Press Release

February 23, 2010

FY2007 Annual Report of Environmental Health Surveillance for Air Pollution

The Ministry of the Environment (MOE) has been implementing environmental health surveillance for air pollution every year since 1996 in response to the amendment of the Pollution-related Health Damage Compensation Law (amendment to the Law Concerning Special Measures for the Relief of Pollution-related Health Damage) of 1988. It aims to regularly and continuously observe the correlation between the health conditions of local populations and air pollution, and to take measures as necessary.

The FY2007 surveillance targeted 3-year-old children (hereinafter, "3-year-old survey") and first-year primary school children (hereinafter, "6-year-old survey") as in the previous year. A cross-sectional analysis was performed using the results of these surveys (FY2007), and a longitudinal analysis was performed using the results of 3-year-old surveys from FY1996 to FY2007. Additionally, a follow-up analysis was performed on 6-year-old children who also responded to the 3-year-old survey conducted in FY2003 and FY2004.

The 3-year-old survey targeted approximately 92,000 3-year-old children in 38 regions throughout Japan (75,000 respondents), and the 6-year-old survey targeted approximately 89,000 6-year-old children also in 38 regions throughout Japan (73,000 respondents).

As a result of the above analyses, no significant correlation was observed between air pollution and asthma in the 3-year-old survey, but a study of factors influencing asthma symptoms in the 6-year-old survey indicated a significant correlation between air pollution (SPM) and asthma (odds ratio 1.10; 95% confidence interval 1.03 – 1.17). Meanwhile, no significant correlation was observed in the past three 6-year-old surveys although the odds ratio was greater than 1, and in the 3-year-old survey, the odds were less than 1, or no significant correlation was observed although the odds ratio was greater than 1. Furthermore, there was no indication that asthma prevalence increases along with increasing concentrations of air pollutants, neither in the analysis of respiratory symptom prevalence at each background concentration level for each subject group, nor in the correlation between average background concentration and respiratory symptom prevalence in each survey area for each subject group.

As shown above, the 3-year-old survey and 6-year-old survey as a whole indicated that higher concentrations of air pollutants do not necessarily result in wheezing or higher rates of asthma prevalence and incidence. Nevertheless, the correlation of SPM and asthma, particularly in the

6-year-old survey, should continue to be observed carefully.

Attached materials

- FY2007 Annual Report of Environmental Health Surveillance for Air Pollution [PDF 607KB]
- <Reference> FY2007 Survey areas [PDF 214KB]

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1. Method

In both the 3-year-old survey and the 6-year-old survey, a health survey and exposure assessment were conducted as shown below, to analyze and assess the correlation between the concentration of air pollutants and prevalence of asthma and other respiratory symptoms.

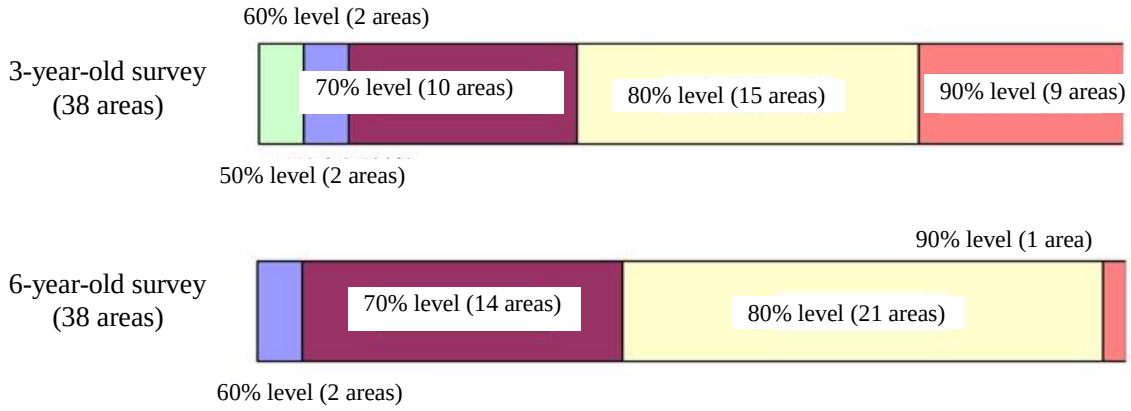
In the follow-up analysis, the correlation between air pollutant concentration and asthma incidence was analyzed and assessed. Among the subjects of the FY2007 6-year-old survey implemented in 32 survey areas where a follow-up analysis was feasible, the analysis targeted those who also responded to a 3-year-old survey held in FY2003 and FY2004. Children who did not have asthma at the time of the 3-year-old survey but displayed asthma symptoms later at the time of the 6-year-old survey were deemed to have developed asthma.

