

Predicted health impacts of congestion pricing in Stockholm

– a local assessment

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Aim and background

Traffic congestion leads to substantial waste of time, extra fuel combusted, polluted air and negative health effects. Using price to allocate space on congested roads involves charging relatively higher prices for travel during periods of peak hours than in other periods. The introduction of such a system is planned in Stockholm, and we have estimated the effects on air pollution levels and health.

Results and conclusions

-For approximately 330000 inner-city residents it is estimated that the reduction in long-term exposure corresponds to 46 deaths per year based on NO₂ as exhaust exposure indicator (Dutch study by Hoek et al).

- If instead PM10 is used as indicator (US coefficients as used by Künzli et al and in APHEIS) the reduction is estimated to 18 deaths per year.

Methods

Traffic models, a dynamic emission database and an air quality dispersion model have been used to calculate the effect on NO₂ and PM₁₀ levels of a system for congestion pricing.

Air pollutant concentrations have been combined with spatial distribution of the population (100x100 m resolution for the inner city, 500 x 500 for outskirts) to obtain population weighted means and extreme values.

The modelled exposure reductions have been combined with reported exposure-response functions and local base-line frequencies to quantify health benefits expected from the pricing system.

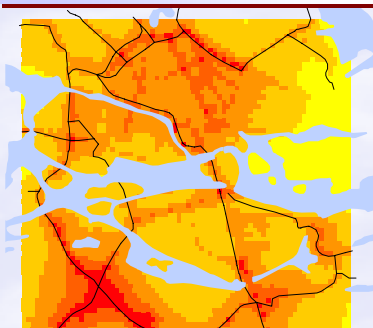
Estimated long term effects on the inner-city mortality

| Indicator | Assumed RR per $\mu\text{g}/\text{m}^3$ | Reduction deaths per year | With day time population |
|------------------|---|---------------------------|--------------------------|
| PM ₁₀ | 0,43 % | 17,7 | 18.3 |
| NO ₂ | 1,2 % | 46,3 | 48.1 |

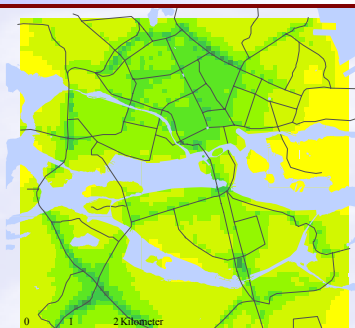
In both cases the population weighted annual mean concentration was estimated to be reduced by 1.2 $\mu\text{g}/\text{m}^3$. If the effects on concentration reduction in the outskirts (a population of about one million people) is included, the total reduction in mortality is estimated to be 65 cases using NO₂ as indicator. "Reductions in hospital admissions were also estimated, but only as a decrease in short-term effects.

Applied relative risks are associated with uncertainties. Other factors cause additional uncertainties, why we see it necessary to further develop this kind of assessments.

Annual mean NO₂ background concentration ($\mu\text{g}/\text{m}^3$) in the inner city



Estimated reduction in annual mean NO₂ concentration ($\mu\text{g}/\text{m}^3$) in the inner city



Estimated reduction in NO₂ annual mean population exposure ($\mu\text{g}/\text{m}^3 \times \text{persons}$) in the inner city

