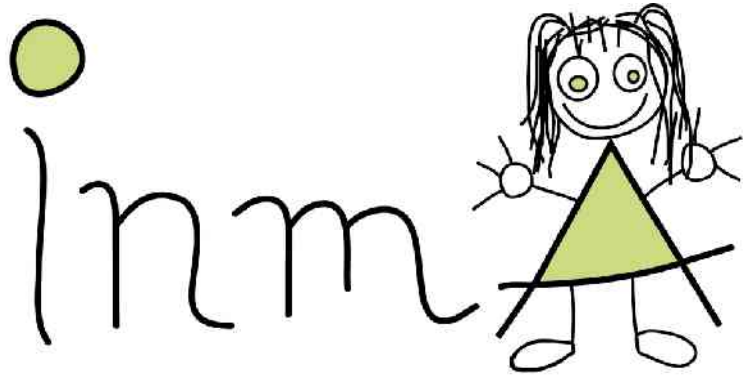

Infancia y Medio Ambiente

Prenatal Exposure to Ambient Pollutants: the INMA cohort in Valencia, Spain

Ferran Ballester, Marisa Rebagliato, Rosa Ramón, Ana Esplugues, Rosalía Fernández-Patier, Sabrina Llop, Mario Murcia, Carmen Iñiguez, Saul García Dos Santos, Cristina M Villanueva, Alfredo Marco , Nuria Ribas, Joan O. Grimalt, Xavier Aguinalde, Jordi Sunyer, and the INMA group

Infancia y Medio Ambiente

- **INMA Network**
- **Study Protocol**
- **Valencia-Cohort**
  - **Design**
  - **Preliminary results**
  - **Discussion/Conclusions**

Infancia y Medio Ambiente

Overview

INMA – INfancia y Medio Ambiente (Environment and Childhood) is a NETWORK born in 2003 funded for a 4 year grant from the Spanish Ministry of Health

INMA aims to study the role of the most important environmental pollutants and diet on child growth and development in Spain.

Infancia y Medio Ambiente

Original Members

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[2.] Àrea de Salut de Menorca - IB-Salut. Maó.

[3.] Institut d'Investigacions Químiques i Ambientals - CSIC. Barcelona.

[4.] Centro de Investigación sobre el Síndrome del Aceite Tóxico y Enfermedades Raras – ISCIII. Madrid.

[5.] Departamento de Salud Pública– UMH. Alicante.

[6.] Escuela Valenciana de Estudios en Salud-EVES – Hospital Universitario La Fe /CSV. Valencia.

[7.] Hospital Universitario San Cecilio – SAS-UGR. Granada, Spain.

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INMA participants

- The INMA project will follow up a population sample of around 4000 pregnant mothers and newborns.

- New and existing cohorts of pregnant women will be incorporated from seven different Spanish regions.

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INMA participants

Population	Inclusion Year	*Target number*
Ribera d'Ebre (Tarragona)	1997-99	92
Menorca (Baleares)	1997-98	492
Granada	2001-2002	668
Madrid	2003	150
Valencia	2004-2005	800
Sabadell (Barcelona)	2004-2006	800
Asturias	2004-2006	400
Guipuzkoa (Basque Country)	2006-2007	600
TOTAL		~ 4000

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First Cohorts

Ribera d'Ebre

Evaluation of the relation between organochlorines and methyl-mercury exposure and neurological development.

High HCB levels found in the area, due to the vicinity of an electrochemical factory.

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First Cohorts

Menorca

Relation between allergy, development and asthma with air pollution and allergens.

Within the framework of AMICS study

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Cohorts

Granada

Assessment of the incidence of infant reproductive health disorders in relation to exposures to xenobiotics.

Intensive pesticides use in agriculture in Almeria and Granada

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New and existing cohorts

A need for more information on

- Environmental exposures on prenatal and infant periods
- Relation with health and development
- Potential interactions

A common research protocol

- Exposure assessment
- Other determinants
- Effects

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A UNIFIED PROTOCOL WAS ELABORATED: ENVIRONMENTAL EXPOSURES

		Prenatal period		Postnatal period			
		12 weeks	32 weeks	Birth	1 year	2 yrs	4 yrs
Exposures	NO_2, VOCs, O_3	Outdoor	Outdoor/ Indoor *		Outdoor/ Indoor*	Q	Q
	Particulates	Outdoor	Outdoor				
	Traffic/ air pollution	AQ networks GIS	Q		Q	Q	Q
	Time activity pattern		Q		Q	Q	Q
	Tobacco/ETS		Q		Q	Q	Q
	Hydroxypyrene	Maternal urine					Child urine
	Trihalomethanes	Water samples					Q
	POP	Maternal serum	a-HCH b-HCH g-HCH d-HCH PCB28 PCB52 PCB101 PCB118 PCB153 PCB138 PCB180 pp-DDT pp-DDE Pe-CB HCB	Cord serum			Child serum
	Other endocrine disrupters			Placenta		Q	
	Lead			Cord blood		Q	Child blood
	Arsenic	Maternal nail				Q	Child nail
	Mercury			Cord blood			Child hair
	Maternal/Paternal occupation		Q		Q	Q	Q

Q: Questionnaire * In a subsample;

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Other determinants

		Prenatal period		Postnatal period		
		12 weeks	32 weeks	Birth	1 year	4 years
Other determinants	Diet	Q	Q		Q	Q
	Antioxidants	Maternal serum		Maternal milk*		Child serum
	Folate	Maternal serum				
	Oxidative stress markers	Maternal serum Matenal urine	Maternal urine		Child urine	
	Fatty acids	Maternal plasma		Maternal milk* Cord blood		Child plasma
	Genetic study	Maternal blood		Cord blood		

Q: Questionnaire * In a subsample;

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Follow-up - effects

	Prenatal period			Postnatal period			
	12 weeks	20 weeks	32 weeks	Birth	1 year	2 yrs	4 years
Intrauterine growth	Ultra sound(Us)	Us	Us				
Postnatal growth				Physical Examination (PhEx)	PhEx		PhEx
Sexual development				PhEx	PhEx		PhEx
Neurodevelopment				Dubowitz Test	Bayley Scales		McCarthy Scales Hyperactivity Social Competence
Thyroid hormones	Maternal serum			TSH screening			Child serum
Asthma/Atopy	Maternal serum				Q	Q	Child serum Prick test* Q
Respiratory infections				Medical records	Q	Q	Q