	3-year-old survey	6-year-old survey
Health survey	ATS-DLD simplified questionnaires (MOE version) were sent to all households with 3-year-old children in the survey areas. They were filled out by the children's parents and collected by staff of 38 local municipalities.	ATS-DLD simplified questionnaires (MOE version) were sent to all households with first-grade children who attend a public primary school in a school district that includes the survey area of the 3-year-old survey. They were filled out by the children's parents and collected by staff of 38 local municipalities.
Exposure assessment	Using the three-year average of annual average concentrations of NO_2, NO_x, SO_2 and SPM at ambient air pollution monitoring stations in and surrounding the study areas between FY2004 and FY2006, the concentration of these pollutants at residential points of all study subjects was estimated.	

2. Results

(1) Number of children surveyed and response rate

The 3-year-old survey targeted 91,848 children and obtained 74,884 responses, corresponding to a response rate of 81.5%. The 6-year-old survey targeted 89,179 children and obtained 72,519 responses, corresponding to a response rate of 81.3%.



The follow-up analysis targeted 38,728 children, corresponding to 59.9% of the 64,647 respondents of the 6-year-old survey implemented in areas where a follow-up analysis was feasible.

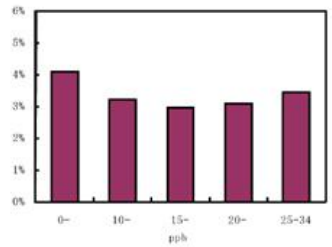
(2) Results of the cross-sectional analysis of the 3-year-old survey and 6-year-old survey

1) Prevalence of respiratory symptoms at each background concentration level for each subject group

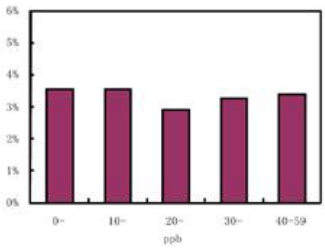
The prevalence of respiratory symptoms was analyzed by background concentration level of air pollutants with respect to each subject group, but neither the 3-year-old survey nor the 6-year-old survey indicated a tendency for asthma prevalence to be higher in areas with higher background concentration levels. In fact, asthma prevalence was higher in areas with lower background concentration levels.

