Press Release

May 27, 2011

FY2009 Annual Report of Environmental Health Surveillance for Air Pollution (Notice)

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.

[Overview of the FY2009 Surveillance Result]

The FY2009 surveillance targeted 3-year-old children (hereinafter, "3-year-old survey") and first-year primary school children (hereinafter, "6-year-old survey") as in previous years. A cross-sectional analysis was performed using the results of these surveys (FY2009), and a longitudinal analysis was performed using the integrated results of 3-year-old surveys from FY1996 to FY2009 and 6-year-old surveys from FY2004 to FY2009. Additionally, a follow-up analysis was performed on 6-year-old respondents who also responded to the 3-year-old survey conducted in FY2005 and FY2006.

The 3-year-old survey targeted approximately 90,000 3-year-old children in 38 regions throughout Japan (73,000 respondents), and the 6-year-old survey targeted approximately 89,000 6-year-old children in 38 regions throughout Japan (73,000 respondents).

Among the respiratory symptoms surveyed, the results of analyses relating to asthma were as follows.

In terms of an examination of odds ratios, the 3-year-old survey showed a significant correlation between air pollution (SPM) and asthma for the first time last year, but not this year. On the other hand, the 6-year-old survey showed no significant correlation between air pollution (SPM) and asthma last year, but showed a significant correlation this year (odds ratio 1.08; 95% confidence interval [1.00 – 1.16]). In regard to air pollutants other than SPM, neither the 3-year-old survey nor 6-year-old survey showed a significant correlation between these air pollutants and asthma again this year. Meanwhile, the exposure assessment revealed a general downward trend in air pollution (SPM), and the exposure assessment and health survey combined showed no clear trend between high asthma prevalence and high air pollutant concentrations, 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.

With respect to symptoms other than asthma, the frequency of catching a cold (more than five time) tended to increase with higher air pollutant concentrations, but the same trend was not observed with cases of wheezing (both associated and not associated with a cold).

[Future Issues]

The correlation between SPM and asthma as observed in the 3-year-old survey and 6-year-old survey cannot be seen as indicating certain trends yet, but it will continue to be observed carefully, also in consideration of regional characteristics.

In response to the environmental quality standards for PM2.5 that were promulgated in September 2009, a continuous surveillance system is currently being developed, so based on the progress of its development, studies of PM2.5 will be made as needed, also in reference to SPM.

Additionally, in recent years, photochemical oxidant warnings are being issued mainly in western Japan, and there are growing concerns about the influence of photochemical oxidants on people's health. As many foreign countries are revising their standards for photochemical oxidants, future developments will continue to be watched closely.

Further studies will also be made in reference to the "Result of the Epidemiological Study of the Health Effects of Localized Air Pollution" announced in May 2011.

Attached materials

- FY2009 Annual Report of Environmental Health Surveillance for Air Pollution [PDF 1,948KB]
- <Reference> FY2009 Survey areas [PDF 475KB]

Contact:
Environmental Health Affairs Office,
Policy Planning Division, Environmental Health Department, Environmental Policy Bureau,
Ministry of the Environment
Direct line: 03-5521-8256
Main line: 03-3581-3351

FY2009 Annual Report of Environmental Health Surveillance for Air Pollution

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.