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The Valencia cohort in INMA

Valencia

A cohort started in 2004 after the release of the INMA's common protocol

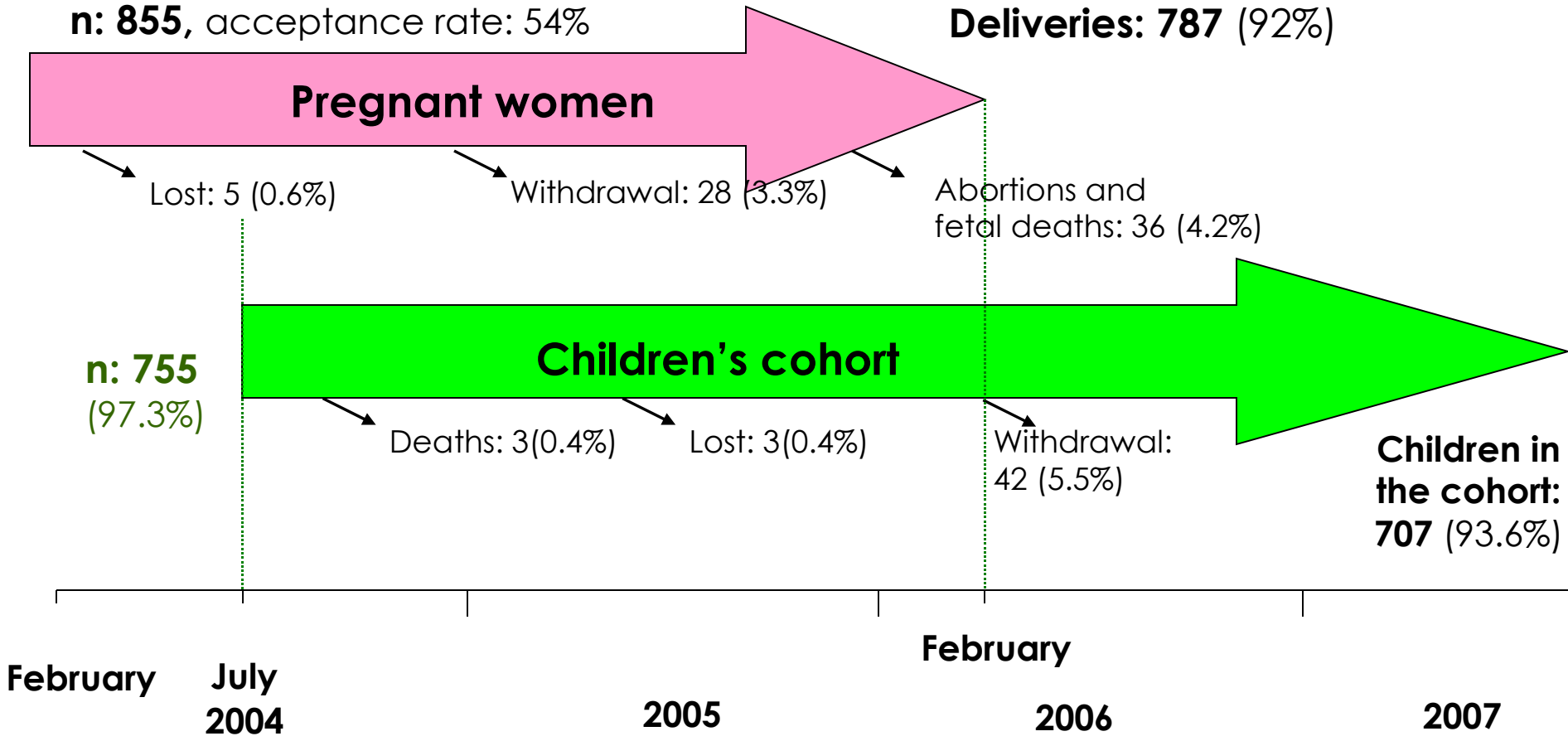
University Miguel Hernandez

La Fe Hospital

Valencian School for Health Studies

Infancia y Medio Ambiente

Valencia cohort



Study area

Urban
Metropolitan
Suburban
Rural

Andilla
Alcublas
Higueruelas
Villar del Arzobispo
Losa del Obispo
Casinos
Gátova
Marines
Olocau
Serra
Llíria
Domeño
Chulilla
Náquera
Bugarra
Benissanó
Pobla de Vallbona
Bétera
Sot de Chera
Benaguacil
Moncada
Pedralba
Gestalgar
L'Eliana
Rocafort
Villamarxant
Godella
Alfara del Patriarca
Riba-roja de Túria
Paterna
Burjassot
Loriguilla
Valencia city

N
W
E
S

20 km

Infancia y Medio Ambiente

Evaluation to the exposure to air pollution during pregnancy

- **Questionnaire** week 32
- **Environmental measures**
  - **outdoor**
    - **NO2, COV, O3** (a grid)
    - **PM10, PM2,5, HAP**(4 fixed points)
    - Air quality control Network
  - **House and personal**
    - Indoor/outdoor house **(NO2, COV)**
    - personal **COV (+ Q-48 h)**

} **Subsample N:50**

- **1-hydroxipirene** in urine

1) Exposure matrices

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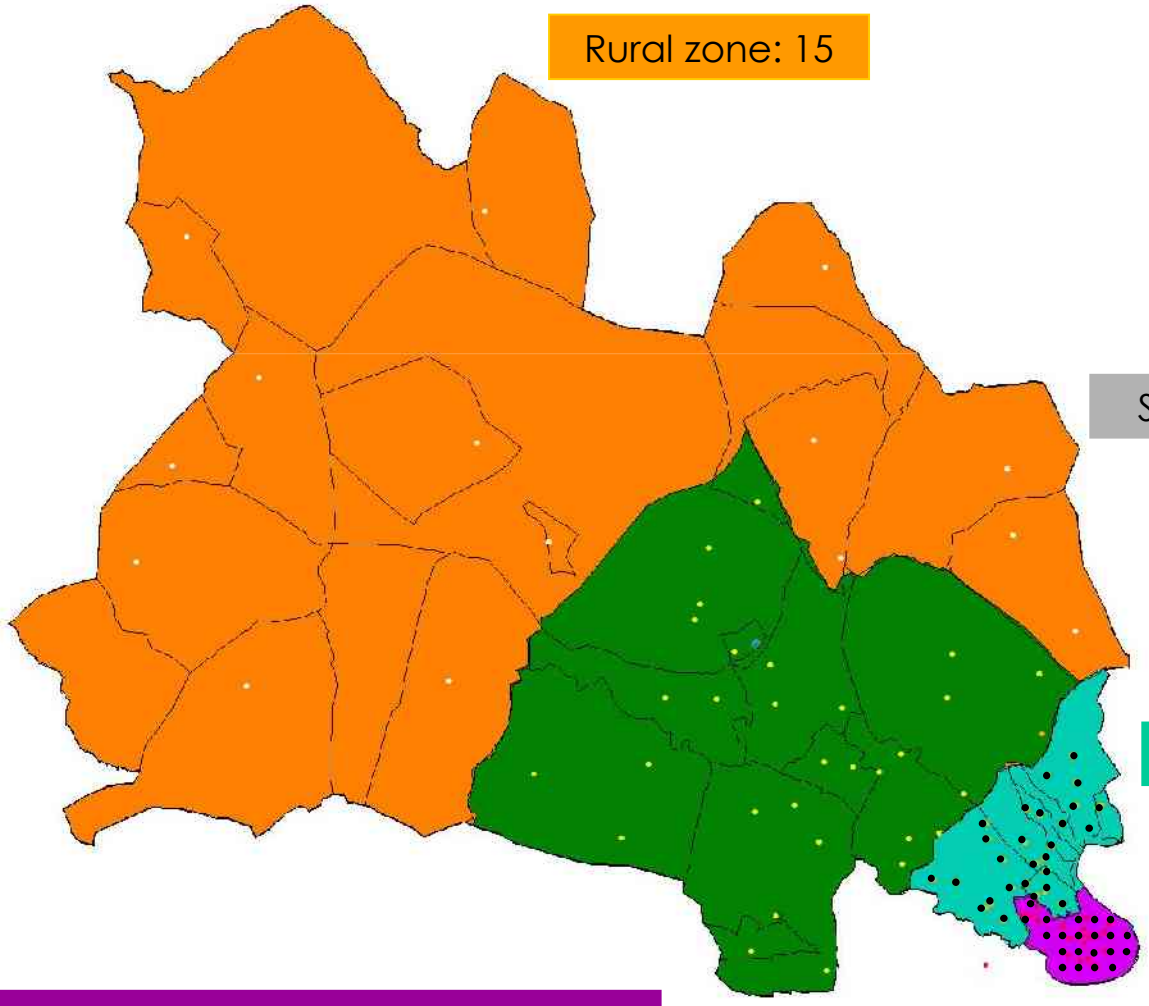
Outdoor air pollution:
Design of a grid for NO2, VOC and O3