3-year-old survey

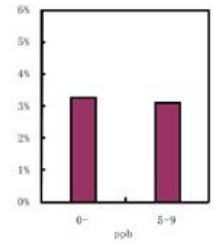
Asthma prevalence by NO_2 concentration



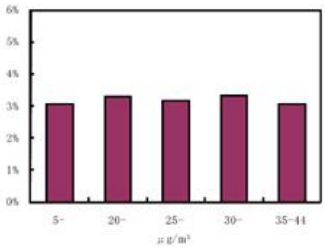
Asthma prevalence by NOx concentration



Asthma prevalence by SO_2 concentration

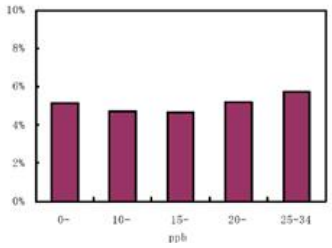


Asthma prevalence by SPM concentration

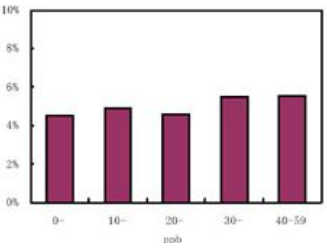


6-year-old survey

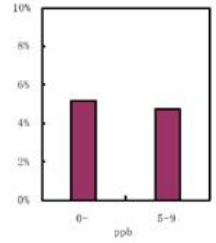
Asthma prevalence by NO_2 concentration



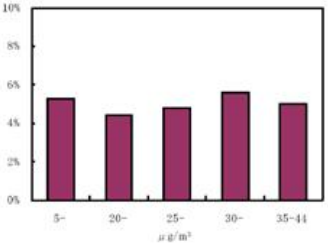
Asthma prevalence by NOx concentration



Asthma prevalence by SO_2 concentration



Asthma prevalence by SPM concentration

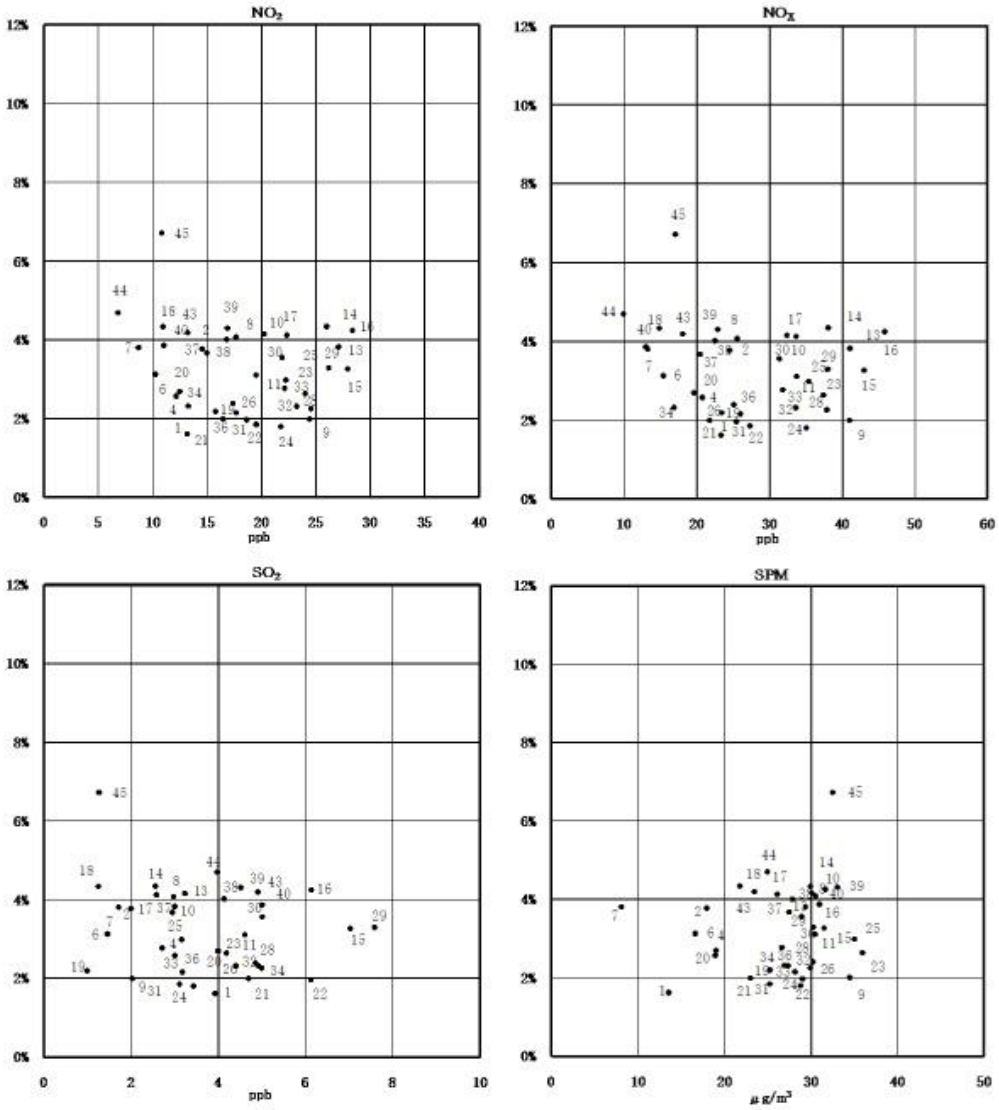


2) Average background concentration and respiratory symptom prevalence in each survey area for each subject group

The correlation between average background concentration and the prevalence of respiratory symptoms was analyzed by survey area with respect to each subject group, but neither the 3-year-old survey nor 6-year-old survey indicated a tendency for asthma prevalence to be higher in areas with higher air pollutant concentrations.

3-year-old survey

Correlation between air pollutant concentration and asthma prevalence (adjusted rates) – All subjects (boys + girls)

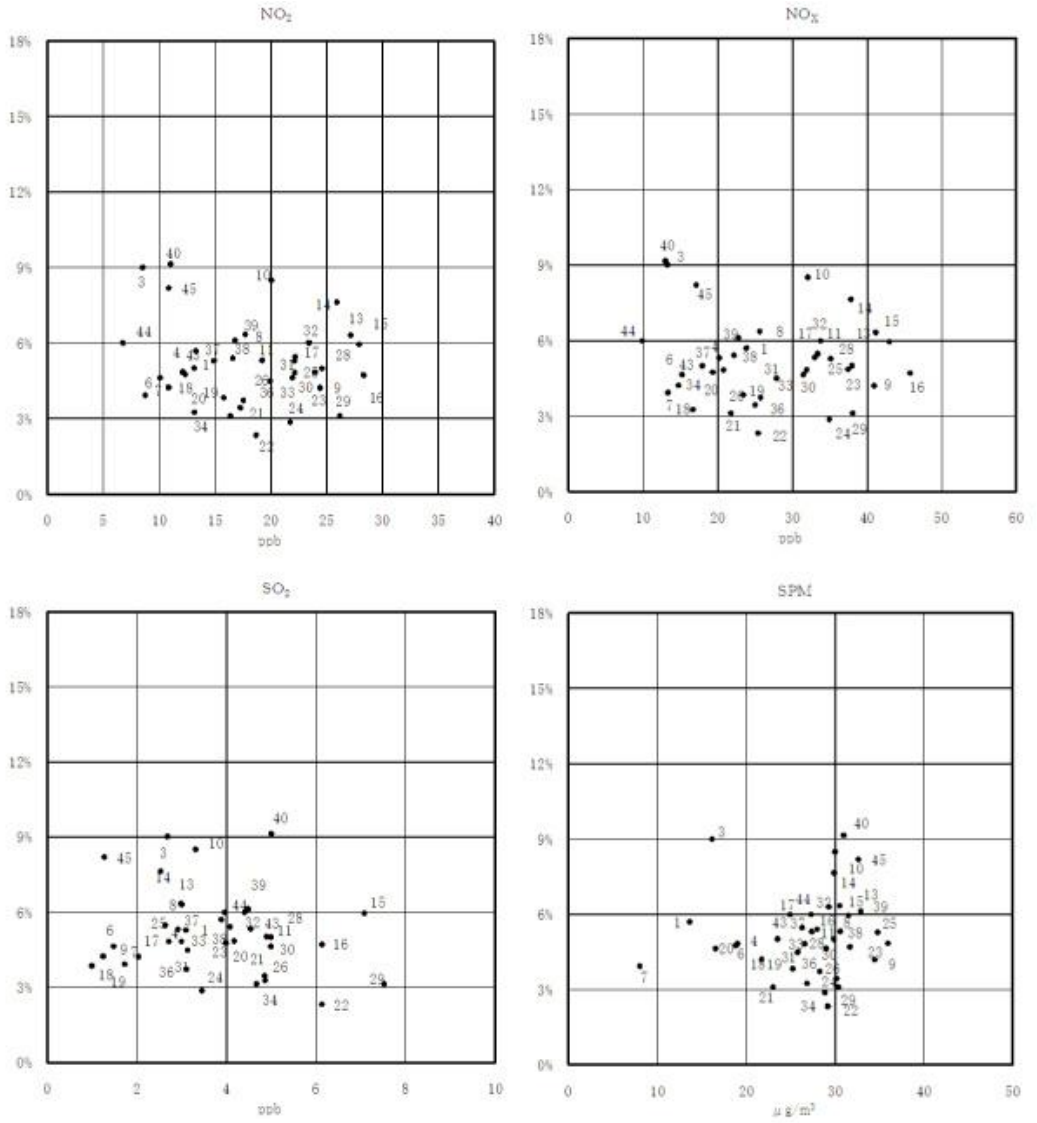


*1 Numbers in the graph indicate survey areas. Refer to the chart on p.14.

*2 The adjusted rates are the prevalence of asthma after factoring in the allergic history of all subjects by the composition ratio of each type of allergy.

6-year-old survey

Correlation between air pollutant concentration and asthma prevalence (adjusted rates) –
All subjects (boys + girls)



*1 Numbers in the graph indicate survey areas. Refer to the chart on p.14.
*2 The adjusted rates are the prevalence of asthma after factoring in the allergic history of all subjects by the composition ratio of each type of allergy.

3) Study of factors influencing asthma prevalence

In the 3-year-old survey, the study indicated that the following factors contribute to the prevalence of asthma symptoms: gender, smoking habits of the mother and other family members at home, daytime caretaker, allergic history of the subject and parents. In the 6-year-old survey, the influencing factors were: gender, smoking habits of the mother and other family members at home, heating method, dwelling period, feeding during the first 3 months after birth, and allergic history of the subject and parents. The study also confirmed a significant correlation between air pollutant (SPM) and asthma in the 6-year-old survey (odds ratio: 1.10; 95% confidence interval 1.03 – 1.17).

