# ENVIRONMENTAL IMPACTS IN THE WIDER AREA OF ATHENS

## Prof. Panagiotis Nastos

Research Center for Atmospheric Physics and Climatology of the Academy of Athens

# Daily mortality and air temperature in the wider area of Athens

## **Materials and Methods**:

**Medical datasets:**

The daily organic-cause mortality datasets were acquired from the Hellenic Statistical Service, for the period 1992–2001.

**Meteorological datasets:**

The daily meteorological datasets, concerning daily maximum and minimum air temperature, were acquired from the Hellinikon/Athens meteorological station, established at the headquarters of the Hellenic Meteorological Service.

**Methods:**

The assessment of the weather variables affecting the incidence of the organic-cause mortality was achieved by the implementation of: a) Pearson $\chi^2$ test, the most widely used method of independence control of groups in lines and columns in a table of frequencies and b) Generalized Linear Models (GLM) with Normal distribution and c) Logistic Analysis.
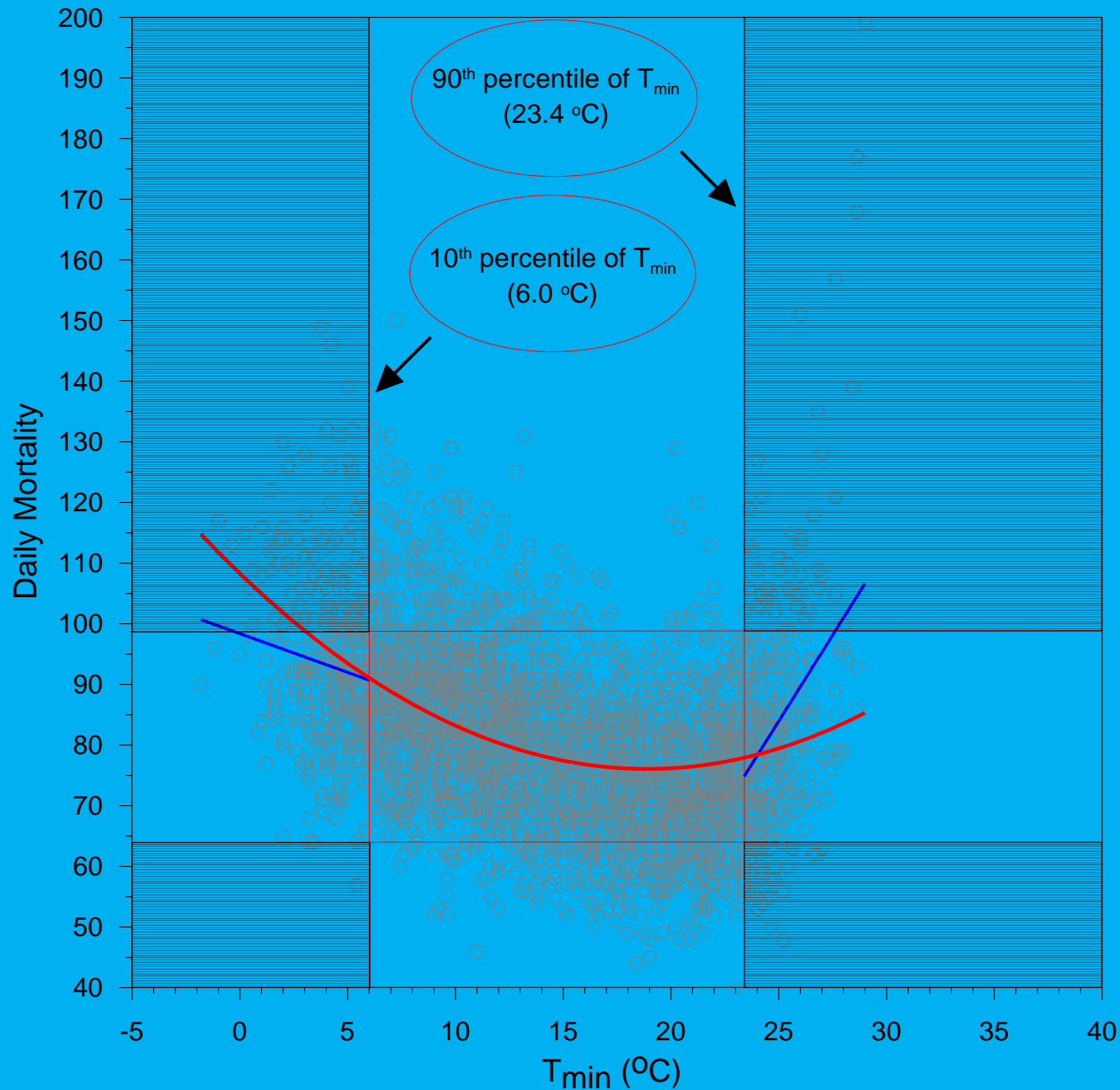
Scatter plot of daily mortality versus daily Tmin values, along with polynomial fitting (quadratic function). The vertical lines in the scatter plots represent the 10th and 90th percentiles of the maximum and minimum air temperature while the horizontal lines represent the 10th and 90th percentiles for the daily mortality.