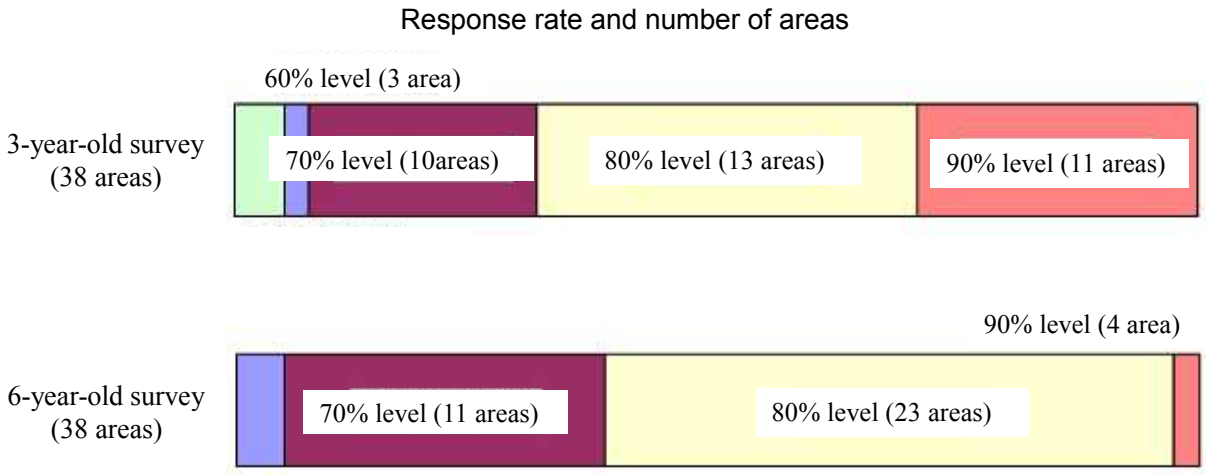
In the follow-up analysis, the correlation between air pollutant concentration and asthma incidence was analyzed and assessed. Among the subjects of the FY2009 6-year-old survey implemented in 37 survey areas where a follow-up analysis was feasible, the analysis targeted those who also responded to a 3-year-old survey held in FY2005 and FY2006. 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 FY2006 and FY2008, 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 90,270 children and obtained 73,715 responses, corresponding to a response rate of 81,7%. The 6-year-old survey targeted 89,122 children and obtained 73,166 responses, corresponding to a response rate of 82,1%.



The follow-up analysis targeted 44,493 children, corresponding to 61,8% of the 72,007 respondents of the 6-year-old survey implemented in areas where a follow-up analysis was feasible.

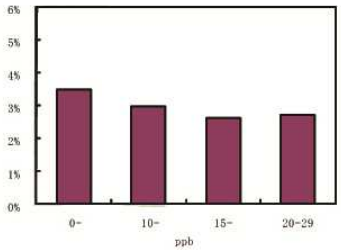
(2) Results of the cross-sectional analysis of the 3-year-old survey and 6-year-old survey

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

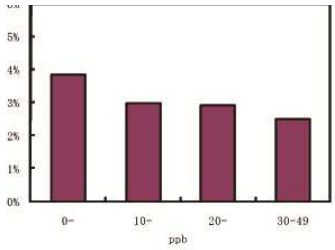
The prevalence of respiratory symptoms was analyzed by background concentration level of air pollutants with respect to each subject group, but neither the 3-year-old survey nor the 6-year-old survey indicated a tendency for asthma prevalence to be higher in areas with higher background concentration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

3-year-old survey

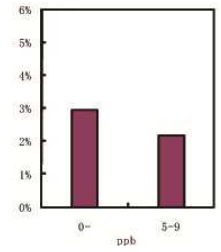
Asthma prevalence by NO_2 concentration



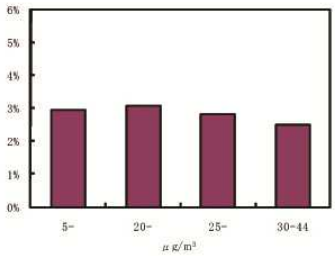
Asthma prevalence by NOx concentration



Asthma prevalence by SO_2 concentration

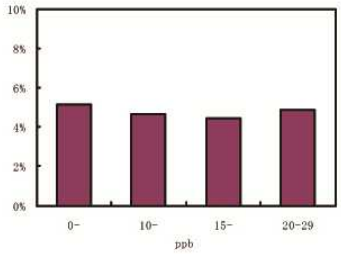


Asthma prevalence by SPM concentration

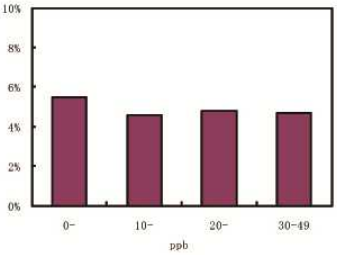


6-year-old survey

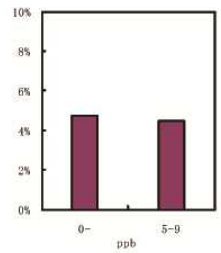
Asthma prevalence by NO_2 concentration



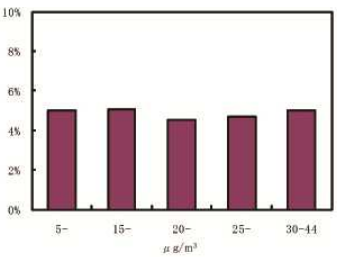
Asthma prevalence by NOx concentration



Asthma prevalence by SO_2 concentration



Asthma prevalence by SPM concentration

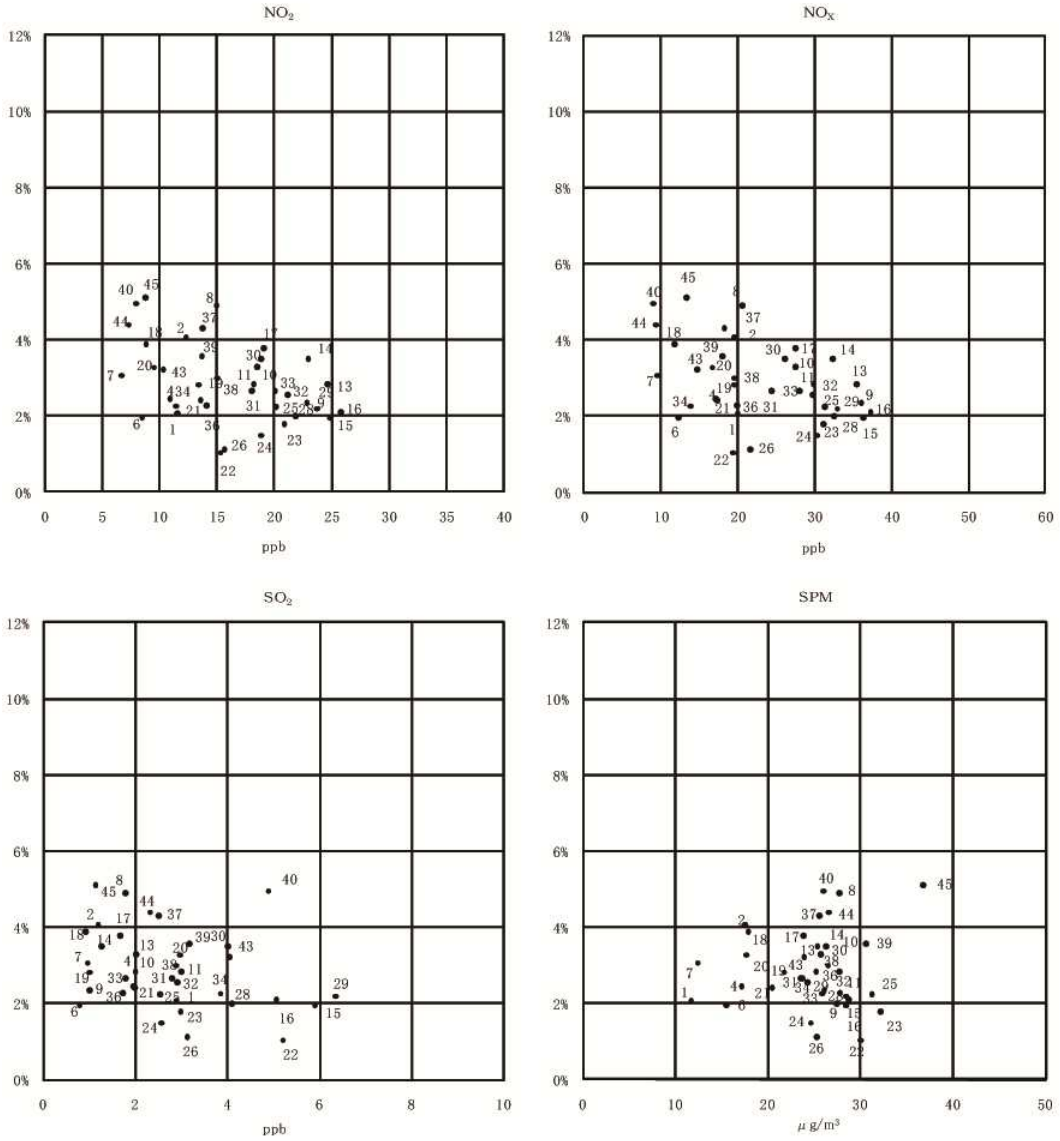


2) Average background concentration and respiratory symptom prevalence in each survey area for each subject group

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)