Odds Ratios of Factors Influencing Asthma Prevalence

		3-year-old survey		6-year-old survey
NO_2	per 10ppb	0.93		0.99
NOx	per 10ppb	0.96		1.01
SO_2	per 10ppb	0.82		0.73*
SPM	per10μg/m3	1.07		1.10*
Gender	male	1.69*		1.54*
	female	1.00		1.00
Smoking habits of family member	mother	1.44～1.45*		1.45～1.46*
	other member	1.22*		1.18*
	no smoker	1.00		1.00
Housing structure	Wooden with wooden frame	1.10～1.13		0.98～1.00
	wooden with metal frame	0.97～1.00		0.99～1.02
	reinforced concrete	1.00		1.00
Heating method	no exhaust system	0.95		0.92～0.93*
	exhaust system	1.00		1.00
Dwelling period	since birth	1.02	since birth	0.92
	more than 1 year	1.02	more than 3 years	0.91*
	less than 1 year	1.00	less than 3 years	1.00
Pets	Yes	1.11		1.01
	No	1.00		1.00
Daytime caretaker	Nursery center	1.41～1.44*		-
	Others	1.00		-
Feeding during the first 3 months after birth	milk only	1.03～1.04		1.15～1.16*
	breast feeding & milk	1.04		1.03～1.04
	breast feeding only	1.00		1.00
History of allergies (subject)	Yes	2.00*		2.72～2.73*
	No	1.00		1.00
History of allergies (parents)	Yes	2.30～2.32*		2.00～2.01*
	No	1.00		1.00

