Health impact assessment of traffic-related air pollution in Copenhagen Municipality

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Health impact assessment of traffic-related air pollution in Copenhagen Municipality
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PM2.5 and O3 in five Southern European countries: Greece, Italy, Portugal, Slovenia and Spain. Health impacts attributable to PM2.5 and O3 were largest in Greece and lowest in Portugal. Ambient air pollution is a significant health risk factor in the studied Southern European countries: Greece, Italy, Portugal, Slovenia and Spain. Health impacts attributable to PM2.5 and O3 to 11,300; 54,200; 5,100; 1,600 and 23,700 deaths in Greece, Italy, Portugal, Slovenia and Spain, respectively. PM2.5 was related to several health outcomes. There is sufficient evidence for ozone (O3) exposure to ambient air pollution has been linked to cardiovascular and respiratory outcomes and mortality. Disease burden methods produce information about risk factors in comparable units enabling comparison between different health outcomes and risk factors.

Methods:
Disease burden methods were used to estimate health impacts of ambient air pollution in Europe (HRAPIE) working group. Concentration-response functions were selected for fine particles (PM2.5) and partly for ozone (O3). Exposure to ambient air pollution has largely exceeded the guideline values set by World Health Organization. Concentrations generated by European Environmental Agency (EEA) and background disease burden data by Health impacts were estimated using disease burden methods.

Background:
WHO.

Results:
We utilized country level population weighted average air pollution in 2015. The current results are presented for 2014. PM2.5 was related to several health outcomes. There is sufficient evidence for ozone (O3). Exposure to ambient air pollution has been linked to cardiovascular and respiratory outcomes and mortality. Disease burden methods produce information about risk factors in comparable units enabling comparison between different health outcomes and risk factors.

Key messages:
In this study we quantify health impacts of ambient air pollution in five Southern European countries: Greece, Italy, Portugal, Slovenia and Spain in 2015. Health impacts were estimated using disease burden methods. Health impacts attributable to PM2.5 and O3 were largest in Greece and lowest in Portugal. Ambient air pollution is a significant health risk factor in the studied Southern European countries: Greece, Italy, Portugal, Slovenia and Spain. Health impacts attributable to PM2.5 and O3 together were attributable to 16,800; 14,400; 8,400; 14,200 and 9,200 years of life lost per one million inhabitants in Greece, Italy, Portugal, Slovenia and Spain, respectively. PM2.5 and O3 to 11,300; 54,200; 5,100; 1,600 and 23,700 deaths in Greece, Italy, Portugal, Slovenia and Spain, respectively. PM2.5 was related to several health outcomes. There is sufficient evidence for ozone (O3). Exposure to ambient air pollution has largely exceeded the guideline values set by World Health Organization. Concentrations generated by European Environmental Agency (EEA) and background disease burden data by Health impacts were estimated using disease burden methods.

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Background:
High-resolution exposure to traffic-related air pollution can be assessed by modelling levels of nitrogen dioxide (NO2) which together with ultrafine particles mainly originate from diesel-powered vehicles in urban areas. The purpose of the study was to estimate the health benefits of reduced exposure to vehicle emissions assessed as NO2 among the citizens of Copenhagen Municipality, Denmark.

Methods:
We utilized residential NO2 concentrations modelled by use of chemistry transport models to calculate contributions from emission sources to air pollution. We used exposure-response functions linking NO2 concentration estimates with the risk of diabetes, cardiovascular diseases, and respiratory diseases derived from a large Danish study. The DYNAMO-HIA model was applied to the population of Copenhagen by using residential NO2 concentrations combined with demographic data and data from nationwide registers on incidence and prevalence of diseases associated with air pollution. Different scenarios were modelled to estimate the impact of NO2 exposure on related diseases and the potential health benefits of lowering the NO2 level in Copenhagen.

Results:
If NO2 exposure was restricted to the rural level life expectancy in 2040 would increase by two years for men and almost a half year for women. The greatest gain in disease-free life expectancy for men would be lifetime without ischemic heart disease (2.2 years), chronic obstructive pulmonary disease (2.1 years), and asthma (2.3 years). Among women the greatest increase would be lifetime without diabetes (1.2 years) and without stroke (1.1 years).

Conclusions:
Reducing the NO2 exposure by controlling traffic-related air pollution reduces the occurrence of some of the most prevalent diseases and increases life expectancy which can be quantified by DYNAMO-HIA with a high resolution exposure modelling. This tool has demonstrated how traffic planners can assess health benefits from reduced levels of traffic-related air pollution.

Key messages:
- Lowering NO2 exposure by reducing traffic-related air pollution would reduce occurrence of cardiovascular, respiratory and metabolic diseases, lung cancer, and increase disease-free life expectancy.
- The full potential of health gain by reducing NO2 exposure level to that of rural areas would increase life expectancy in Copenhagen by two years for men and almost a half year for women.