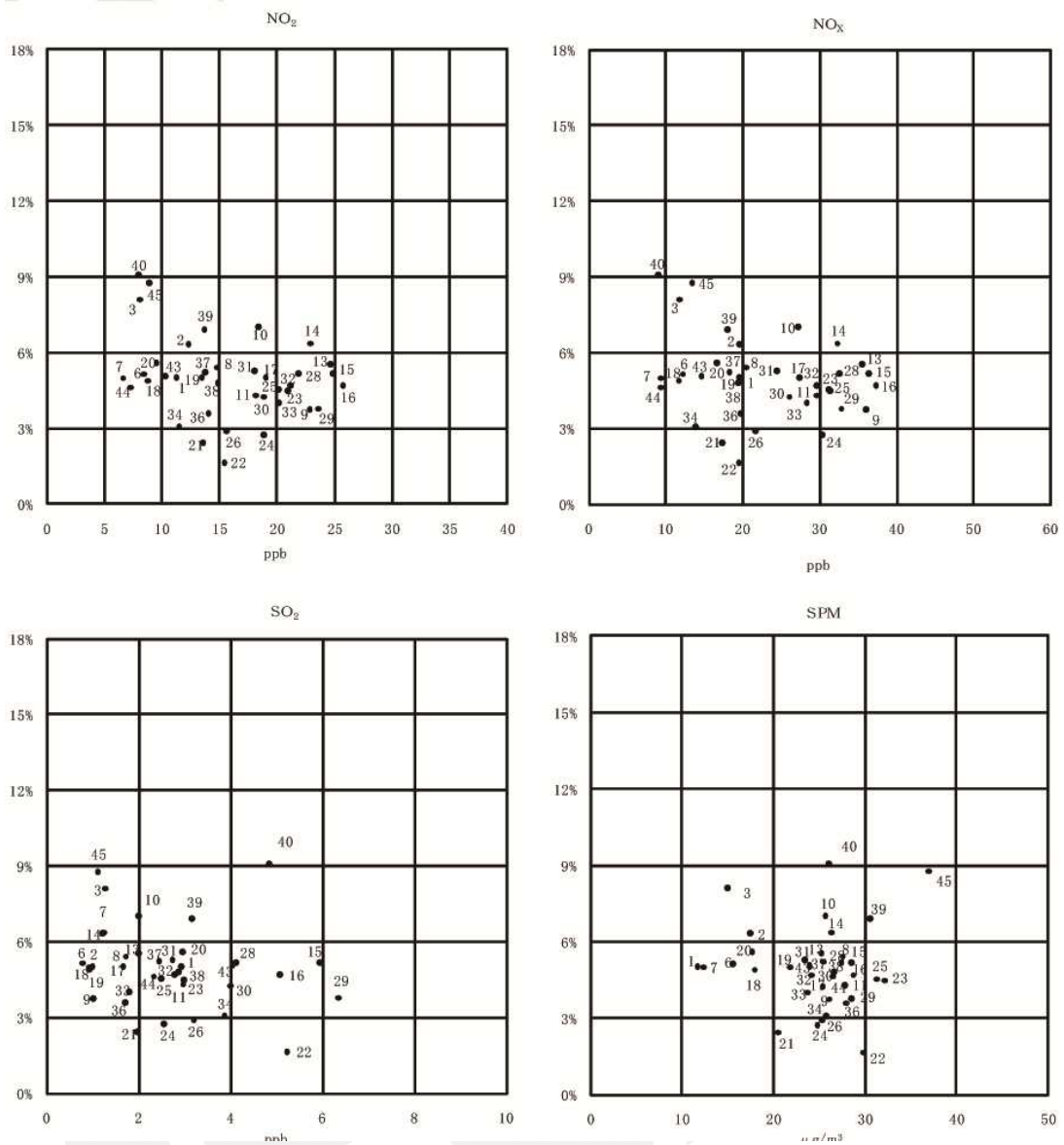


*1 Numbers in the graph indicate survey areas. Refer to the separately attached "<Reference> FY2009 Survey Areas."

*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 separately attached "<Reference> FY2009 Survey Areas."

