A Multi-Pollutant Air Quality Health Index (AQHI) Based on Short-Term Respiratory Effects in Stockholm

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AQHI BASED ON ASTHMA EMERGENCY DEPARTMENT VISITS INDICATES THE OVERALL DAILY RISKS OF EXPOSURE TO NO\textsubscript{x}, O\textsubscript{3}, PM\textsubscript{10} AND BIRCH POLLEN

\section*{Background}

The AQHI is intended for public information regarding the expected health risks associated with current or forecasted concentrations of pollutants and pollen.

\section*{Methods}

The AQHI is based on daily emergency department visits for asthma (AEDV) and urban background concentrations of NO\textsubscript{x}, O\textsubscript{3}, PM\textsubscript{10} and birch pollen in Stockholm. The index is calculated as:

\[ \text{AQHI} = \sum_{i=1}^{p} 100(e^{B_i X_i} - 1) \]

where the beta-coefficient ($B_i$) represents the increase in AEDV per unit increase of each individual air pollutant and pollen ($X_i$) per cubic meter. The coefficients are based on all age groups, and the exposure window is lag01 (mean of same day and yesterday).

\begin{table}
\centering
\begin{tabular}{|l|c|}
\hline
\% increase in AEDV per 10 units m\textsuperscript{-3} & \\
\hline
NO\textsubscript{x} & 0.5 (95\% CI: -1.2–2.2) \\
O\textsubscript{3} & 0.3 (95\% CI: -1.4–2.0) \\
PM\textsubscript{10} & 2.5 (95\% CI: 0.3–4.8) \\
Birch pollen & 0.26 (95\% CI: 0.18–0.34) \\
\hline
\end{tabular}
\end{table}

\section*{Results}

- Total monthly mean AQHI (% increase in AEDV) during 2015–2017 varied between 4 and 9\%, with a peak value of 15\%.
- Simultaneously high levels of pollen, O\textsubscript{3} and PM\textsubscript{10} makes AQHI peak during spring early summer.
- NO\textsubscript{x} exhibits an even distribution throughout the year, except for a decrease during the summer due to less traffic.
- The mean risk contributions during the study period were 3\%, 2\%, 0.8\% and 0.3\% for PM\textsubscript{10}, O\textsubscript{3}, NO\textsubscript{x} and pollen.

\begin{figure}
\centering
\includegraphics[width=\textwidth]{monthly_aqhi_graph.png}
\caption{MONTHLY AQHI BASED ON MEASURED CONCENTRATIONS 2015-2017}
\end{figure}

\textsuperscript{12} Olstrup et al,. 2019