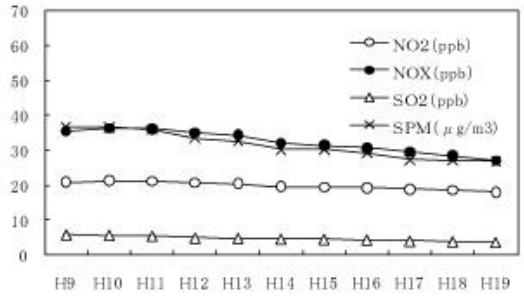
* Statistically significant (P<0.05)

(Note) To examine the correlation between asthma prevalence and major factors (items between “gender” and “history of allergies (parents)” above) in detail, odds ratios were estimated by logistic regression analysis using the major factors and air pollutant concentrations as explanatory variables.

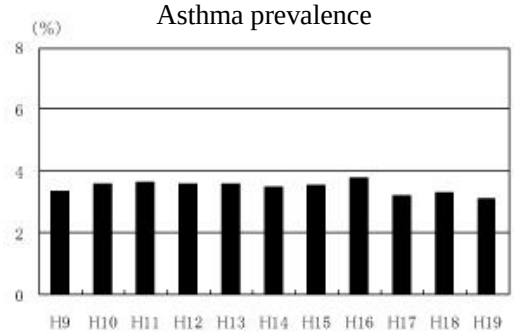
(3) Longitudinal and comprehensive analysis of 3-year-old survey data*

In the longitudinal analysis of data from FY1997 to FY2007, a number of survey areas showed an increase or decrease in asthma prevalence during that time period. However, no clear trend was observed in the correlation between changes in average background concentration of air pollutants and changes in asthma prevalence in either subject group.

Air pollutant concentration

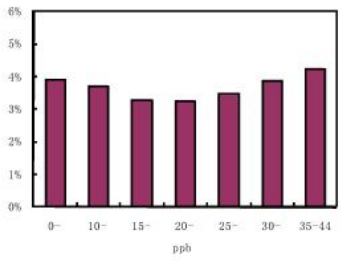


Asthma prevalence

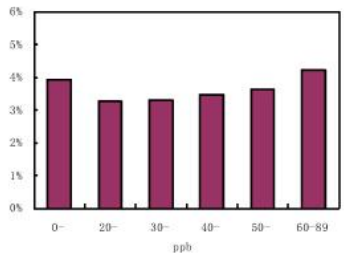


The result of comprehensive analysis of integrated data from FY1997 to FY2007 was also the same as the cross-sectional analysis. Neither the prevalence of respiratory symptoms at each background concentration level for each subject group, the correlation between average background concentration and respiratory symptom prevalence in each survey area for each subject group, nor the study of factors influencing such symptoms showed a tendency for asthma prevalence to be higher at higher air pollutant concentrations, as with the cross-sectional analysis.

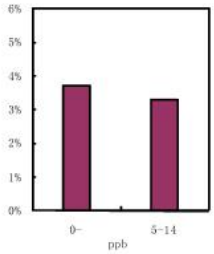
Asthma prevalence by NO_2 concentration



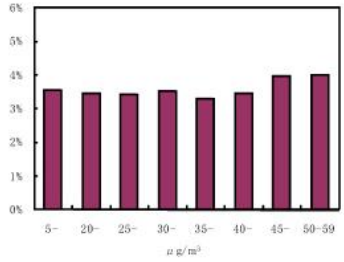
Asthma prevalence by NOx concentration



Asthma prevalence by SO_2 concentration



Asthma prevalence by SPM concentration



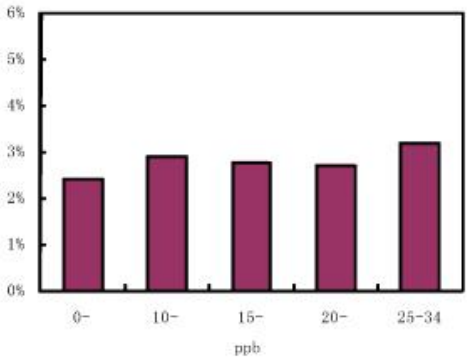
* The data on asthma prevalence obtained in FY1996, the first year of the survey, was simply used as reference in the longitudinal and comprehensive analyses, because it showed values that were distinctly lower than data from other years.