*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 (male), smoking habits of family members at home (mother and other family members), daytime caretaker (nursery school), and allergic history of subject and parents (positive history). In the 6-year-old survey, the influencing factors were: gender (boys), smoking habits of family members (mother and other members), housing structure (wooden with wooden frame), dwelling period (since birth and more than a year), pets, 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: 1,08; 95% confidence interval [1,00 – 1,16]).

Odds Ratios of Factors Influencing Asthma Prevalence

		3-year-old survey		6-year-old survey
NO_2	per 10ppb	0.85*		0.91*
NOx	per 10ppb	0.90*		0.96
SO_2	per 10ppb	0.51*		0.63*
SPM	per10 μ g/m3	1.04*		1.08
Gender	male	1.73*		1.53*
	female	1.00		1.00
Smoking habits of family members	mother	1.59～1.62*		1.42～1.43*
	other member	1.17～1.18*		1.11～1.12*
	no smoker	1.00		1.00
Housing structure	wooden with wooden frame	1～1.04		1.04～1.08
	wooden with metal frame	0.92～0.95*		0.93～0.96
	reinforced concrete	1.00		1.00
Heating method	no exhaust system	1.04～1.05		0.93～0.94*
	exhaust system	1.00		1.00
Dwelling period	since birth	0.94～0.95	since birth	0.86～0.87
	more than 1 year	0.95	more than 3 years	0.9～0.91*
	less than 1 year	1.00	less than 3 years	1.00
Pets	Yes	1.01		1.09～1.1
	No	1.00		1.00
Daytime caretaker	Nursery center	1.38～1.43*		
	Others	1.00		
Feeding during the first 3 months after birth	milk only	1.13～1.14*		1.02～1.03*
	breast feeding & milk	1.07～1.09		0.98～0.99
	breast feeding only	1.00		1.00
History of allergies (subject)	Yes	2.121.00		2.44～2.46*
	No			1.00
History of allergies (parents)	Yes	2.48～2.52*		1.96～1.98*
	No	1.00		1.00

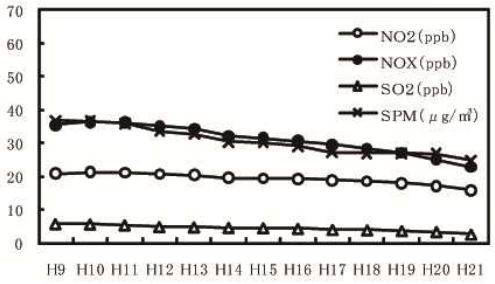
* Statistically significant (P<0.05)

(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.

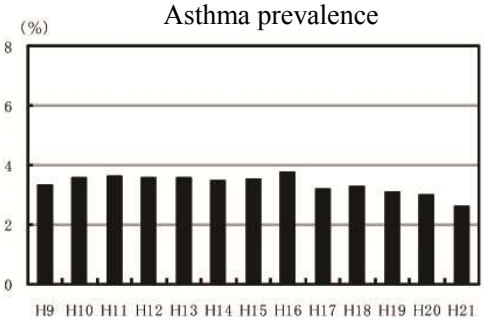
(3) Longitudinal and comprehensive analysis of 3-year-old survey data*

In the longitudinal analysis of data from FY1997 to FY2009, 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

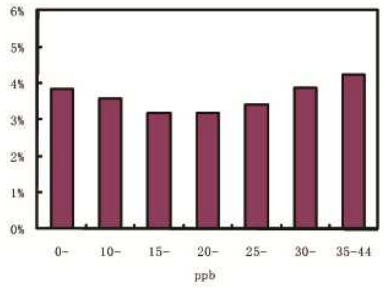


Asthma prevalence

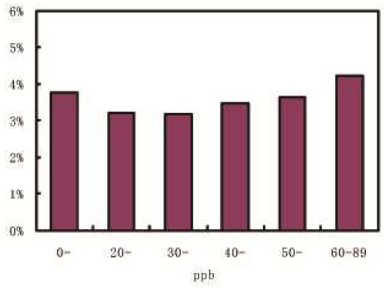


The result of comprehensive analysis of integrated data from FY1997 to FY2009 was also the same as the cross-sectional analysis. Neither the prevalence of respiratory symptoms at each background concentration level for each subject group, the correlation between average background concentration and respiratory 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