Rural zone: 15

Suburban zone: 30

Metropolitan zone: 28

Urban zone: 20

TOTAL= 93 sampling points

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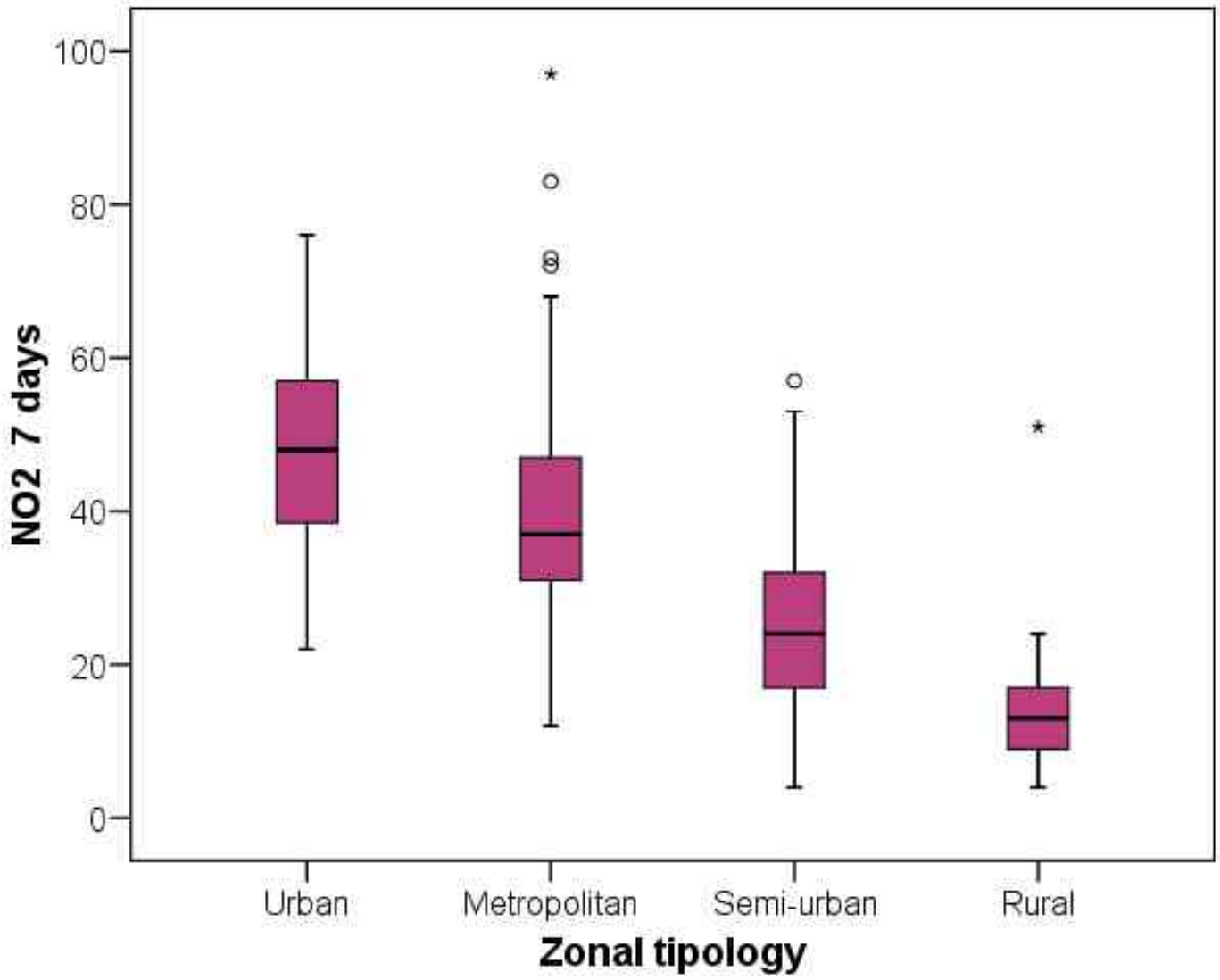
Grid for Outdoor Air Pollution

Passive samplers measurements

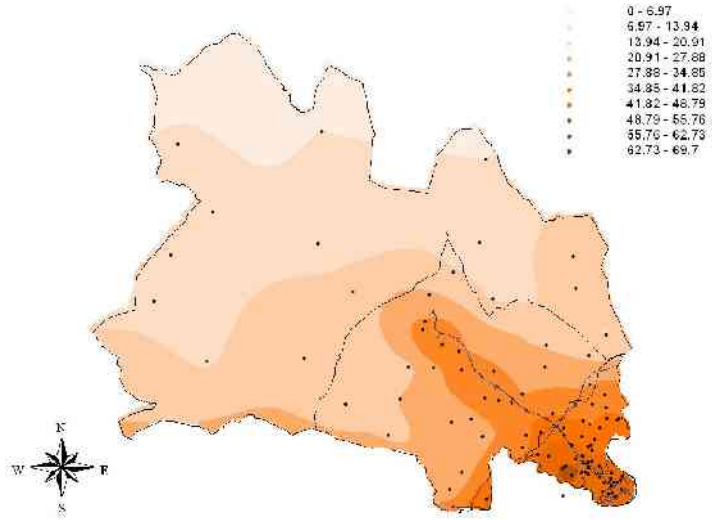
Pollutants	Frequency	Sampling time
NO2, VOC	4 campaigns 1/3 mo	2, 7 days
Ozone	Only summer	14 days

Passive samplers

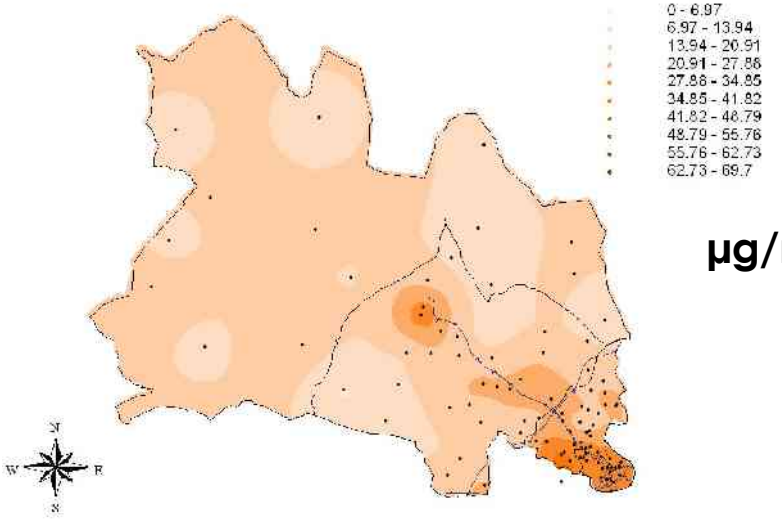
NO_2 7 days: mean of the 4 campaigns



NO2 Prediction maps (Kriging)

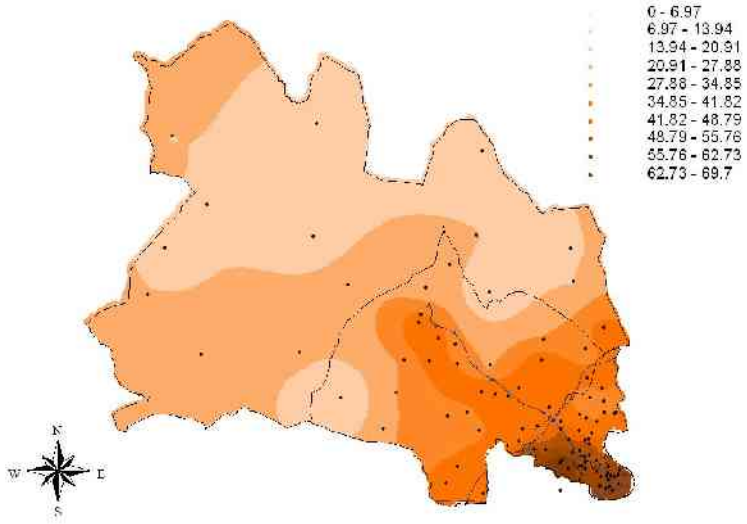


April ‘04

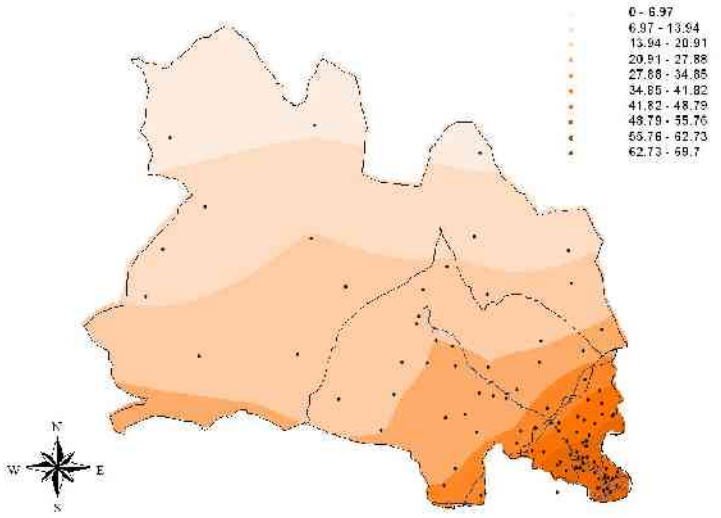


µg/m3

June ‘04

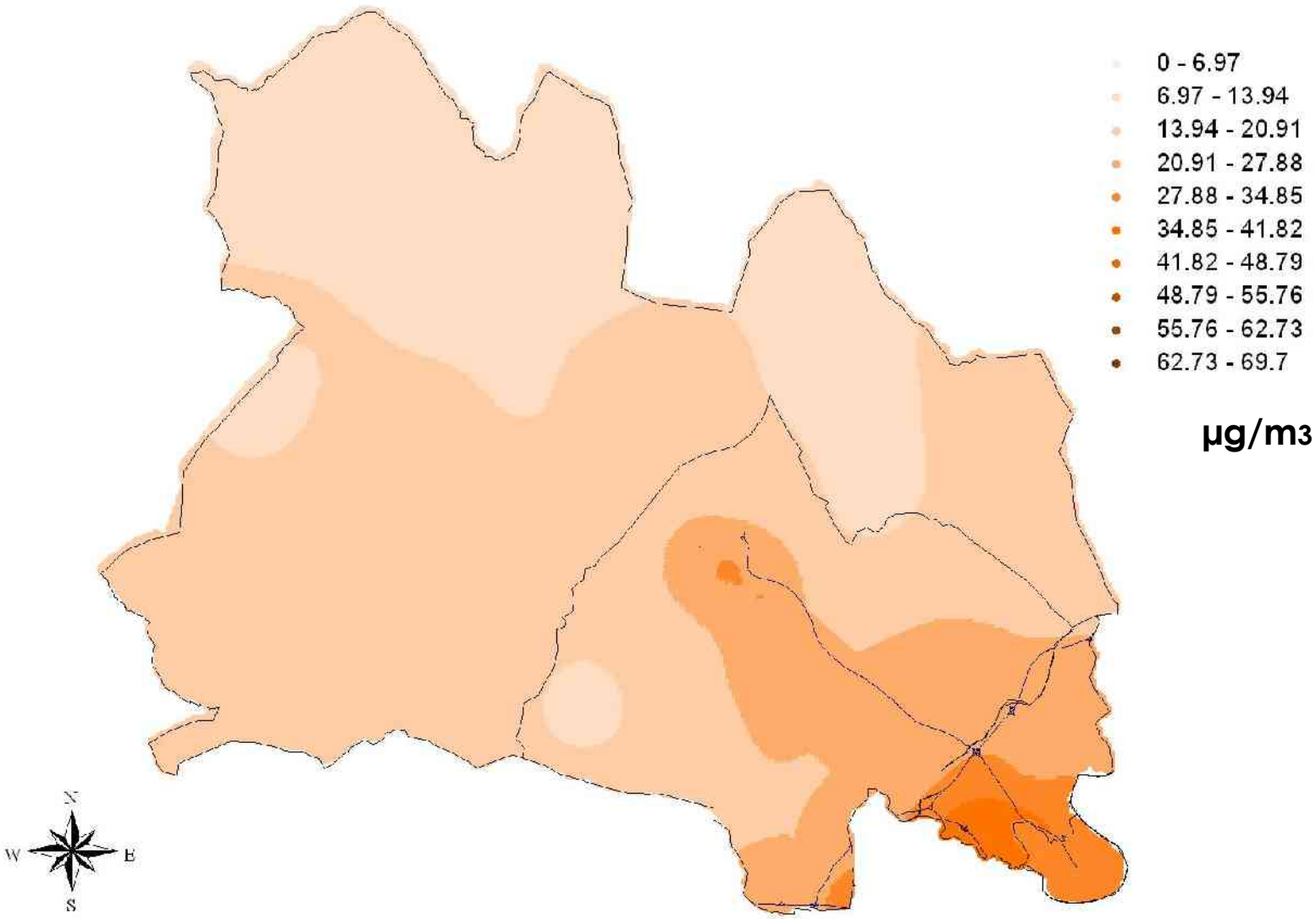


November ‘04

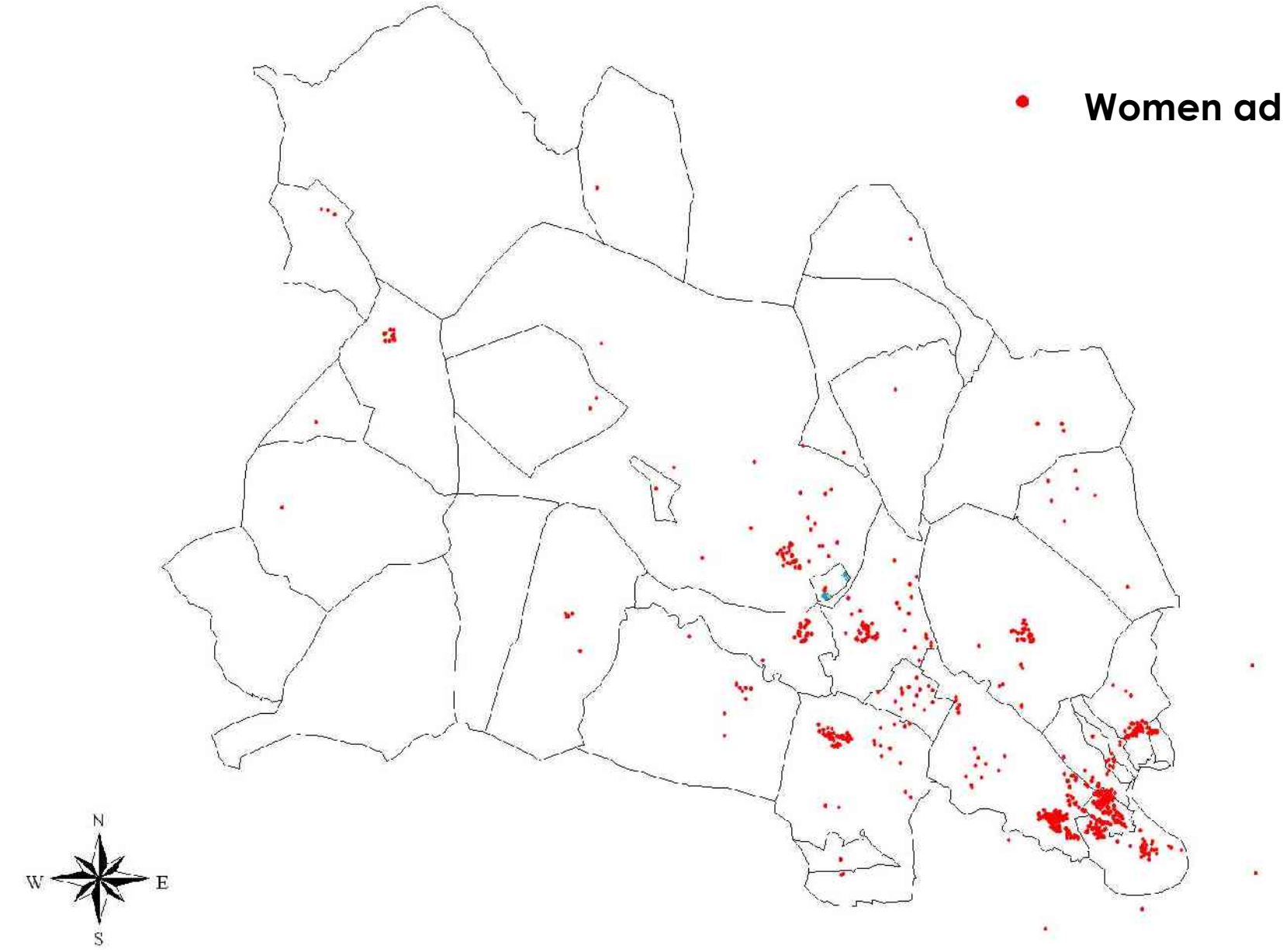


February ‘05

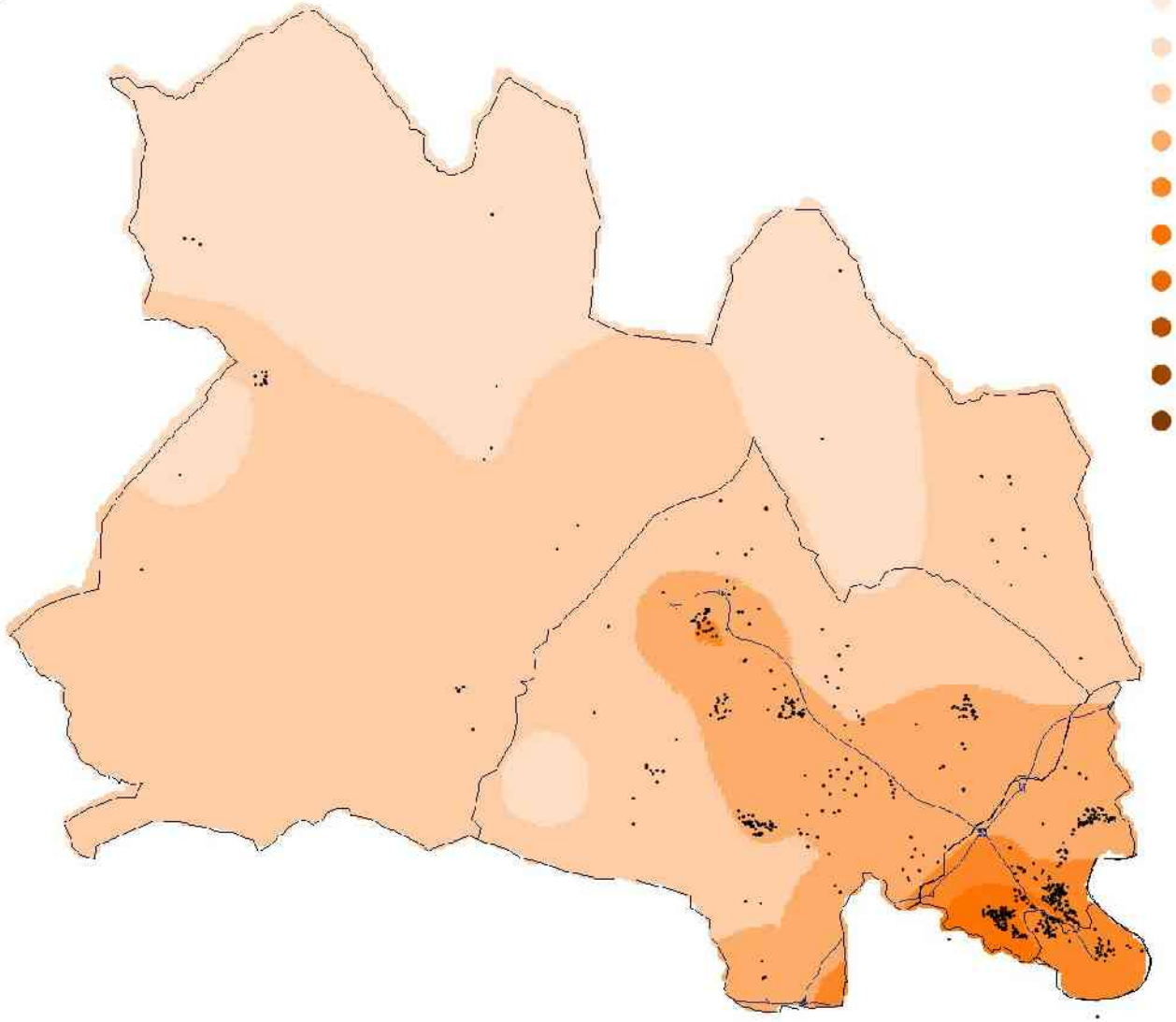
NO2 Prediction maps: 4 campaigns Combined



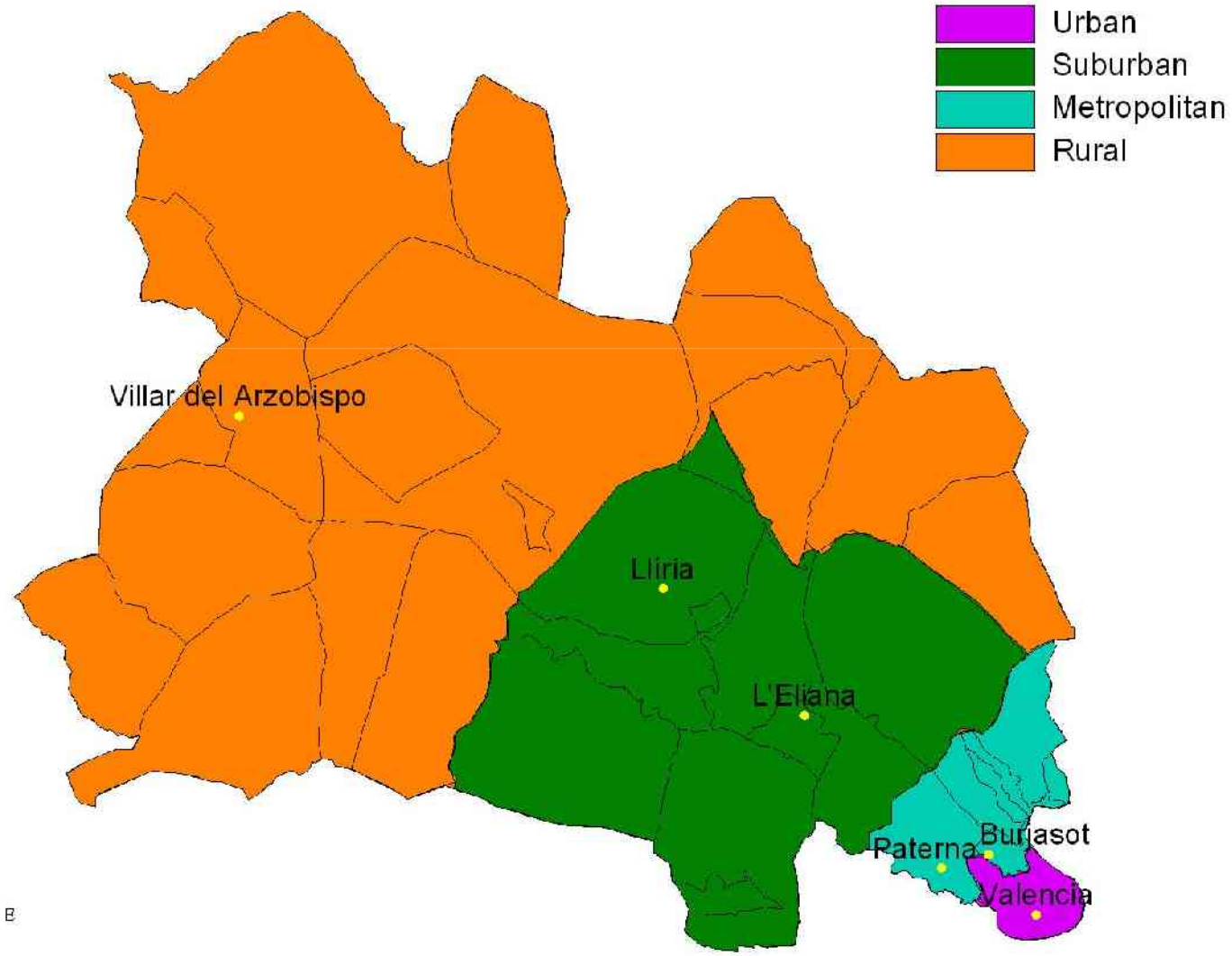
Home and work addresses are geo-coded



NO2 Prediction maps: 4 campaigns Combined



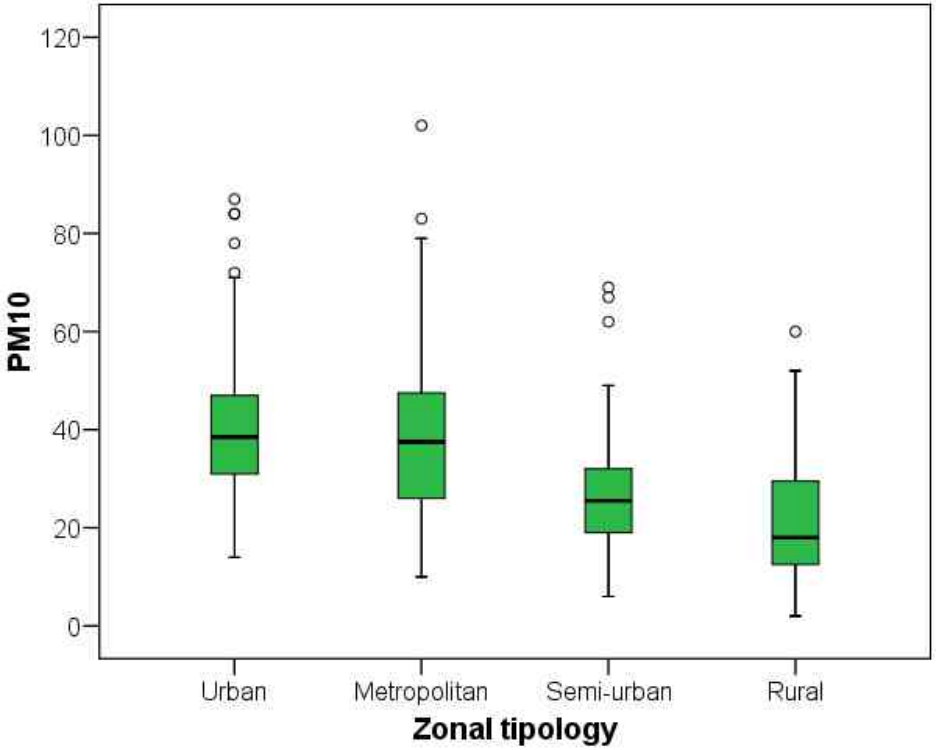
Particles measuresments



Measures: gravimetry + composition (PAH, metals, total carbon, sultates, nitrates)

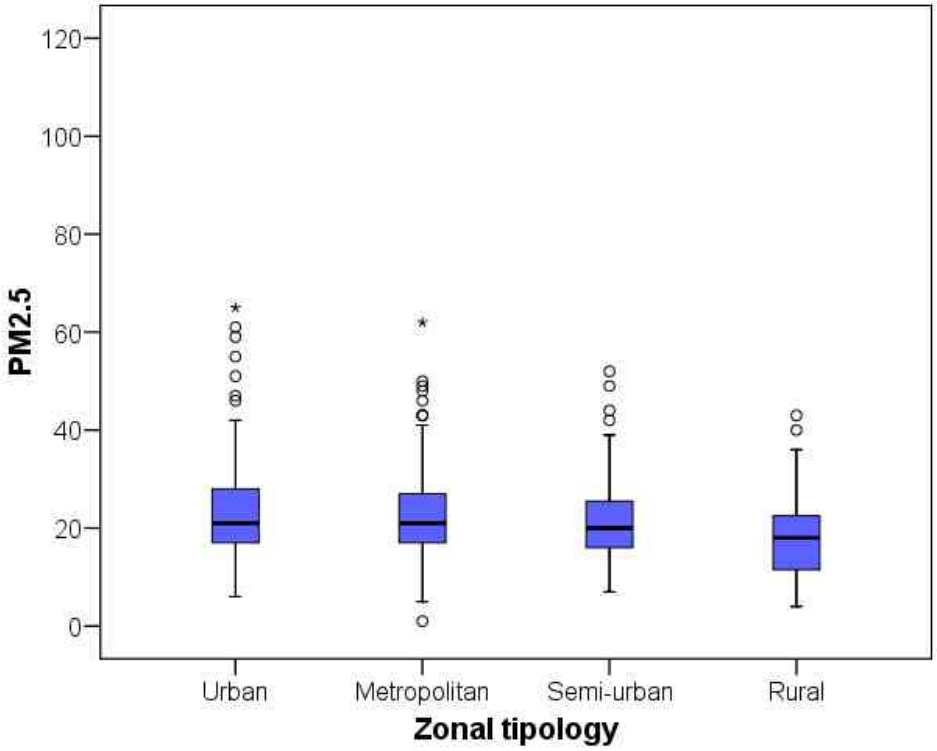
Particulate Matter

PM10



N	126	120	58	72
Mean (sd) ug/m3	40.4 (14.4)	38.5 (15.8)	27.2 (12.8)	21 (12.6)
P50	38.5	37.5	25.5	18.0

PM2.5



N	134	174	116	52
Mean (sd) ug/m3	23.2 (10.6)	22.0 (9.4)	21.3 (8.2)	18.4 (9.0)
P50	21	21.0	20.0	18.0

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Evaluation to the exposure to water toxicants during pregnancy

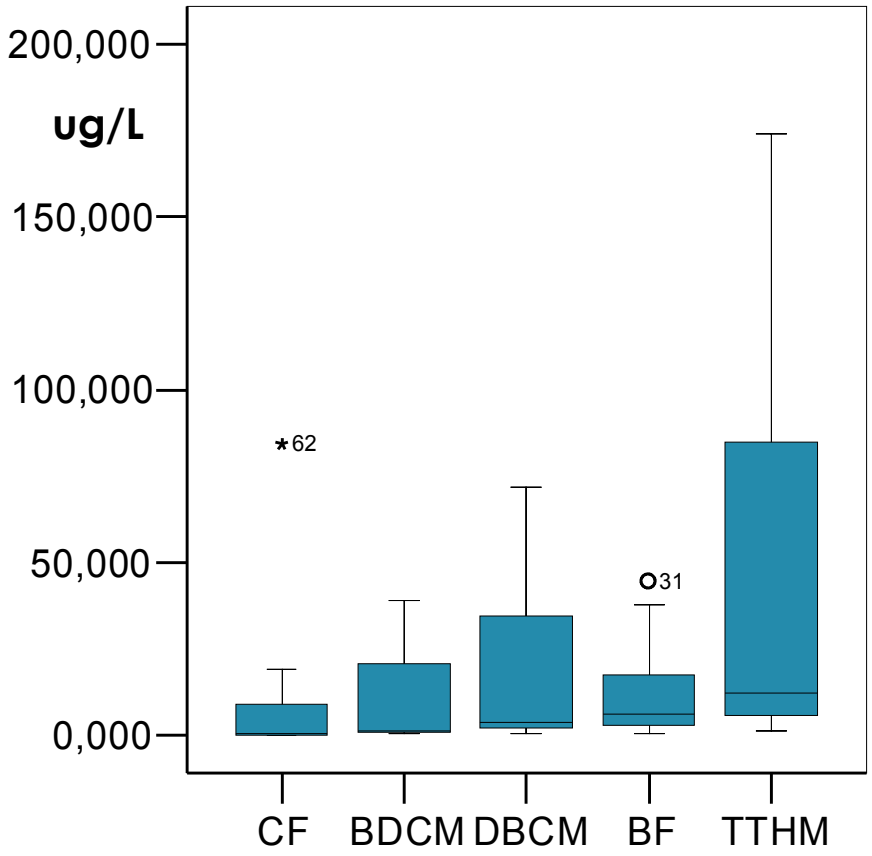
- Questionnaire week 32
- Environmental measures :
  - Trihalometanes concentration in the pipe (70 sampling points)
  - Trihalometanes concentration in the swimming pools (15 sampling points)

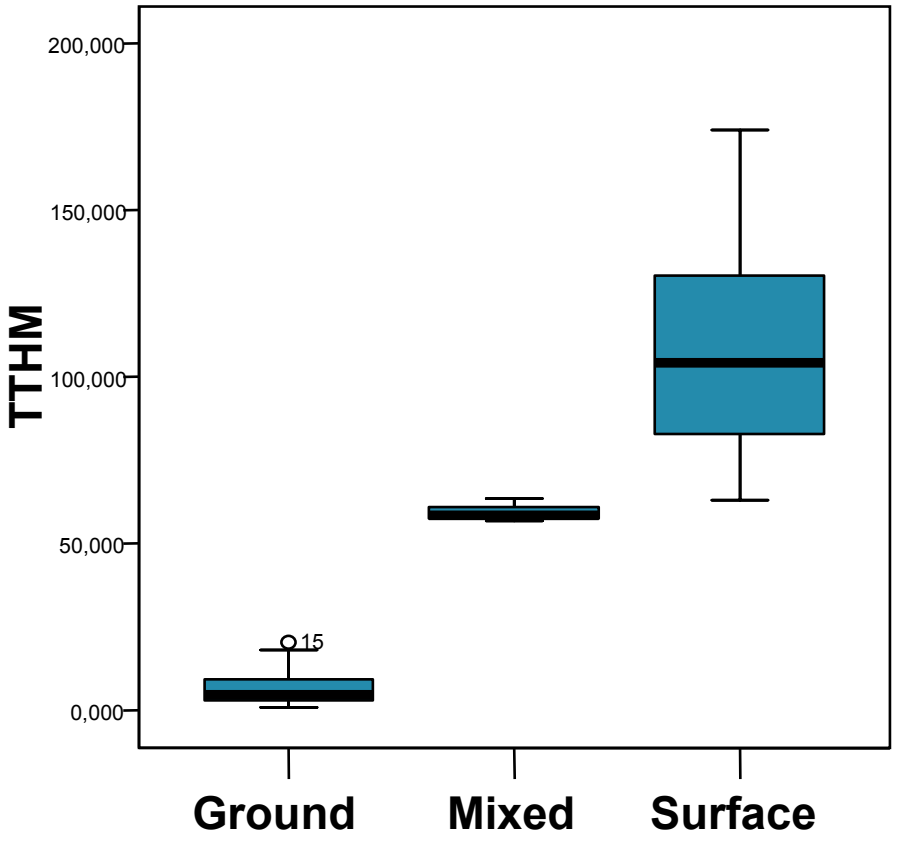
3) Water Quality Administration and Suppliers registers:
  - Supply system charateristics: source, treatment
  - Analitical records: nitrates, pesticides,..

- Exposure matrices

Infancia y Medio Ambiente

Evaluation to the exposure to water toxicants during pregnancy: TRIHALOMETANES





CF: Cloroform; BDCM: Bromodiclormethane

DBCM: Dibromoloromethane; BF: Bromoform

Water source

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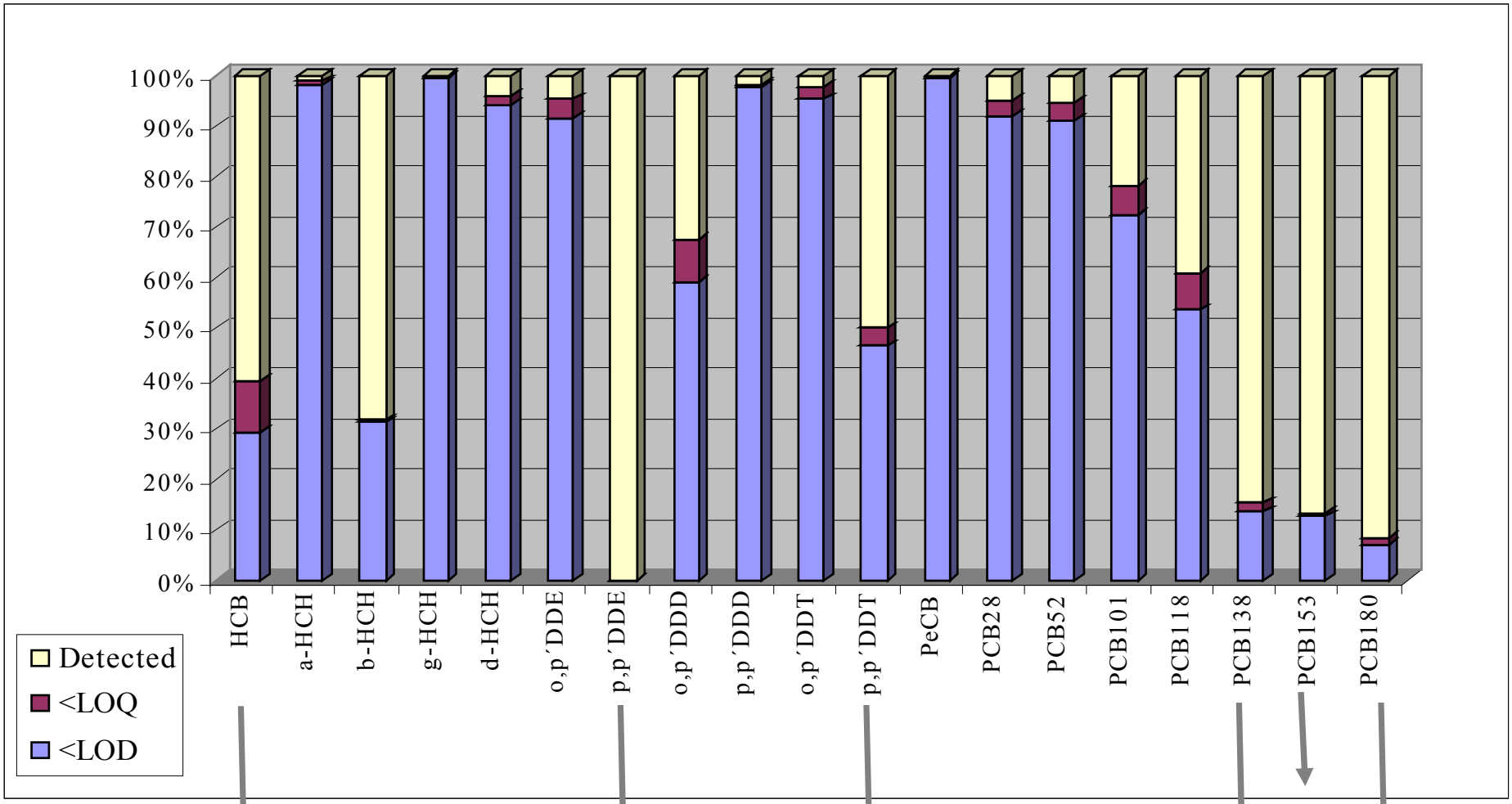
Organochlorine compounds in mothers´blood
(week of pregnancy: 12, n: 166)



Organochlorine compounds in umbilical blood cord (n:188)