(4) Results of the follow-up analysis

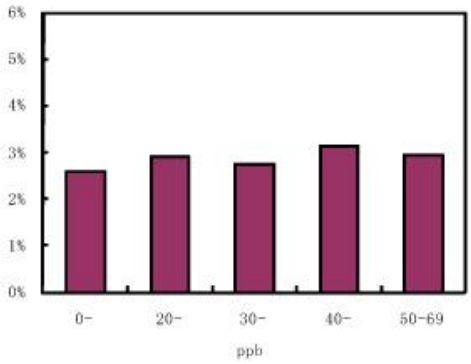
1) Asthma incidence at each background concentration level

Asthma incidence was analyzed by background concentration of air pollutants with respect to each subject group, but it did not necessarily tend to be higher at higher air pollutant concentrations.

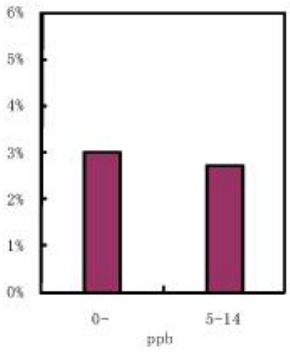
Asthma prevalence by NO_2 concentration



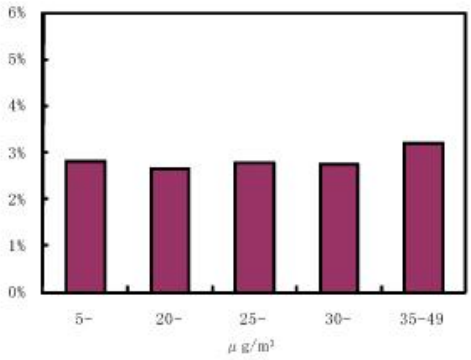
Asthma prevalence by NOx concentration



Asthma prevalence by SO_2 concentration



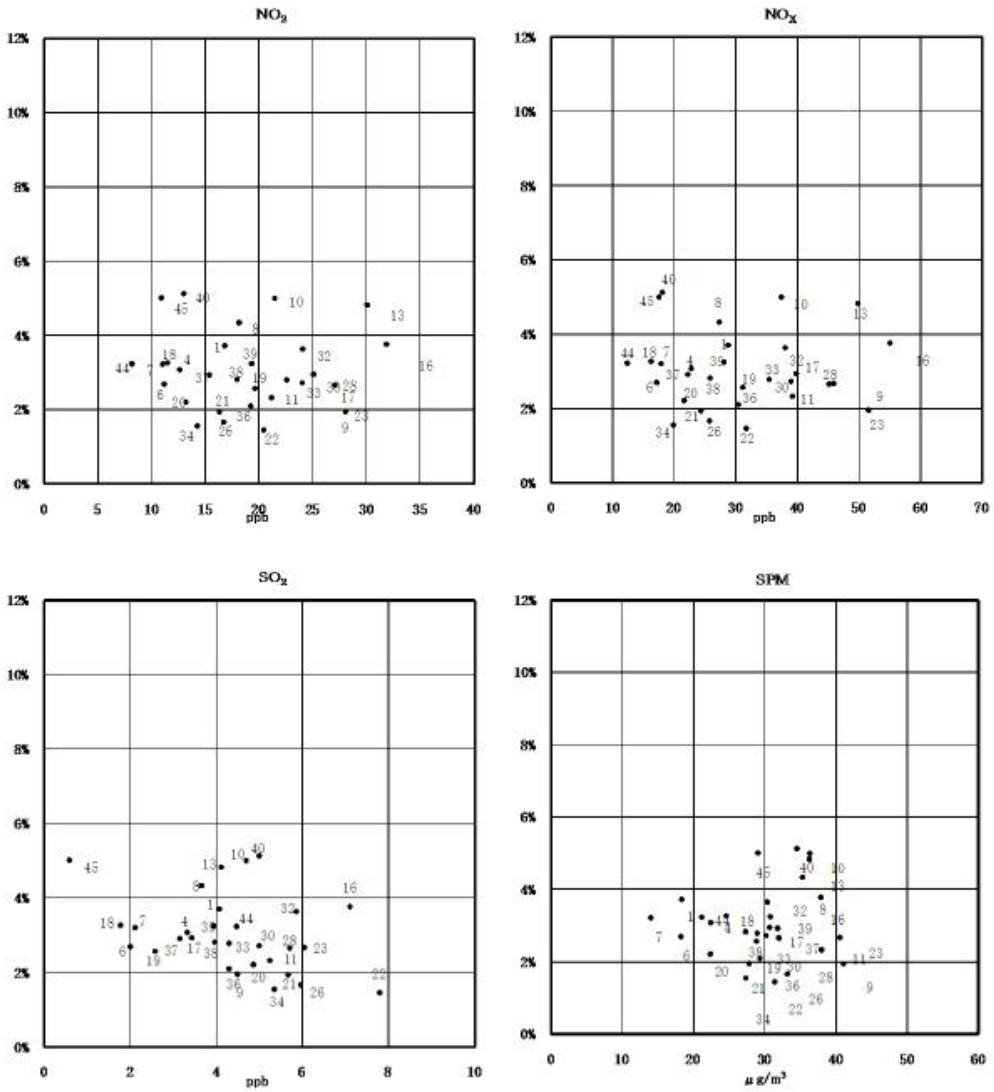
Asthma prevalence by SPM concentration



2) Average background concentration and asthma incidence in each survey area

The correlation between average background concentration and asthma incidence was analyzed by survey area with respect to each subject group, but asthma incidence did not tend to be higher in areas with higher air pollutant concentrations compared to areas with lower concentrations. In fact, some areas with low air pollutant concentrations had the same or higher incidence of asthma compared to areas with high air pollutant concentrations.

Correlation between air pollutant concentrations and asthma incidence (adjusted rates) – All subjects (boys + girls)



*1 Numbers in the graph indicate survey areas. Refer to the chart on p.14.

*2 The adjusted rates are the incidence of asthma after factoring in the allergic history of all subjects of the three-year-old survey by the composition ratio of each type of allergy and the average of the follow-up analysis.