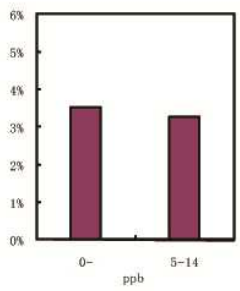
Asthma prevalence by NO_2 concentration



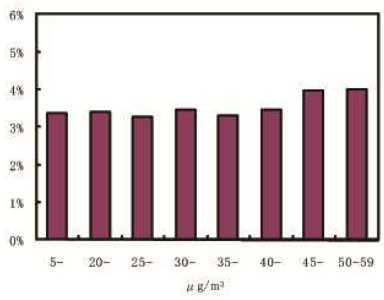
Asthma prevalence by NOx concentration



Asthma prevalence by SO_2 concentration



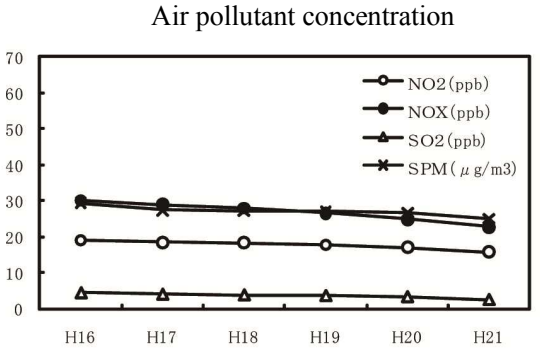
Asthma prevalence by SPM concentration

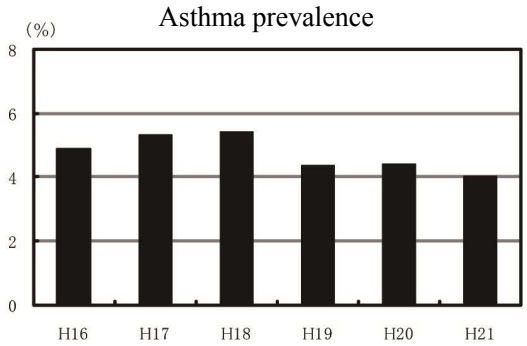


* The data on asthma prevalence obtained in FY1996, the first year of the survey, was simply used as reference in the longitudinal and comprehensive analyses, because it showed values that were distinctly lower than data from other years.

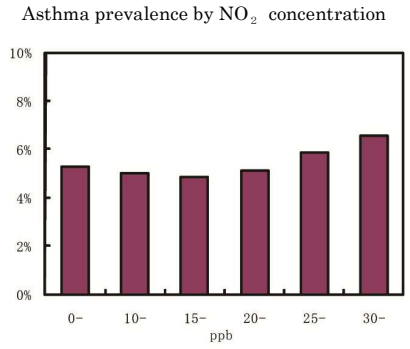
(4) Longitudinal and comprehensive analysis of 6-year-old survey data

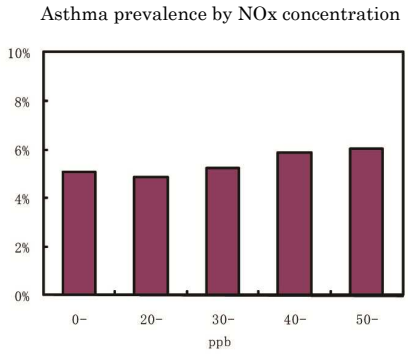
In the longitudinal analysis of data from FY2004 to FY2009, a number of survey areas showed an increase or decrease in asthma prevalence during that time period. However, no clear trend was observed in the correlation between changes in average background concentration of air pollutants and changes in asthma prevalence in either subject group.

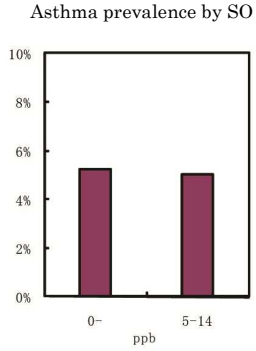


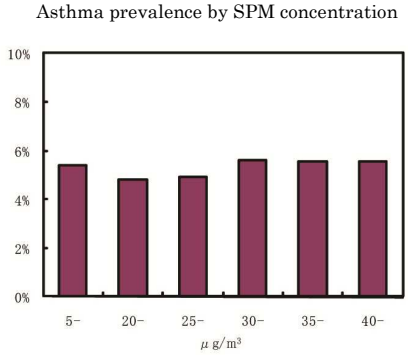


The result of comprehensive analysis of integrated data from FY2004 to FY2009 was also the same as the cross-sectional analysis. Neither the prevalence of respiratory symptoms at each background concentration level for each subject group, the correlation between average background concentration and respiratory 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.





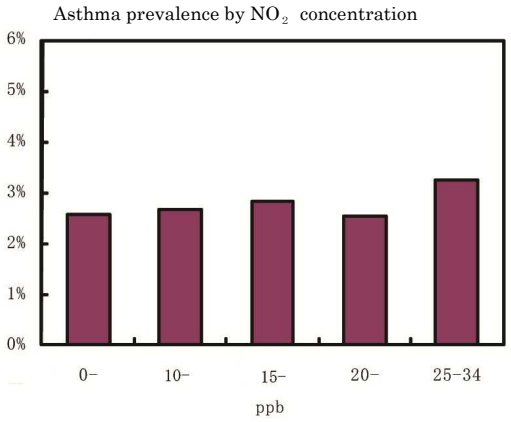


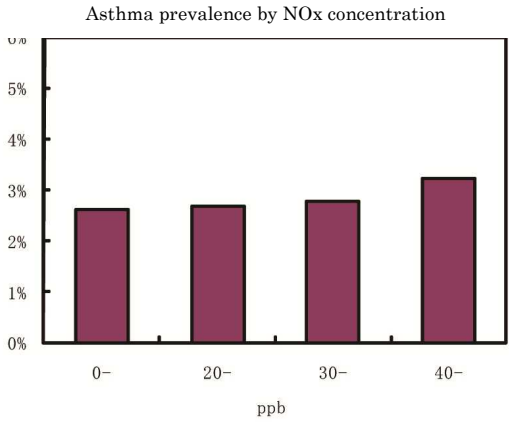


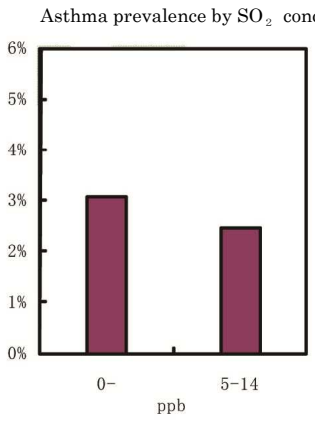
(5) Results of the follow-up analysis

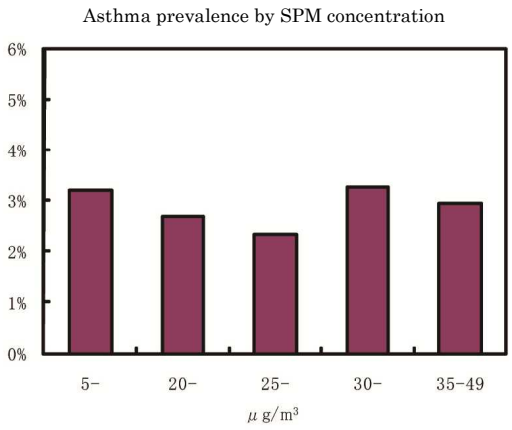
1) Asthma incidence at each background concentration level

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.





