HEALTH IMPACT ASSESSMENT OF AIR POLLUTION WITH OZONE AND PM\textsubscript{10} IN THE COASTAL REGION OF SLOVENIA

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Abstract

This work provides an estimation of the health impact of ozone and PM\textsubscript{10} in the coastal region of Slovenia for the years 2007 and 2008. The SOMO35 indicator formed the basis for the annual estimate of human exposure to ozone and PM\textsubscript{10}, and yearly average PM\textsubscript{10} concentration over the reference value: 70 μg/m\textsuperscript{3} for ozone and 20 μg/m\textsuperscript{3} for PM\textsubscript{10}, respectively. Acute mortality from all causes, excluding accidents, was calculated for ozone and PM\textsubscript{10} impact, while the mortality from cardiovascular and respiratory causes was estimated for ozone and, for PM\textsubscript{10}, both cardiovascular and respiratory causes. The estimation performed reveals a comparable proportion of mortality from selected health end-points within other EU regions in a similar air quality situation.

Methodology

The number of deaths attributable to air pollution from ozone and PM\textsubscript{10} was calculated by using an estimate of concentration-response functions in terms of the relative risk (RR) at 95 % CI for stated health end-point and unit change in concentration of a pollutant, where RR is the increase in the probability of occurrence of the adverse effect on health associated with a given change in exposure level above the reference value\textsuperscript{1}. The cut-off value 70 μg/m\textsuperscript{3} in terms of the ozone SOMO35 indicator and the yearly average PM\textsubscript{10} value were used in estimating the health impact\textsuperscript{2}. The SOMO35 indicator is calculated from 24-hourly running averages for each day (as the maximum 8-hours running average) in a year. The yearly average PM\textsubscript{10} value is calculated from valid daily means and compared to the reference value of 20 μg/m\textsuperscript{3} (the scenario of compliance with EU limits to be achieved by 2010).

Results

The average ozone value SOMO35 in the selected period was 22 μg/m\textsuperscript{3}. The average PM\textsubscript{10} value for the same period was 27 μg/m\textsuperscript{3}. Figure 2 shows the contribution to SOMO35 and PM\textsubscript{10} from rural and urban areas, respectively. The cumulative ozone concentrations in the region during the indicative monitoring period is shown in Figure 4.

The excesses of ozone concentrations over the cut-off value was found to have contributed to 8 deaths from all causes, excluding accidents (0.7 % in the whole population in the region) and additionally to 4 deaths from cardiovascular causes (0.9 %). For all causes of acute mortality, excluding accidental causes, 5 deaths (0.4 %) were attributable every year to PM\textsubscript{10} levels in excess of 20 μg/m\textsuperscript{3}.

An additional 3 deaths (0.6 %) from cardiovascular causes and 1 death (0.9 %) from respiratory causes were attributable to levels of PM\textsubscript{10} in excess of the reference value. The results are shown in Table 1.

Conclusion

It was estimated that the impacts of ozone and PM\textsubscript{10} on health outcomes represent a considerable public health issue in the Slovenian coastal region. This estimation is comparable to other EU regions, where similar proportions of mortality from selected health end-points were reported. However, some questions and uncertainties about the use of epidemiological evidence to predict effects of outdoor air pollution on health remain open. Particular attention should be paid to this in future studies, as well to vulnerability and susceptibility to air pollution.

Table 1: Cases of mortality in 2007 and 2008 attributable to ozone as SOMO35 and levels of PM\textsubscript{10} exceeding 20 μg/m\textsuperscript{3}

<table>
<thead>
<tr>
<th>Year</th>
<th>Causes of death</th>
<th>OZONE</th>
<th>PM\textsubscript{10}</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>All causes (excl. accidents)</td>
<td>1,000</td>
<td>1,000</td>
</tr>
<tr>
<td>2007</td>
<td>Cardiovascular causes</td>
<td>1,000</td>
<td>1,000</td>
</tr>
<tr>
<td>2007</td>
<td>Respiratory causes</td>
<td>1,000</td>
<td>1,000</td>
</tr>
</tbody>
</table>

References: