

Effect of Air pollution on Asthma

Disposition



← **Induction**

**Disease
Asthma**

← **Trigger /
Exacerbation**

Asthma attacks

**Lung function
decrements**

**Emergency room
visits**

**Symptoms
(wheeze)**

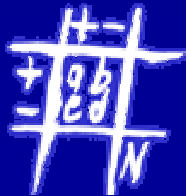


Inquinamento atmosferico e aggravamento dell'asma

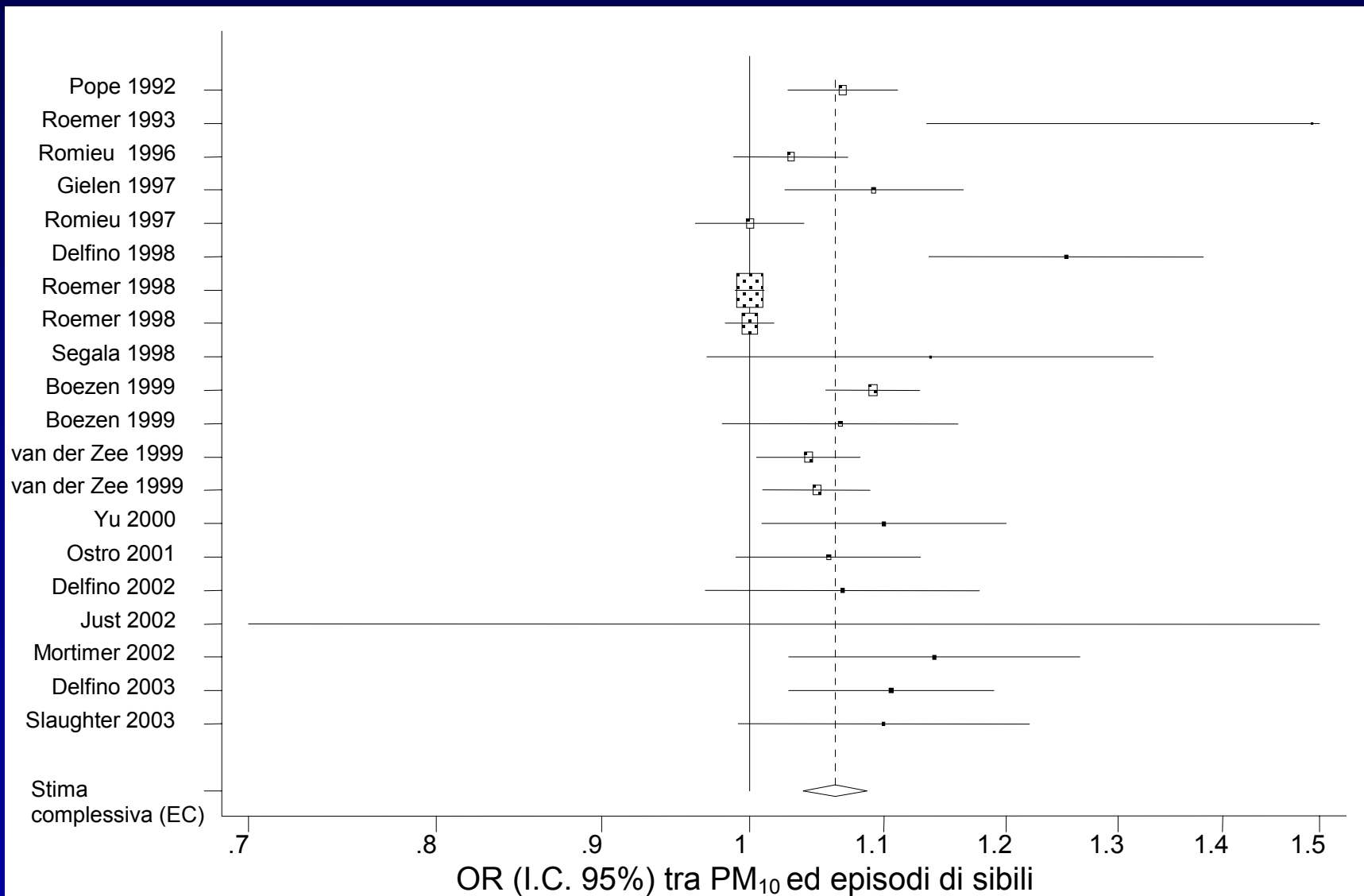
**Studi di correlazione tra cambiamenti
temporali nei livelli di inquinamento
atmosferico e variazioni temporali delle
variabili sanitarie (ospedalizzazione, visite al
pronto soccorso per asma, uso di medicinali,
sintomi)**

Studi di serie temporali

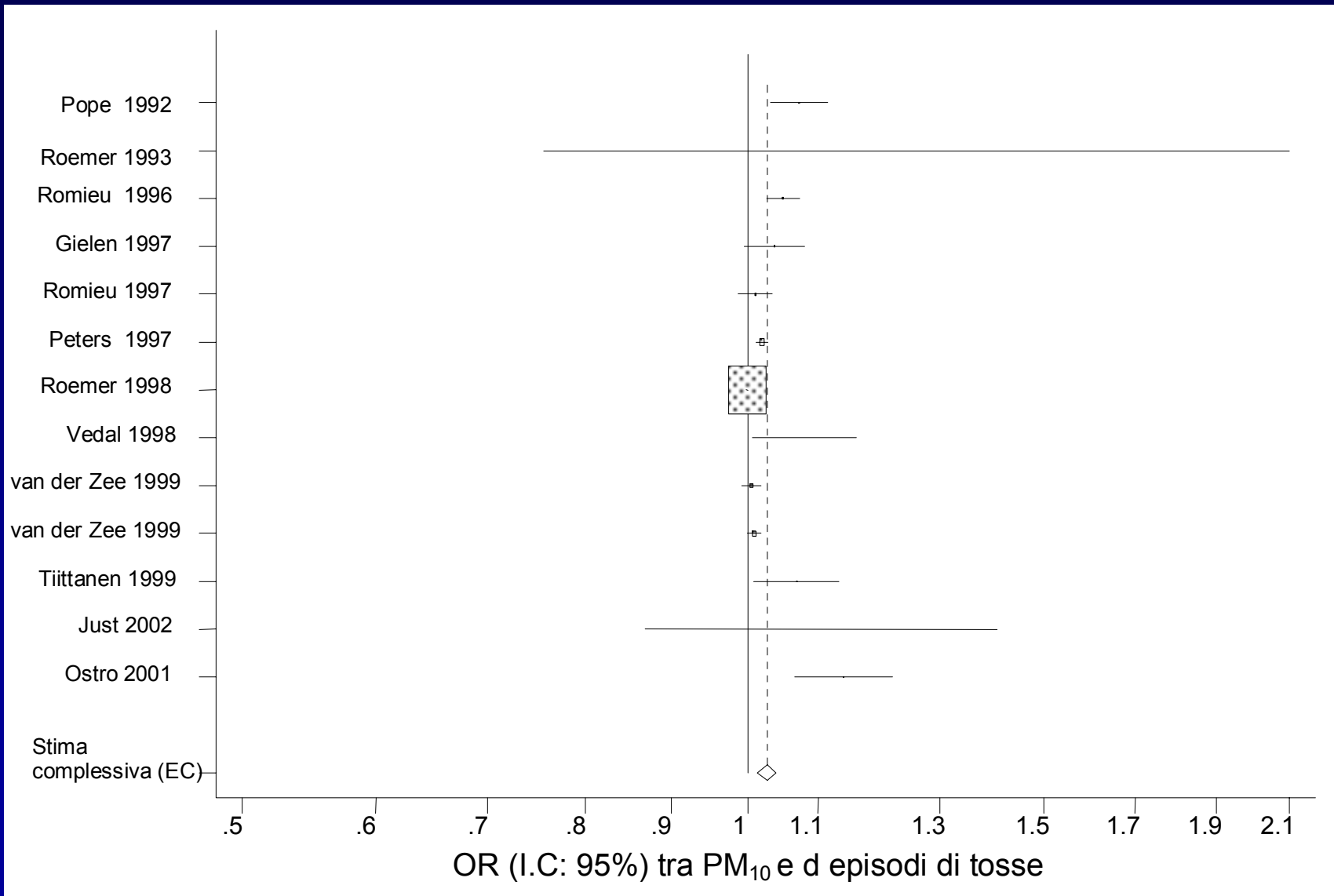
Metanalisi degli studi sugli effetti respiratori a breve termine del PM_{10} in bambini asmatici



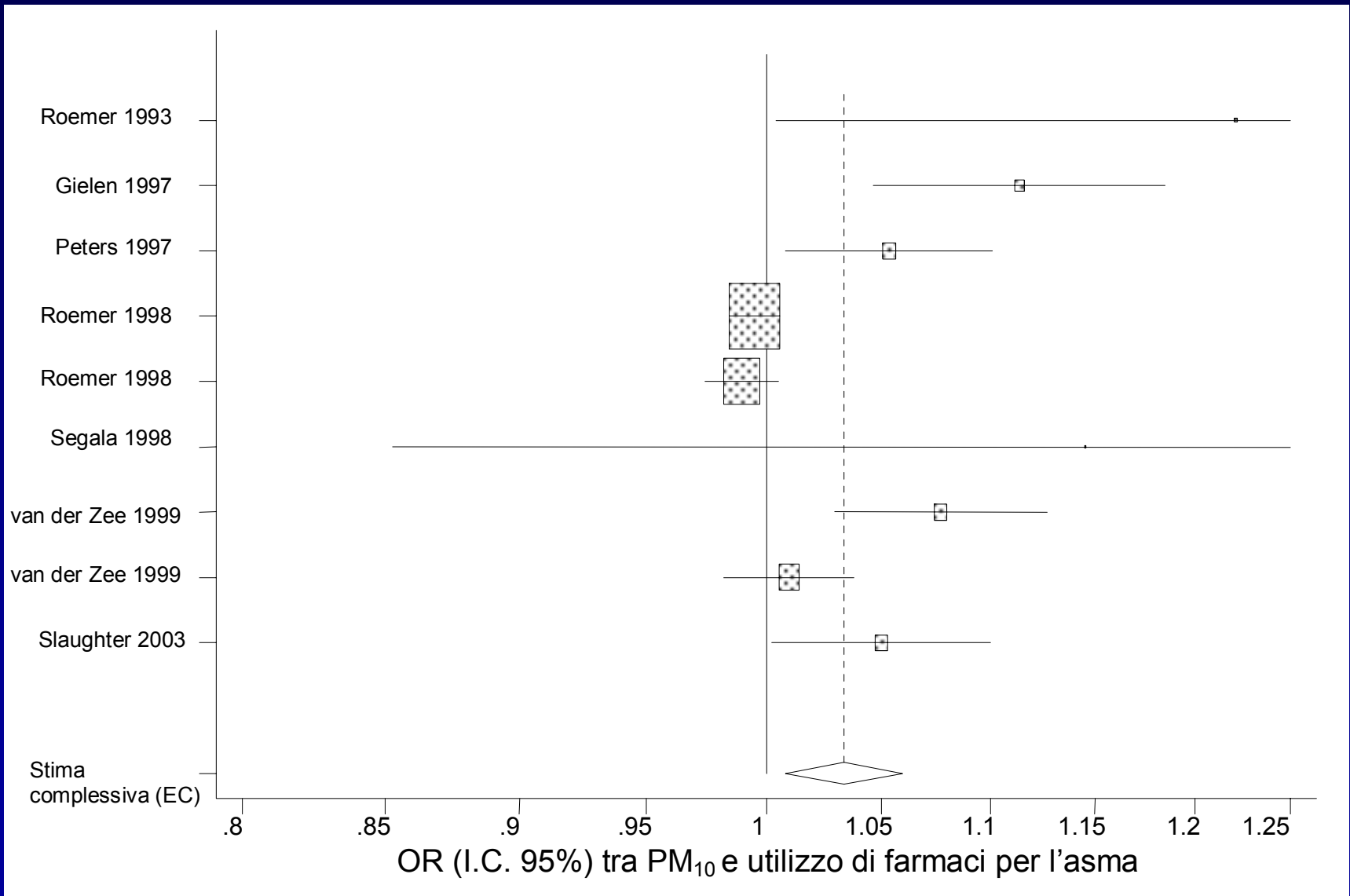
PM₁₀ e episodi di sibili (per 10 μg/m³)



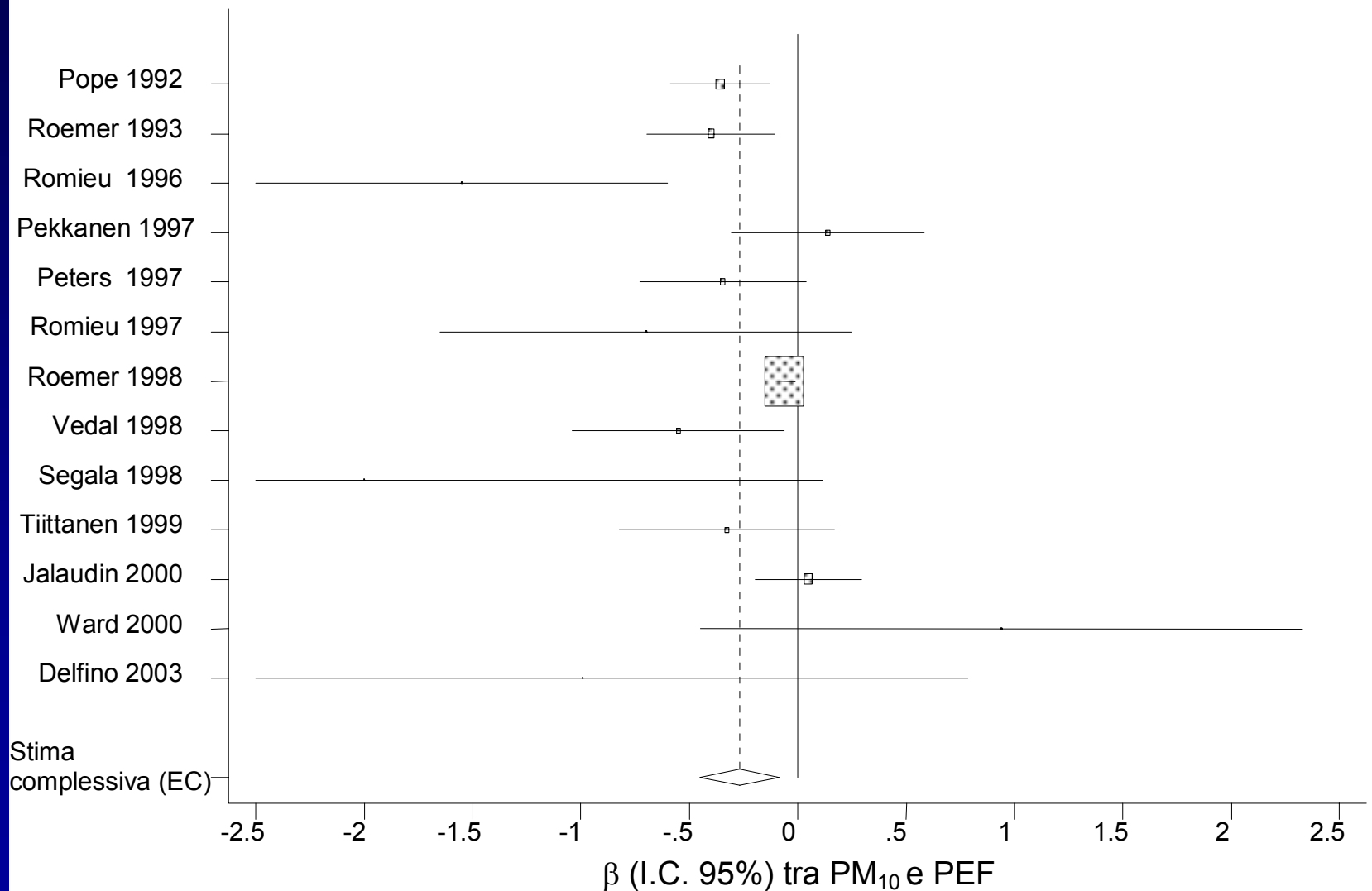
PM₁₀ ed episodi di tosse (per 10 μg/m³)



PM₁₀ ed utilizzo di farmaci per l'asma (per 10 μg/m³)



Stime dei coefficienti di regressione (I.C.95%) dell'associazione tra PM_{10} e PEF espressi come l/min per un incremento di $10 \mu\text{g}/\text{m}^3$ nella concentrazione di inquinante.



PM₁₀ (per 10 mg/m³) e ricoveri ospedalieri per asma, episodi di sibili, episodi di tosse, utilizzo di farmaci antiasmatici, PEF

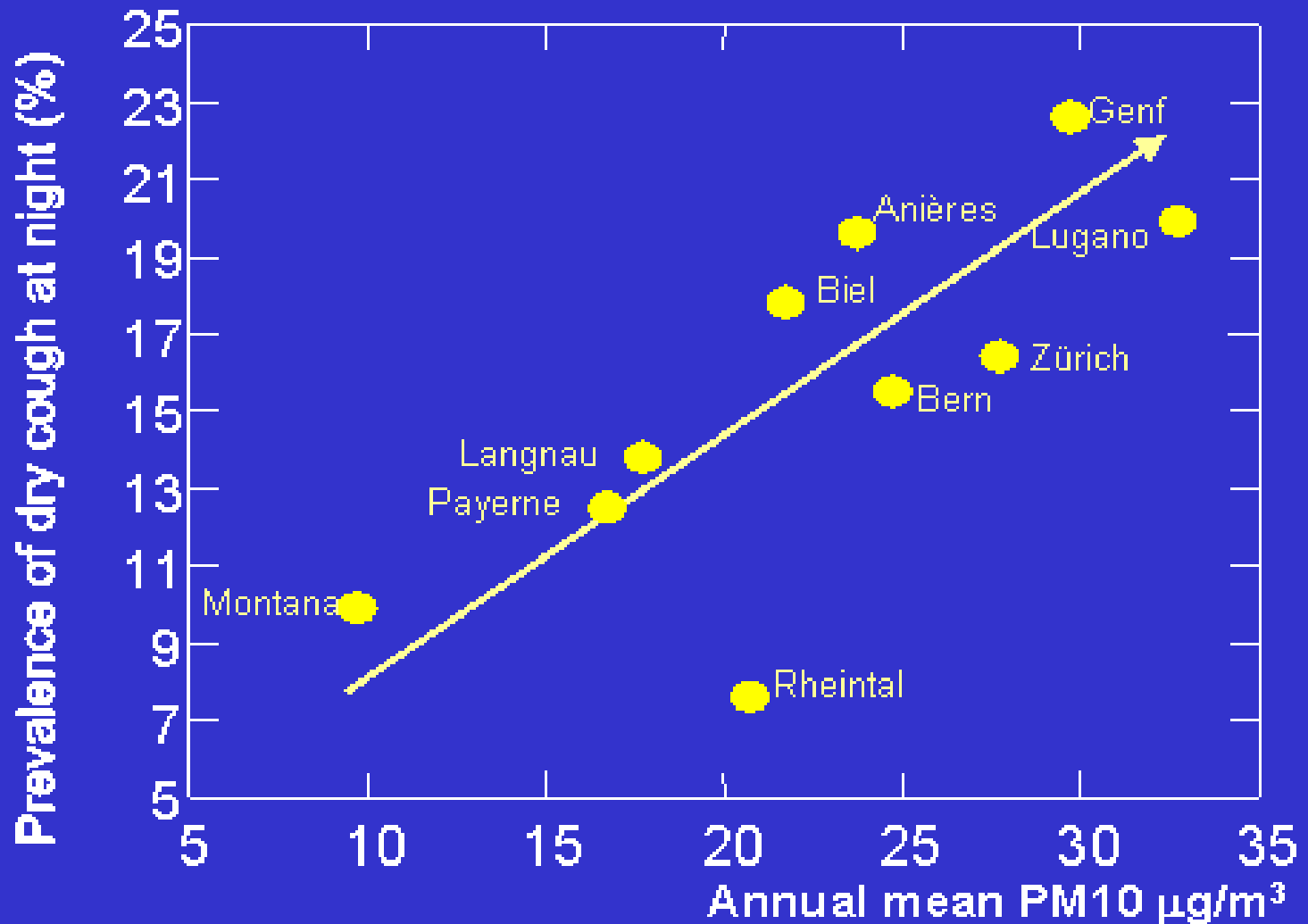
	n° di studi	OR*	IC:95%	I²
Ricoveri ospedalieri	16	1.017	1.008-1.025	43%
Sibili	20	1.063	1.038-1.087	79%
Tosse	13	1.026	1.013-1.039	86%
Utilizzo di farmaci	9	1.033	1.008-1.059	79%
PEF L/m	13	-0.269	-0.451;-0.087	79%

L'esposizione cronica ad
inquinanti ambientali aumenta
l'incidenza di nuovi casi di asma?

Epidemiologic studies to evaluate the effect of air pollution on induction of asthma

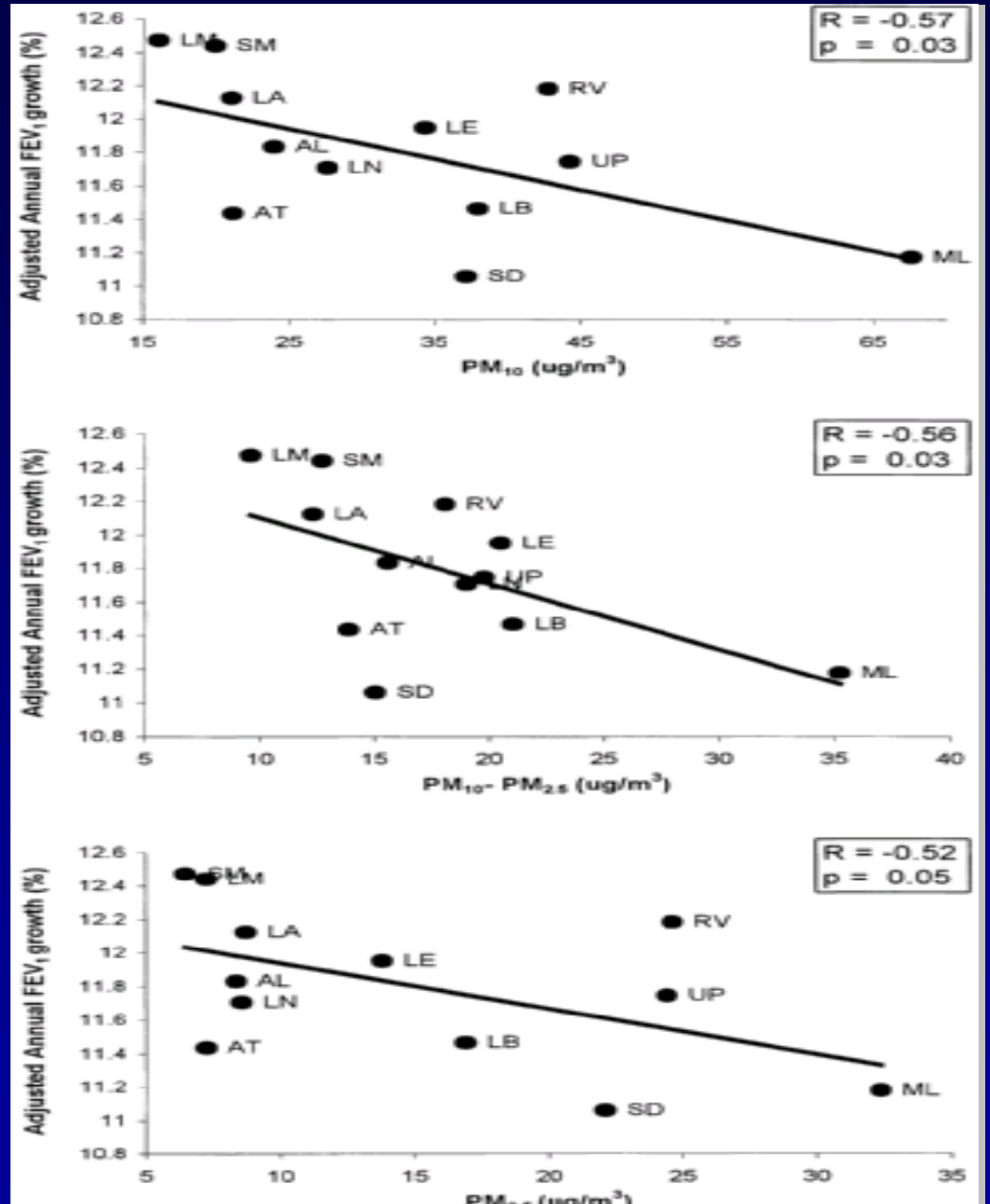
- **Urban-rural (East-West) comparisons**
- **Cross-sectional studies contrasting the prevalence of asthma across several study areas with varying degree of long term ambient air pollution**
- **Cross-sectional studies contrasting varying exposures to traffic related air pollution**
- **Cohort studies of populations with different exposures to air pollution**

Prevalence of nocturnal dry cough and annual mean PM_{10}

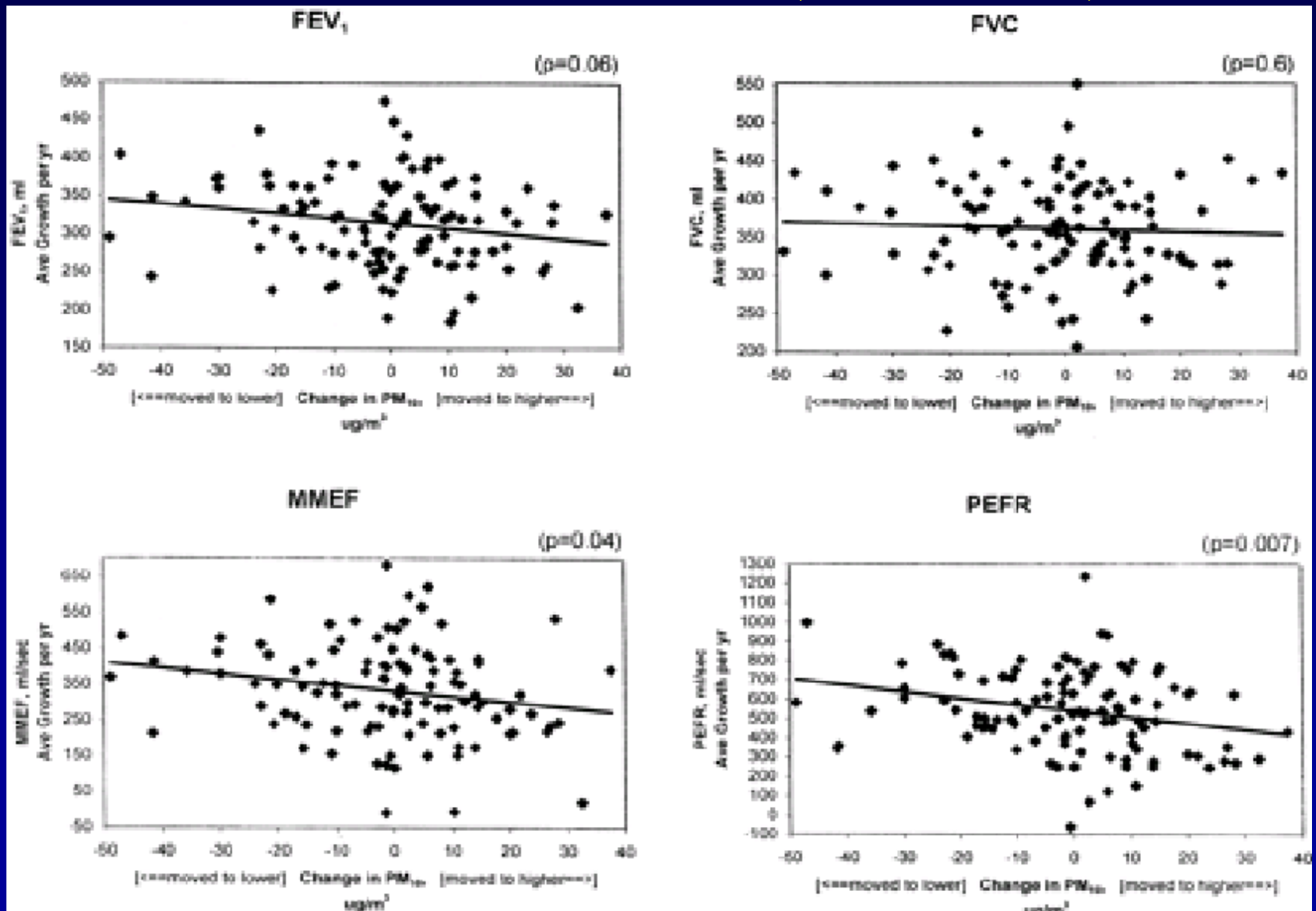


Air Pollution and Lung Function Growth

Gaudermann et al,
AJRCCM, 2002



Respiratory Effects of Relocating to Areas of Differing Air Pollution Levels (Avol et al, AJRCCM, 2002)



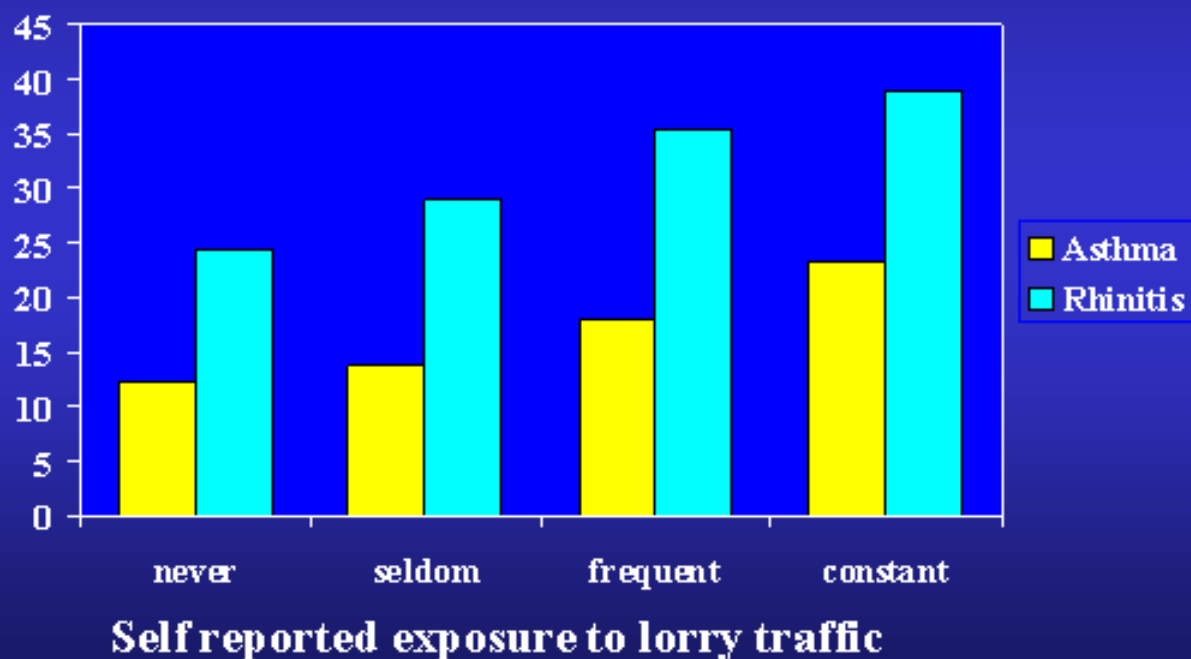
Il ruolo dell'inquinamento atmosferico nello studio SIDRIA

Ciccone G, Forastiere F, Agabiti N et al.
Road traffic and adverse respiratory effects in
children. SIDRIA Collaborative Group.
Occup Environ Med 1998;55:771-8.

Asthma and Rhinitis Symptoms and Traffic Exposure *(Questionnaire based)*

Duhme et.al. Epidemiology 1996

Symptom Prevalence %



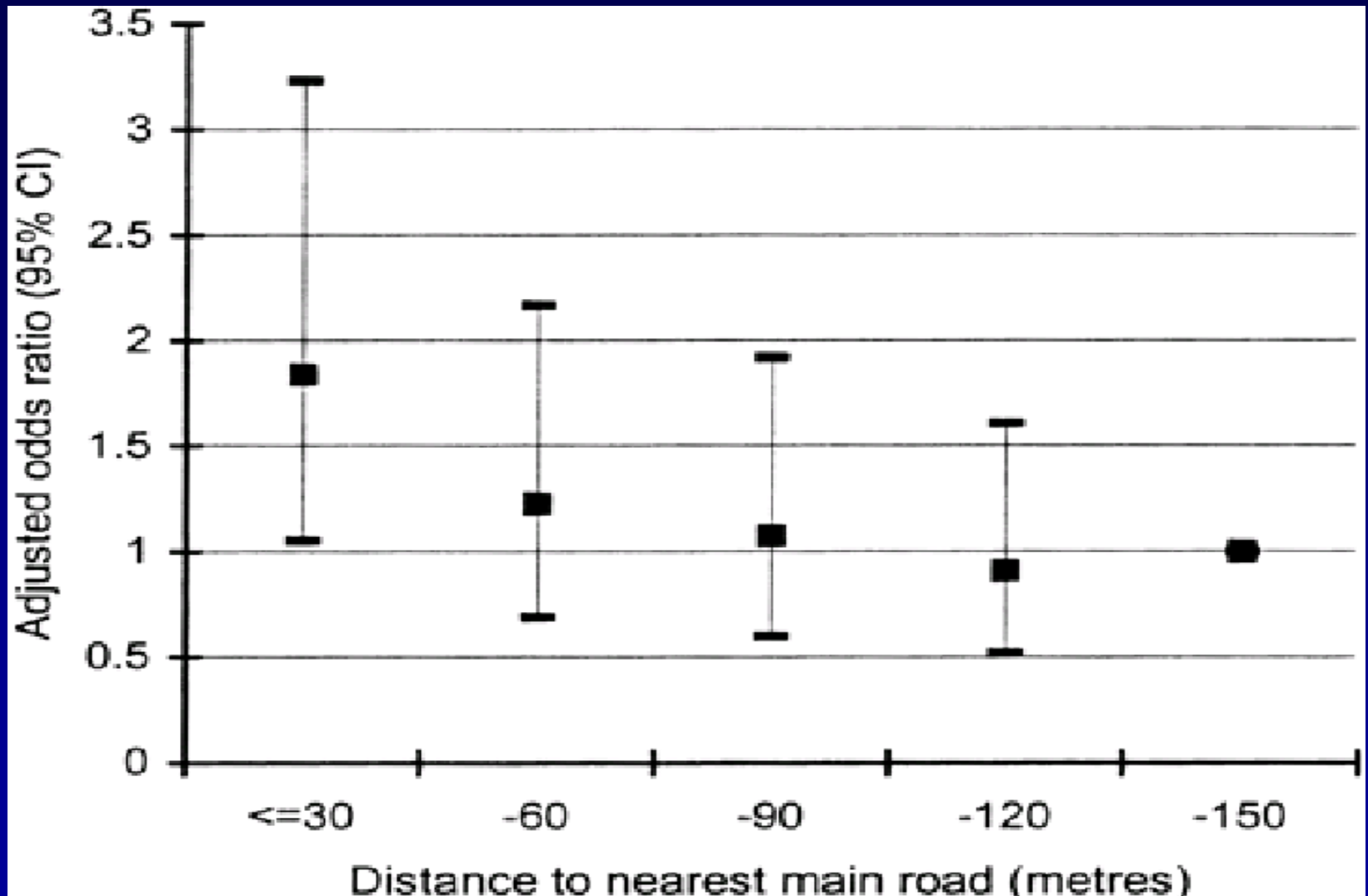
Indicatori di inquinamento da traffico e disturbi respiratori nei bambini, per livello di urbanizzazione

Disturbi respiratori correnti negli ultimi 12 mesi

	Aree urbano/rurali		Aree metropolitane	
	OR	95% CI	OR	95% CI
PASSAGGIO DI CAMION				
Mai	1	-	1	-
A volte	1.09	1.01-1.19	1.21	1.10-1.32
Spesso	1.01	0.92-1.12	1.29	1.15-1.45

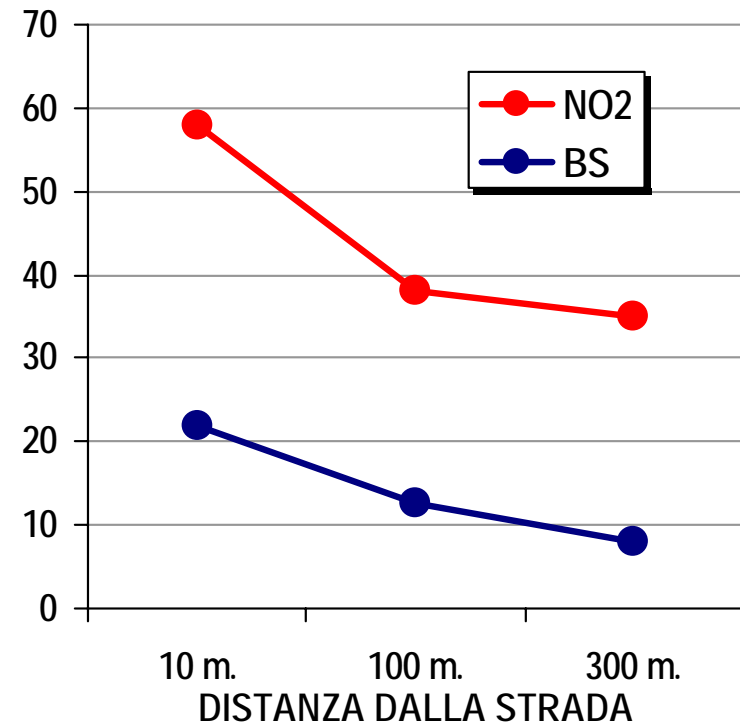
OR aggiustati per: età, centro, sesso, cambio residenza, istruzione madre, familiarità per asma, densità abitativa, arredi camera da letto, umidità, gas da cucina, riscaldamento, fumo di sigaretta (del ragazzo, genitori, altri) piano dell'abitazione

Living Near a Main Road and the Risk of Wheezing Illness in Children (Venn et al, AJRCCM, 2002)



- Oltre a contribuire all'inquinamento di fondo, il traffico urbano comporta esposizioni dirette
- La concentrazione di alcuni inquinanti è molto più elevata lungo le strade a traffico intenso

CONCENTRAZIONE ($\mu\text{g}/\text{m}^3$) DI NO₂ E BLACK SMOKE A # DIST. DALLA STRADA

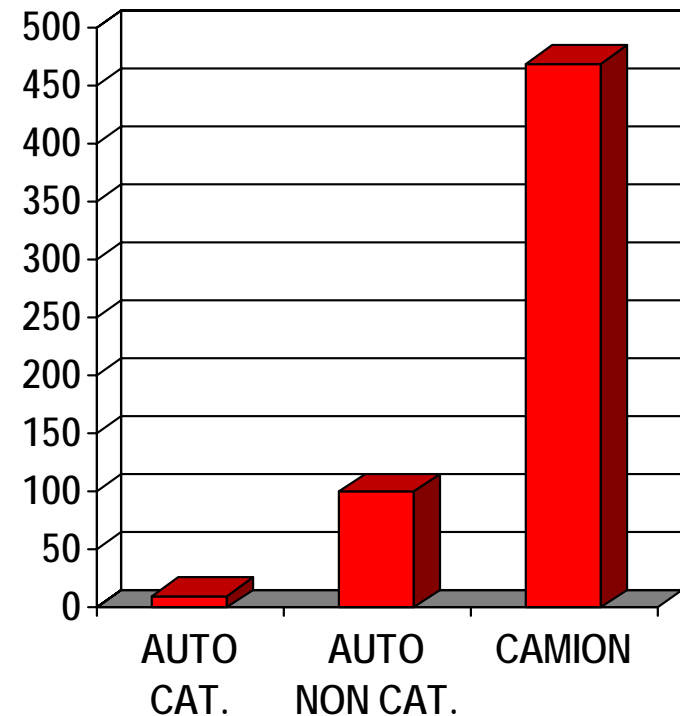


* Roorda-Knape, Atmosph Environ, 1998

CONCLUSIONI DI SIDRIA 1

- I risultati di SIDRIA e di altre indagini recenti indicano gli **scarichi diesel** come i più dannosi per i disturbi respiratori
- Le emissioni di motori diesel contengono concentrazioni di **polveri sottili** molto più elevate rispetto ai motori a benzina

EMISSIONE DI PM10 (mg/Km)
PER # TIPI DI VEICOLI *



* Hildeman, Environ Sci Technol, 1991

**Traffic related air pollution and
adverse effects on respiratory
health in childhood: the results of
a large Italian multicenter survey
(Sidria 2)**

SIDRIA

*Italian Studies on Respiratory Disorders in
Children and the Environment*

Italian extension of ISAAC
cross-sectional study

Phase I (ISAAC I): 1994/1995

Phase II (ISAAC III): 2002

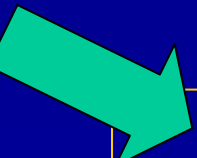
SIDRIA phase I - 1994/95

Objectives

- 1) To estimate the prevalence of asthma and allergies in Italian children and adolescents
- 2) To estimate the prevalence of some possible risk factors for asthma and respiratory disorders
- 3) To examine the association between these risk factors and asthma or other respiratory disorders in childhood

SIDRIA phase II - 2002

Objectives

1. To improve national estimates of the prevalence of respiratory disorders in children, according to latitude and level of urbanization
 2. To evaluate variations in time trend of the prevalence of asthma (rhinitis, eczema) and of some risk factors for asthma
 3. To explore the association between respiratory disorders in children and risk factors recently suggested:
 - socio-economical inequalities
 - BMI and life style
 - Indoor risk factors
 - Pregnancy and early life exposures
 - Hospital admissions and burden of diseases
- Outdoor risk factors
 - traffic exposure (cars and trucks)
- 

Italian centres participating in SIDRIA - phase



SIDRIA II - Population

6-7 yrs old children

Schools sampled: 235

Subjects included: 20.016



13-14 yrs old adolescents

Schools sampled: 175

Subjects included: 16.175



Standardized
questionnaire

Response rates:

89.2% children (parents)

93% adolescents (self-rep)

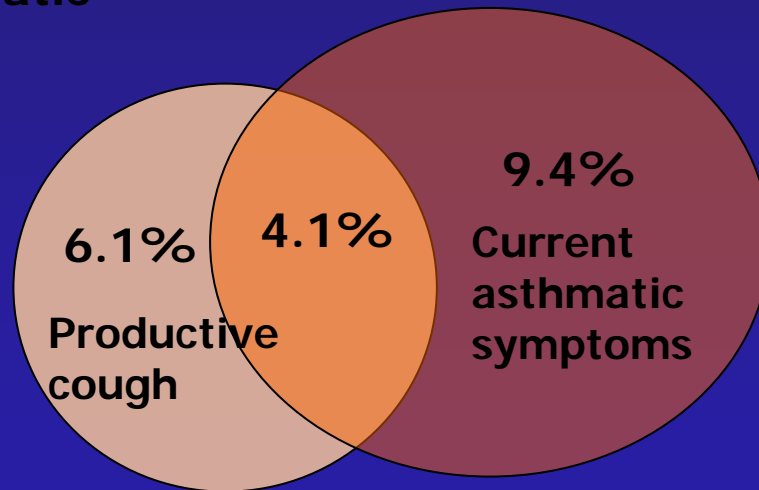
83.3% adolescents (parents)

Results¹

Prevalence (%) of respiratory outcomes investigated in the sample

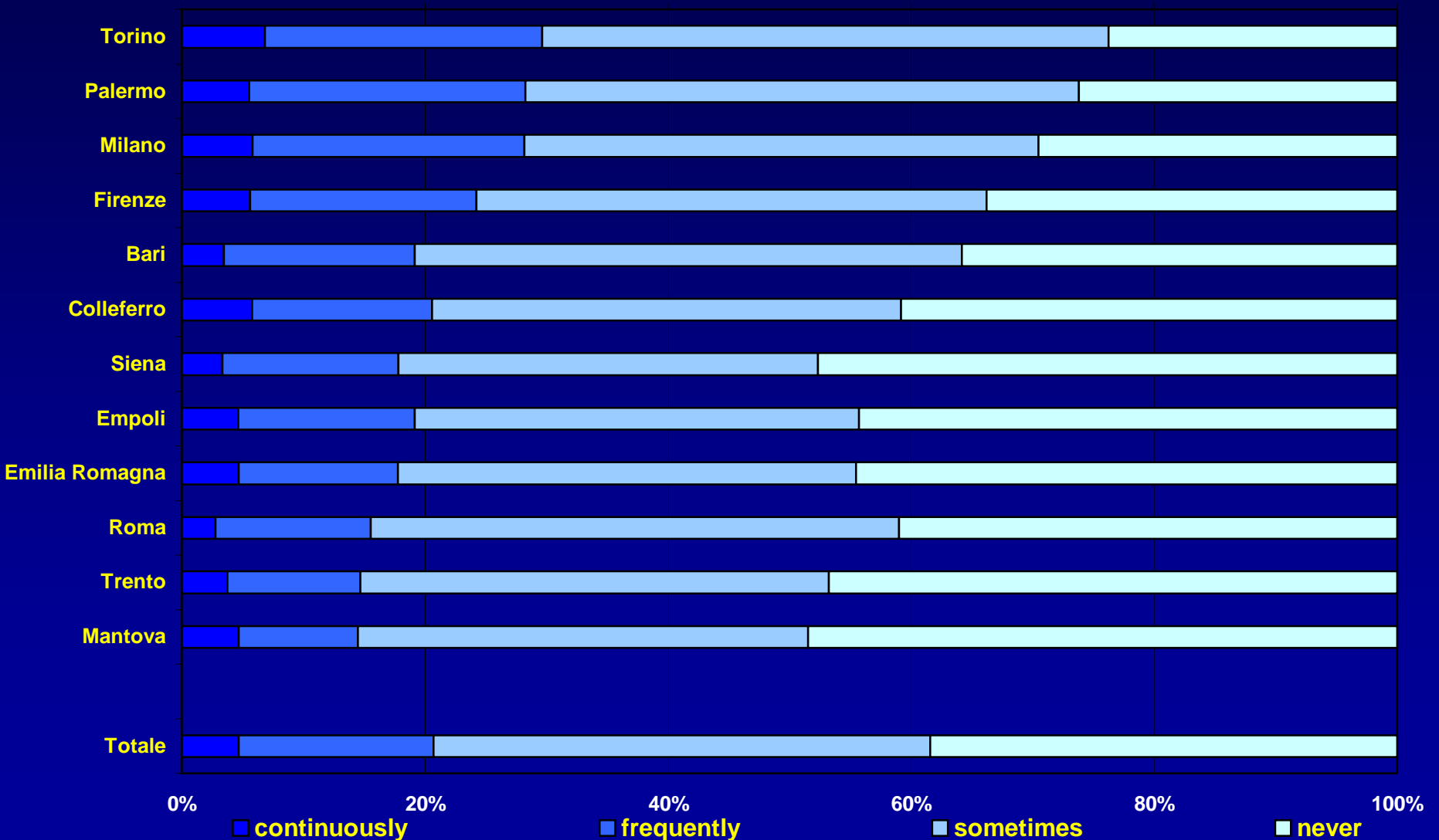
Asymptomatic
subjects

80.0%



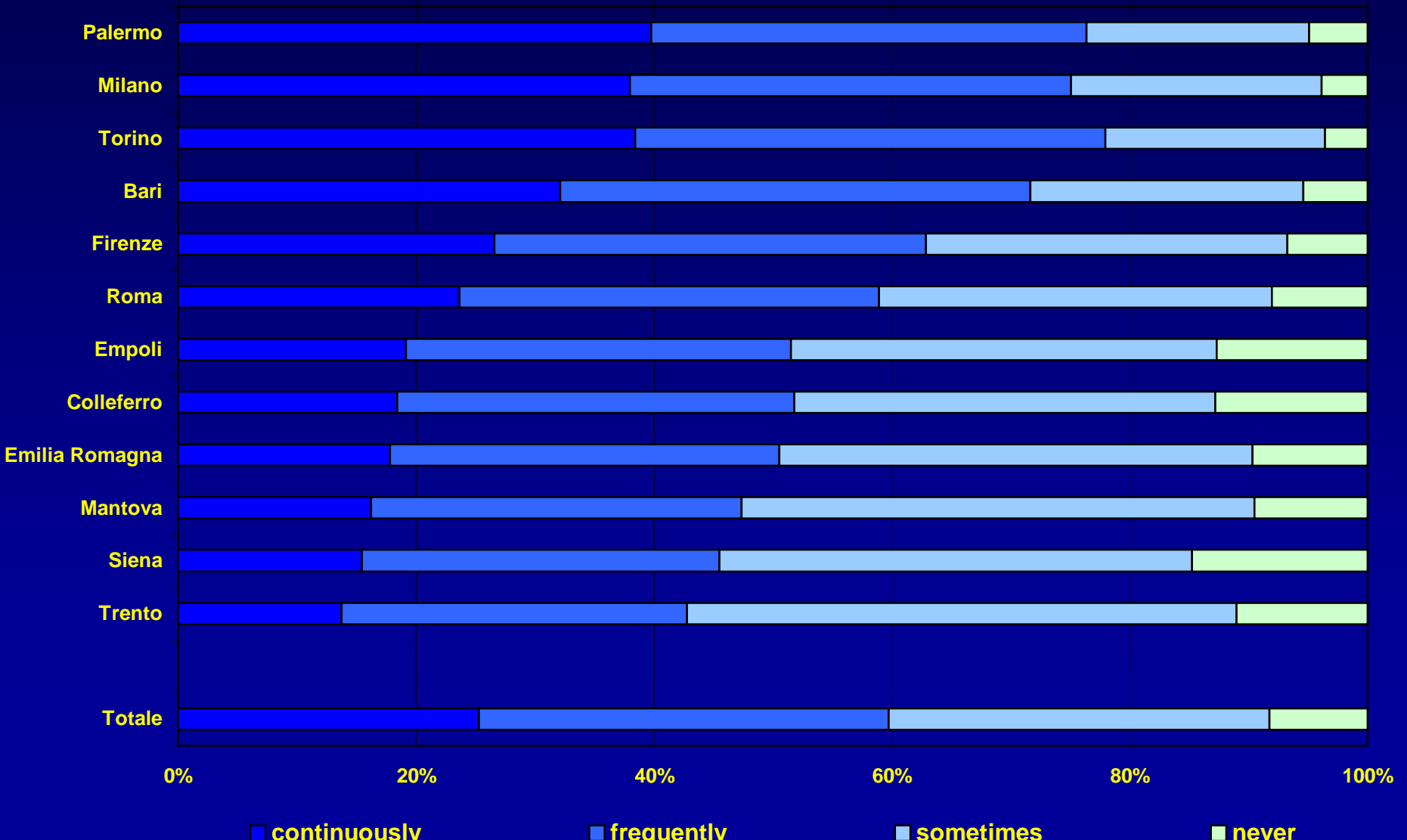
Results²

Prevalence of exposure to trucks transit in the street of residence, by study centre



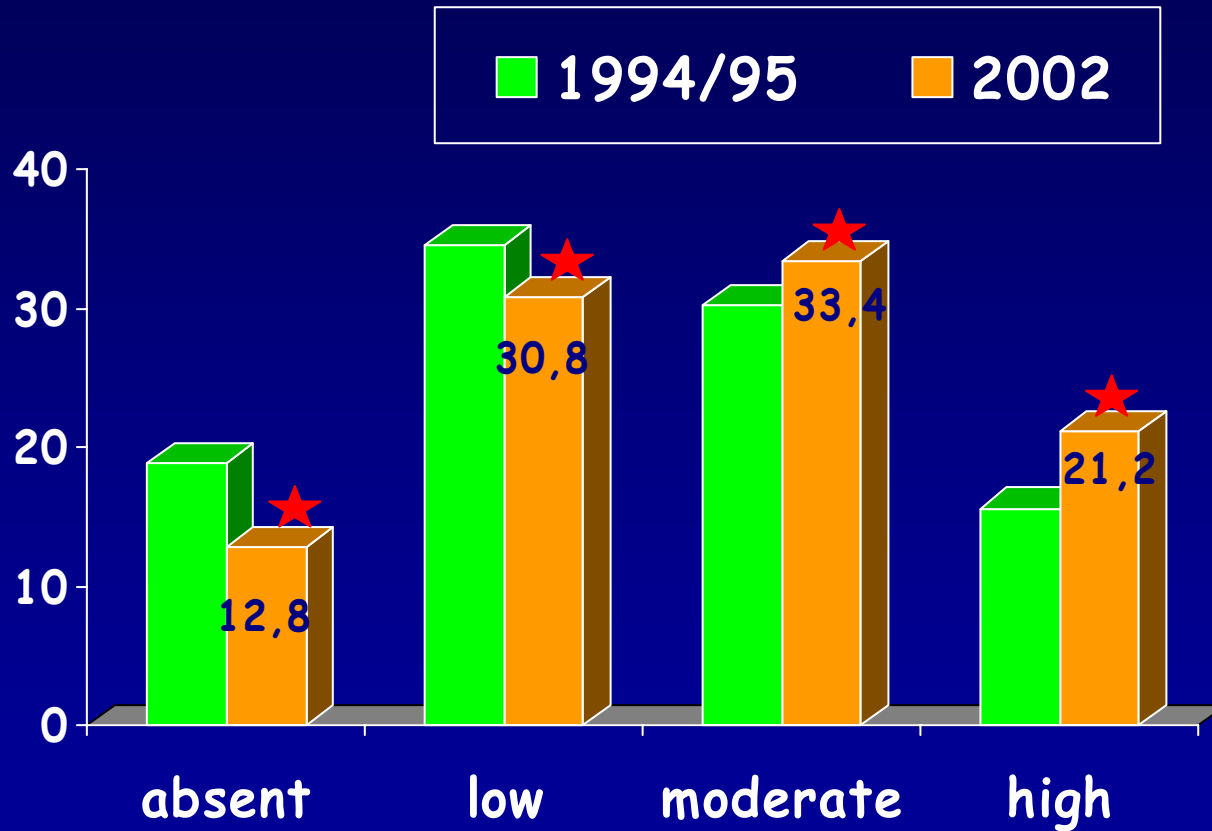
Results³

Prevalence of exposure to cars transit in the street of residence, by study centre



Results⁴

Traffic density in the zone of residence - change between 1994/1995 and 2002 (6-7 yrs children)



★ $p < .05$, logistic regression

Results

Association (OR, CI 95%) between current respiratory symptoms (asthmatic symptoms and productive cough) and traffic indicators.

	Current asthma symptoms				Productive cough			
	Cases (No.)	(%)	OR	95% CI	Cases (No.)	(%)	OR	95% CI
Traffic density								
absent	589	12.6	1.00		421	9.0	1.00	
Low	1278	12.7	1.02	0.91-1.14	882	8.8	0.96	0.85-1.09
moderate	1417	13.8	1.09	0.98-1.22	1070	10.5	1.07	0.94-1.22
High	818	14.7	1.14	1.00-1.29	696	12.5	1.22	1.06-1.41
Frequency cars transit								
never	319	12.8	1.00		214	8.6	1.00	
sometimes	1198	12.3	0.96	0.84-1.10	812	8.3	0.95	0.81-1.12
frequently	1443	13.6	1.05	0.92-1.20	1064	10.1	1.09	0.92-1.30
Continuously	1143	14.9	1.13	0.98-1.30	983	12.8	1.36	1.15-1.61
Frequency trucks transit								
never	1460	12.4	1.00		1015	8.6	1.00	
sometimes	1703	13.7	1.10	1.01-1.18	1245	10.0	1.12	1.03-1.22
frequently	706	14.5	1.15	1.04-1.27	591	12.1	1.33	1.19-1.49
Continuously	220	15.8	1.26	1.08-1.48	218	15.7	1.82	1.54-2.16

Results

Association (OR, CI 95%) between productive cough and combined exposure to truck and car transit and for each traffic indicator adjusted for the other one

		Truck transit			
		Never	Sometimes	Freq/continuous.	
Car transit	<i>N</i> cases (%)	656 (7.9%)	335 (9.1%)	28 (11.4%)	
	Never/ sometimes	OR(95%CI)	1.00	1.15 (1.01-1.31)	1.39 (0.93-2.08)
	<i>N</i> cases (%)	272 (9.9%)	570 (9.6%)	220 (11.8%)	
	Frequently	OR(95%CI)	1.19 (1.02-1.38)	1.13 (1.00-1.28)	1.45 (1.22-1.73)
	<i>N</i> cases (%)	85 (11.5%)	336 (12.0%)	561 (13.6%)	
	Continuously	OR(95%CI)	1.34 (1.01-1.77)	1.39 (1.20-1.61)	1.59 (1.39-1.82)

Particles – Does Size Matter? Or Mass? Or Number? Or What?

Mass ($\mu\text{g}/\text{m}^3$)	Diameter (μ)	Number (per ml)	Surface Area (μ^2/ml)
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10	2	1.2	24
10	0.5	153	120
10	0.02	2,400,000	3016

Adapted from Donaldson K et al. Occup Environ Med 2001;58:211-216

I problemi aperti

- Dimensione, composizione delle particelle
- Ruolo delle emissioni diesel
- Ruolo dell'inquinamento sulla incidenza dell'asma
- Finestra temporale rilevante
- Studio di coorti di nati
- Interazione con i meccanismi allergici