3) Study of factors influencing asthma incidence

The study indicated that the following factors contribute to the incidence of asthma: gender, pets, and allergic history of subject and parents. However, it did not show any significant correlation between high air pollutant concentrations and high incidence rates.

Odds Ratios of Factors Influencing Asthma Incidence

		Follow-up analysis
NO_2	per 10ppb	1.03
NOx	per 10ppb	1.02
SO_2	per 10ppb	0.58*
SPM	per10μg/m3	1.02
Gender	male	1.56*
	female	1.00
Smoking habits of family member	mother	1.16～1.17
	other member	0.90
	no smoker	1.00
Housing structure	wooden with wooden frame	1.06
	wooden with metal frame	0.91～0.92
	reinforced concrete	1.00
Heating method	no exhaust system	1.03～1.05
	exhaust system	1.00
Address change	Change of address	1.02
	Same address	1.00
Pets	Yes	1.17*
	No	1.00
Daytime caretaker	Nursery center	0.90～0.93
	Others	1.00
Feeding during the first 3 months after birth	milk only	0.88
	breast feeding & milk	1.03
	breast feeding only	1.00
History of allergies (subject)	Yes	1.96～1.97*
	No	1.00
History of allergies (parents)	Yes	1.62～1.65*
	No	1.00

* Statistically significant ($P<0.05$)

(Note) To examine the correlation between asthma prevalence and major factors (items between “gender” and “history of allergies (parents)” above) in detail, odds ratios were estimated by logistic regression analysis using the major factors and air pollutant concentrations as explanatory variables.