# Weather patterns and childhood asthma in the wider area of Athens
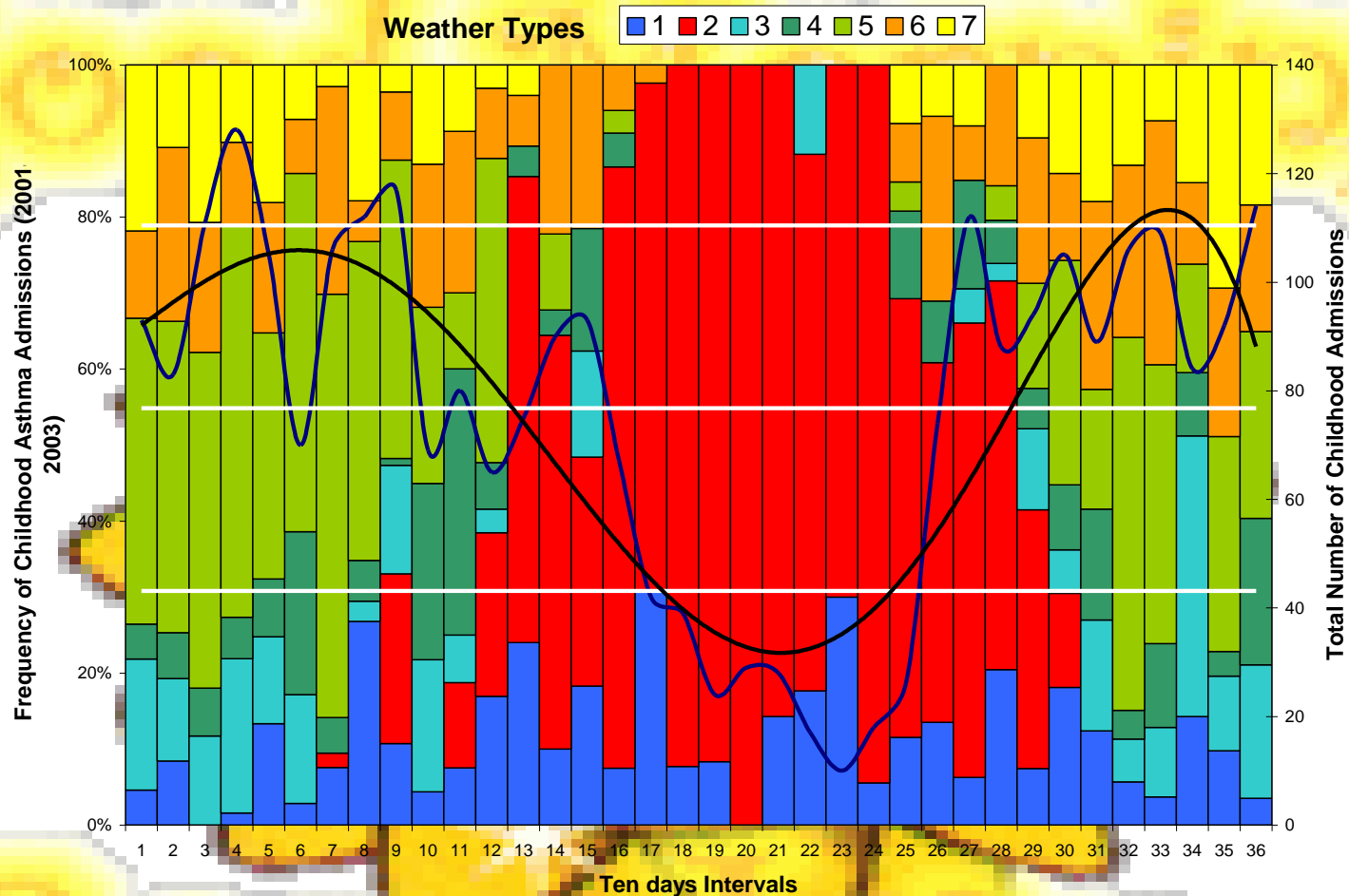
# Materials and Methods:

