fig.2 Exposure of population to exceedences of O_3 standards 2004-10

Conclusions
Although absolute ozone concentrations may be higher in rural areas absolute numbers of people exposed for each of the standards considered is higher within both urban and suburban areas than for rural areas. Particularly in light of evidence that suggests that NOx management strategies may be leading to increases in urban ozone concentrations, this work raises significant questions about the need for advances in how we manage ozone and its precursors.

Further work will be undertaken to compare these outcomes with exposure predictions made using a different methodology by the European Environment Agency. Also, an estimate will be made of the difference in estimated exposure that results from using the new 25km EMEP grid developed to provide better representation of urban areas.

Acknowledgement
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References
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