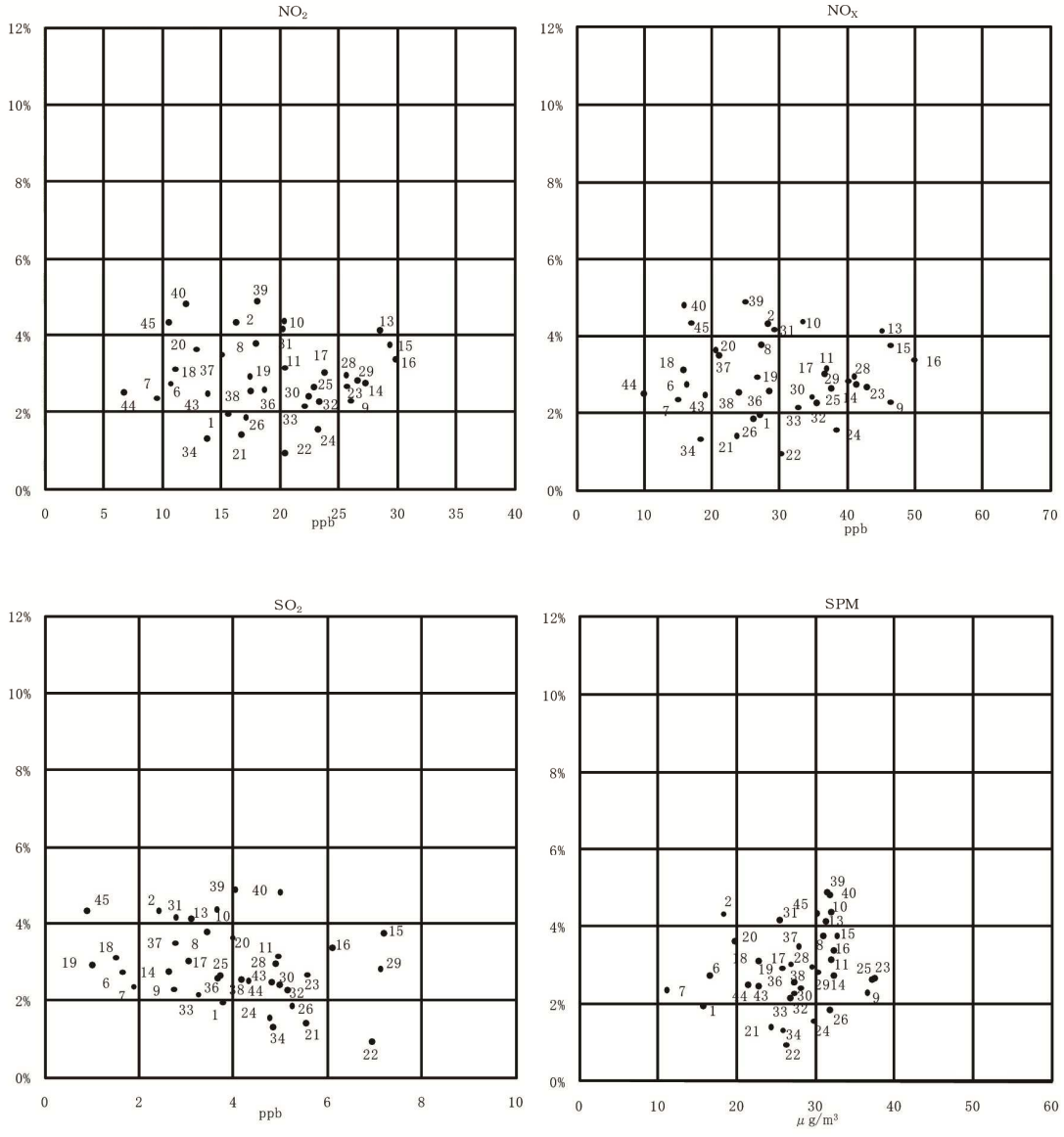




2) Average background concentration and asthma incidence in each survey area

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 concentration and asthma incidence (adjusted rates) –
All subjects (boys + girls)



*1 Numbers in the graph indicate survey areas. Refer to the separately attached "<Reference> FY2009 Survey Areas."

*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 (male), smoking habits of family members (mother and other members), and allergic history of the subject and parents. However, it did not show any clear correlation between high air pollutant concentrations and high incidence rates.

Odds Ratios of Factors Influencing Asthma Incidence

		Follow-up analysis
NO_2	per 10ppb	1.05
NOx	per 10ppb	1.05
SO_2	per 10ppb	0.55*
SPM	per10 μ g/m3	1.06
Gender	male	1.52*
	female	1.00
Smoking habits of family members	mother	1.43～1.44
	other member	1.18～1.19
	no smoker	1.00
Housing structure	wooden with wooden frame	1.08～1.1
	wooden with metal frame	0.92～0.95
	reinforced concrete	1.00
Heating method	no exhaust system	0.98～1
	exhaust system	1.00
Address change	Change of address	1.1～1.11
	Same address	1.00
Pets	Yes	1.15*
	No	1.00
Daytime caretaker	Nursery center	0.95～0.99
	Others	1.00
Feeding during the first 3 months after birth	milk only	0.88～0.89
	breast feeding & milk	0.88
	breast feeding only	1.00
History of allergies (subject)	Yes	2.09～2.1*
	No	1.00
History of allergies (parents)	Yes	1.69～1.73*
	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.