## Medical datasets:

2764 daily asthma admissions from the hospital registries of the three main Children's Hospitals of Athens for the 2001-2003 period. All children admitted with the diagnosis of "asthma", "asthmatic bronchitis" or "wheezy bronchitis", aged 0-14 years, living in the metropolitan area of Athens were included.

## Meteorological datasets:

Daily values of 20 parameters recorded at the National Observatory of Athens during the period 2001-2003: maximum temperature (Tmax); minimum temperature (Tmin); mean temperature (Tmean); diurnal temperature range (Trange = Tmax – Tmin); mean relative humidity (RH); mean water vapor pressure (e); mean atmospheric pressure at sea level (P); mean irradiance (I); mean sunshine (S); mean wind speed (v) and day-to-day changes of the aforementioned variables.
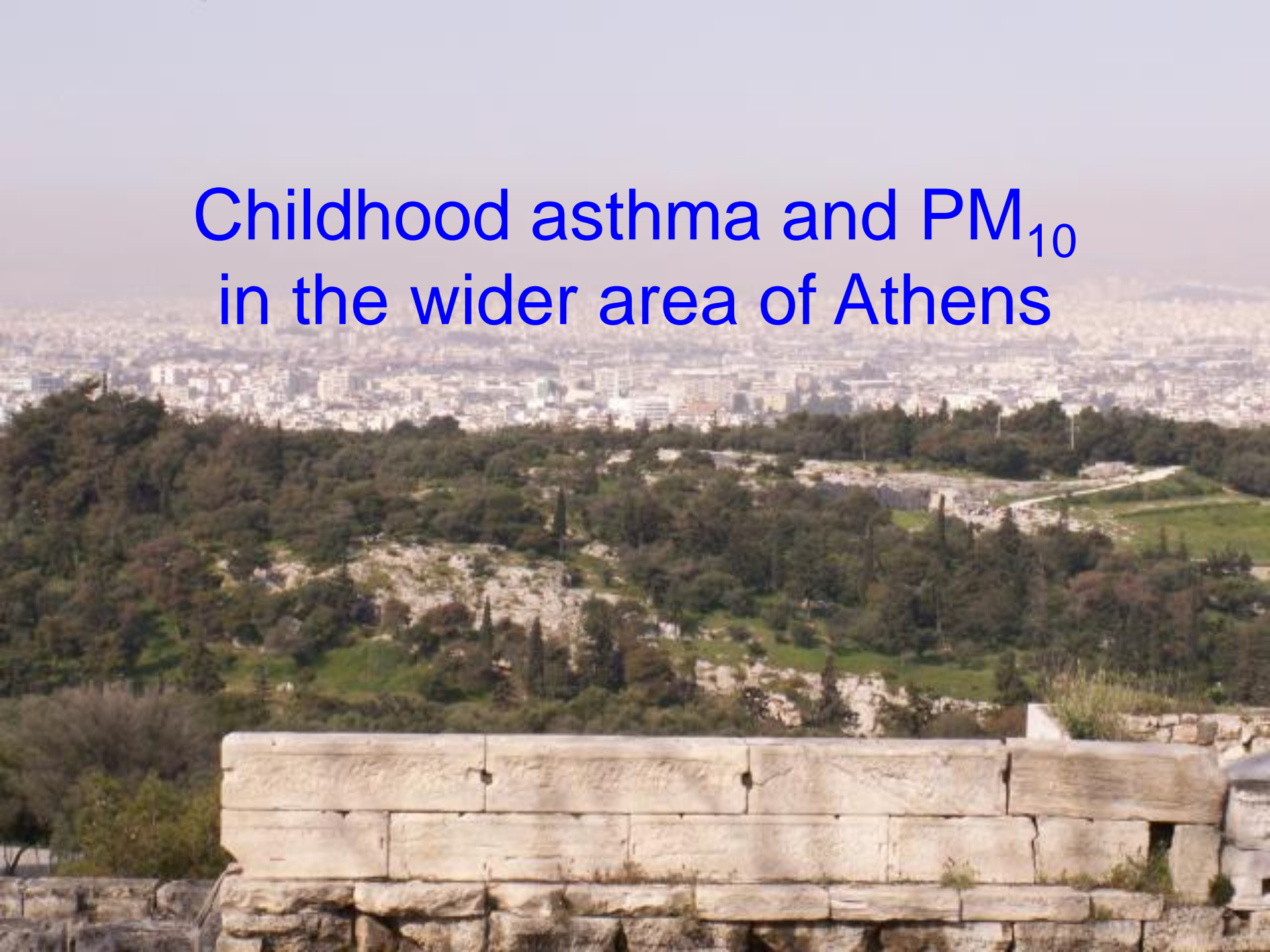
## Methods:

The assessment of the weather types affecting the incidence of childhood asthma was achieved by the implementation of: a) Pearson $\chi^2$ test, the most widely used method of independence control of groups in lines and columns in a table of frequencies and b) Factor Analysis (FA) and Cluster Analysis (CA).

Relative frequency (%) of the Childhood Asthma admissions per Ten-Days Intervals as a function of the weather types (clusters) along with the variation of the total number of admissions per Ten-Days Interval (blue line) and the polynomial fitting (black line). Three reference lines (white lines) concerning the mean, the mean+SD and the mean-SD are also depicted.

# Childhood asthma and $PM_{10}$ in the wider area of Athens

# Materials and Methods:

## Medical datasets:

3602 daily childhood asthma admissions (CAA) from the hospital registries of the three main Children's Hospitals of Athens for the 2001-2004 period. All children admitted with the diagnosis of "asthma", "asthmatic bronchitis" or "wheezy bronchitis", aged 0-14 years, living in the metropolitan area of Athens were included.

## Ambient air pollution datasets:

Mean daily $PM_{10}$, concentrations for the wider area of Athens, from the network of the Ministry of Environment.

## Methods:

The assessment of the PM10 impacts on the incidence of childhood asthma was achieved by the implementation of: a) Pearson $\chi^2$ test, the most widely used method of independence control of groups in lines and columns in a table of frequencies, b) Generalized Linear Models (GLM) with Poisson distribution and c) Logistic Analysis.
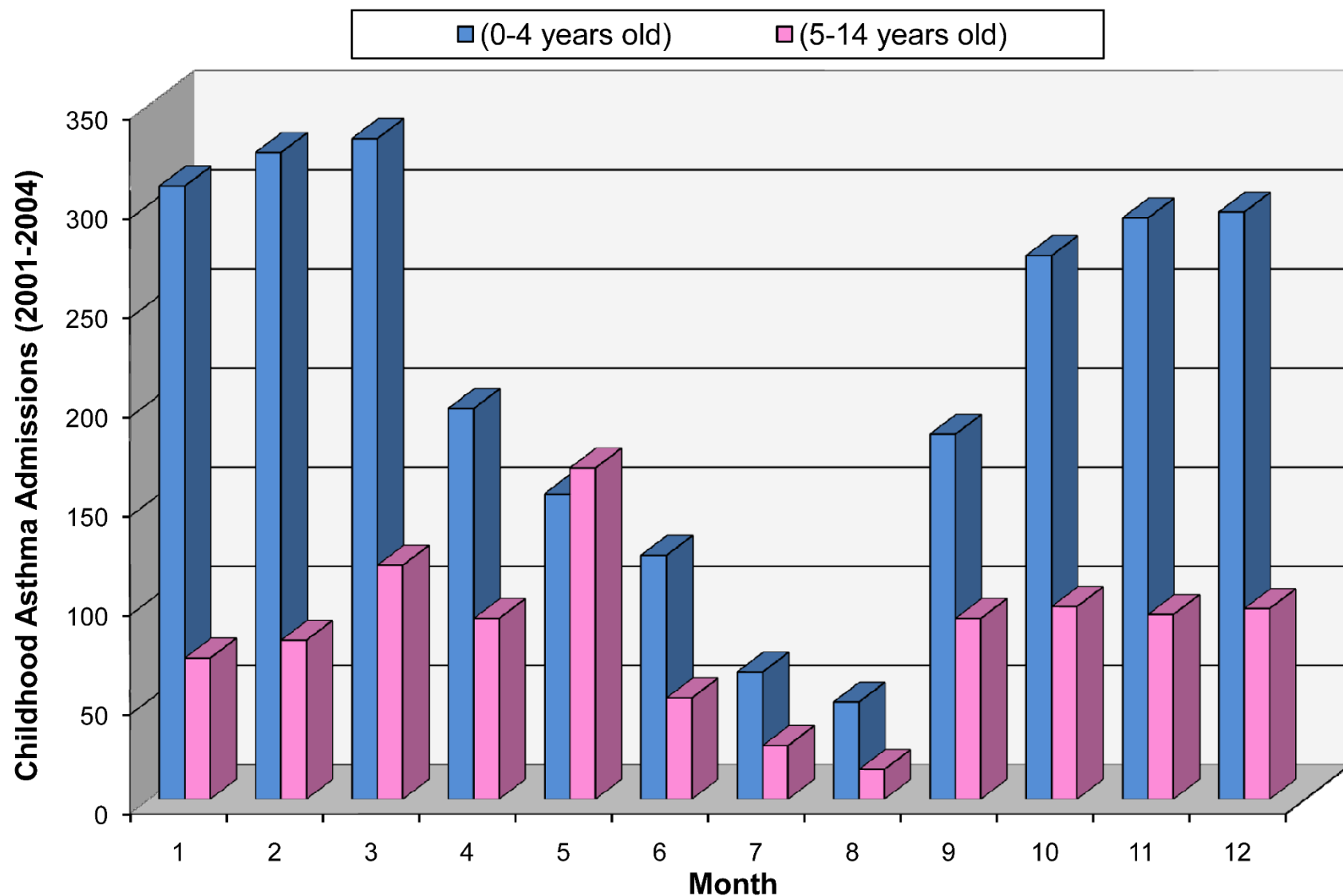
Number of monthly childhood asthma admissions for each age group during the period 2001-2004

# Childhood Asthma Admissions and $PM_{10}$ concentrations

There is a statistically significant ($p < 0.05$) relationship for the day of admission (0-day lag) between mean daily PM10 concentrations (averaged values from all monitoring stations) and CAA in the 5-14 year-old age group; namely, an increase by 10 µg/m³ on mean daily PM10 concentrations was associated with an increase of 3.8% in the probability of CAA. No such correlation was found in the 0-4 year-old age group.

| Childhood Asthma Admissions | | $PM_{10}$ (µg/m³) | |
|---|---|---|---|
| | | β-coefficient ± S.E. | p |
| 0-day lag | (0-4 years old) | 0.0005 ± 0.0010 | 0.647050 |
| | (5-14 years old) | 0.0038 ± 0.0016 | 0.014101 |
| 1-day lag | (0-4 years old) | -0.0023 ± 0.0011 | 0.028252 |
| | (5-14 years old) | 0.0034 ± 0.0016 | 0.031084 |
| 4-day lag | (0-4 years old) | 0.0011 ± 0.0010 | 0.267737 |
| | (5-14 years old) | 0.0043 ± 0.0016 | 0.005755 |