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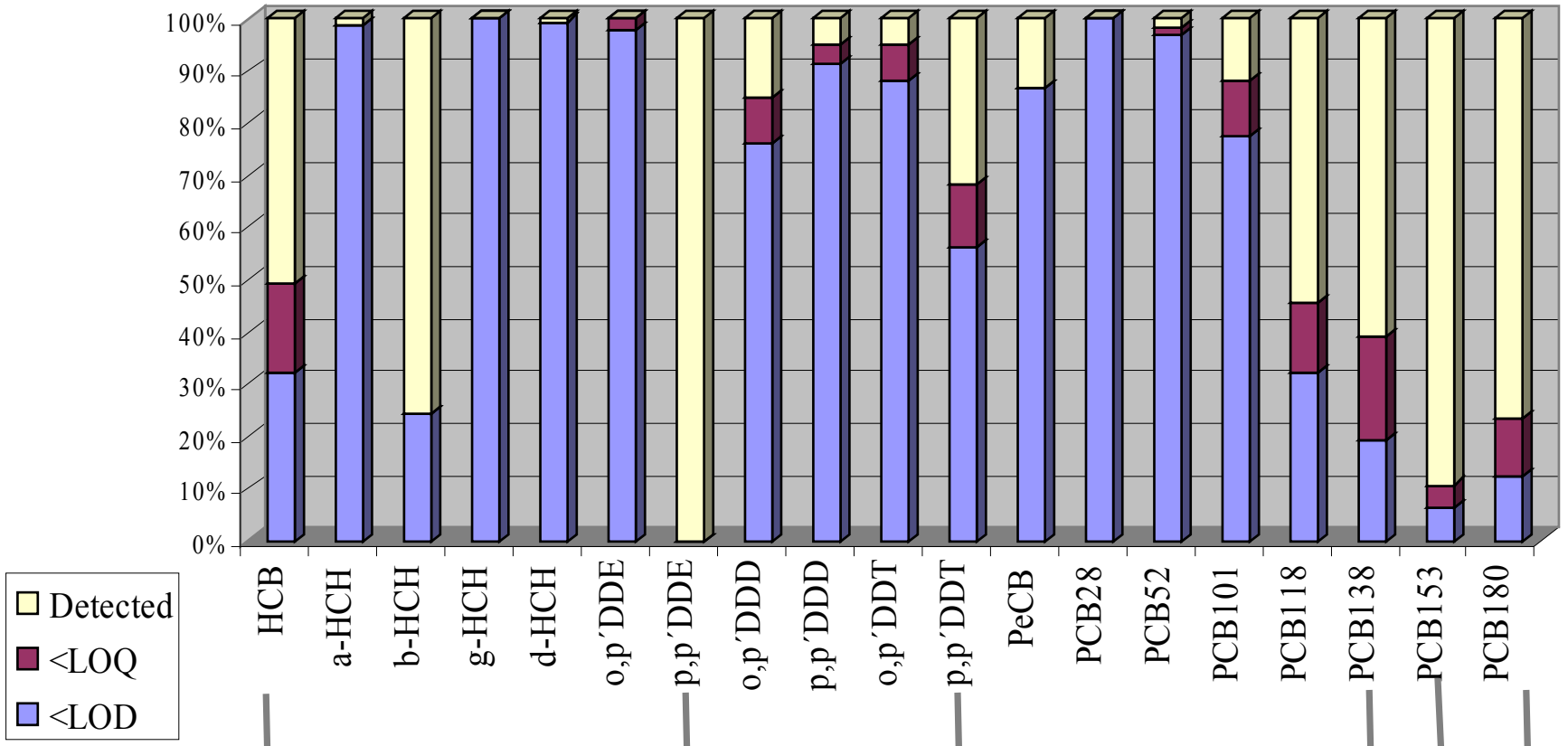
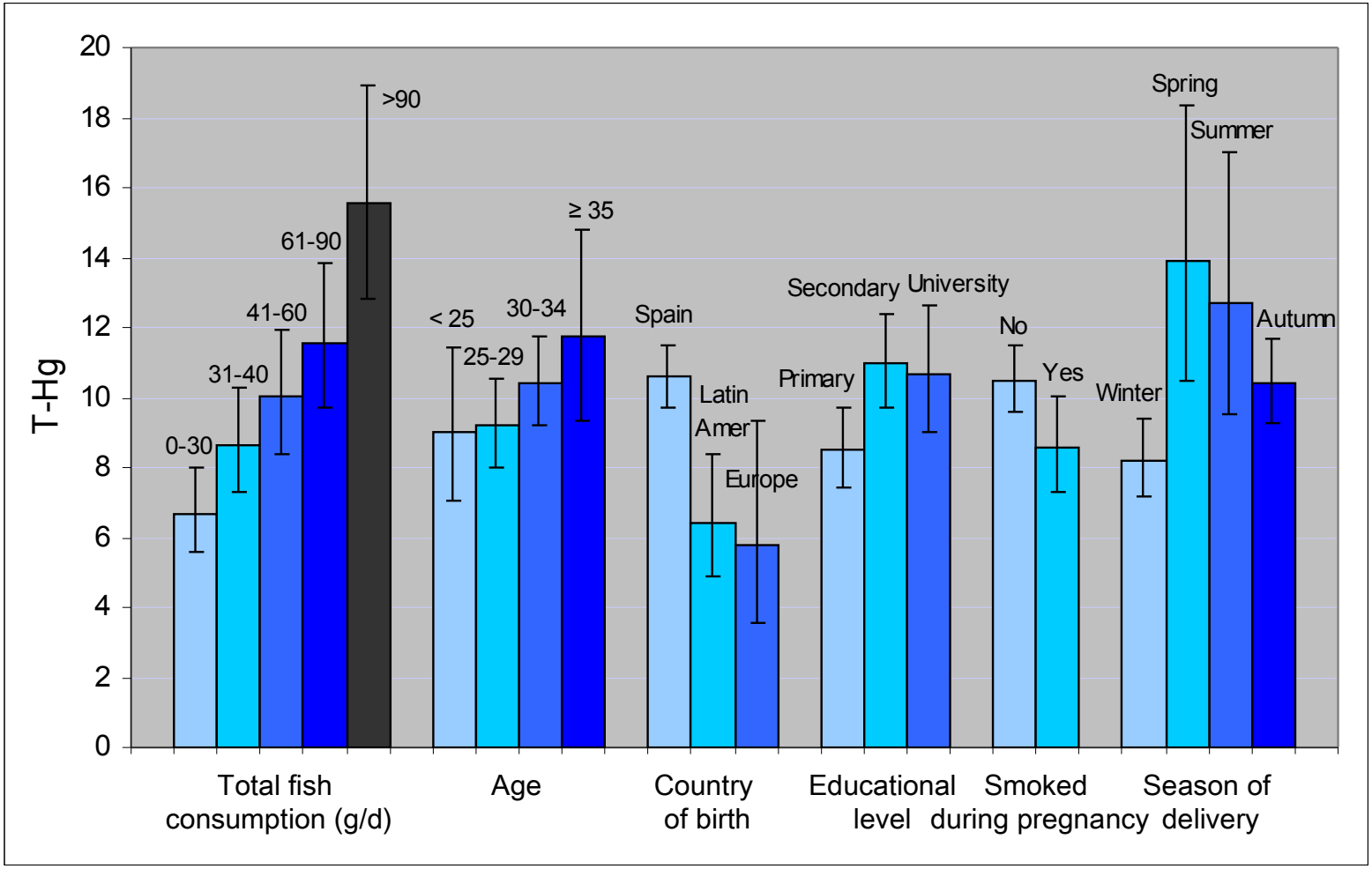


	HCB	p,p´DDE	p,p´DDT	PCB138	PCB153	PCB180
Geometric Mean (ng/ml)	0.15	0.50	0.06	0.06	0. 09	0.06

Infancia y Medio Ambiente

Cord blood Total-Mercury n:253; Gmean: 9.9 µg/L

Total-Hg levels (mean and 95% CI) simultaneously adjusted for all variables in the figure



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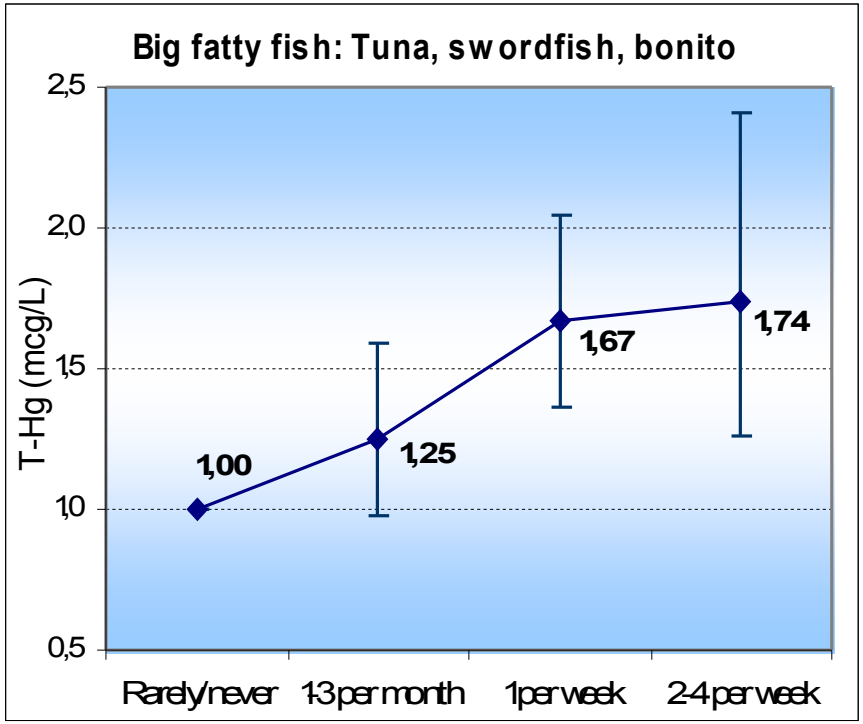
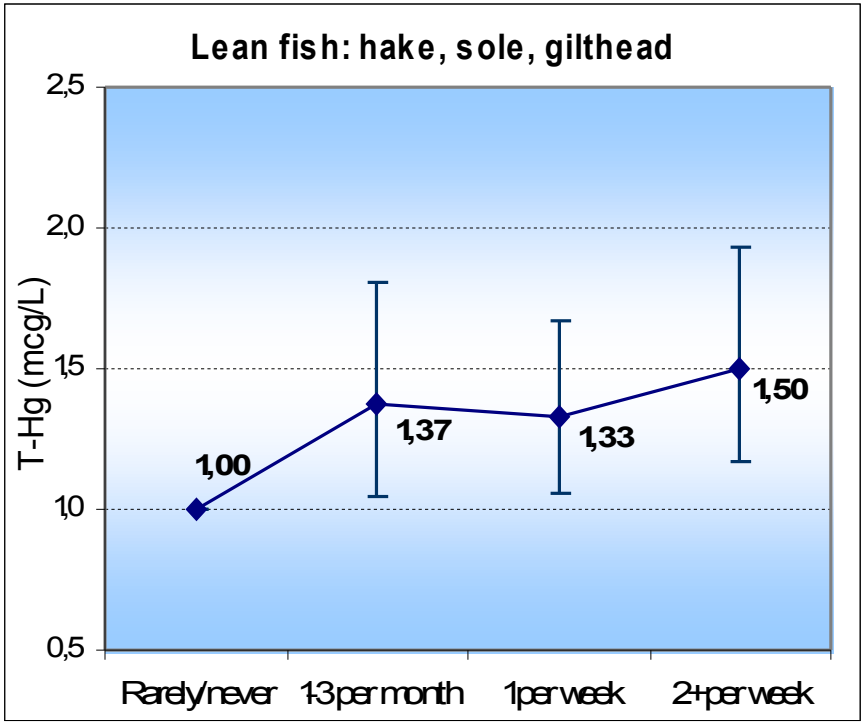
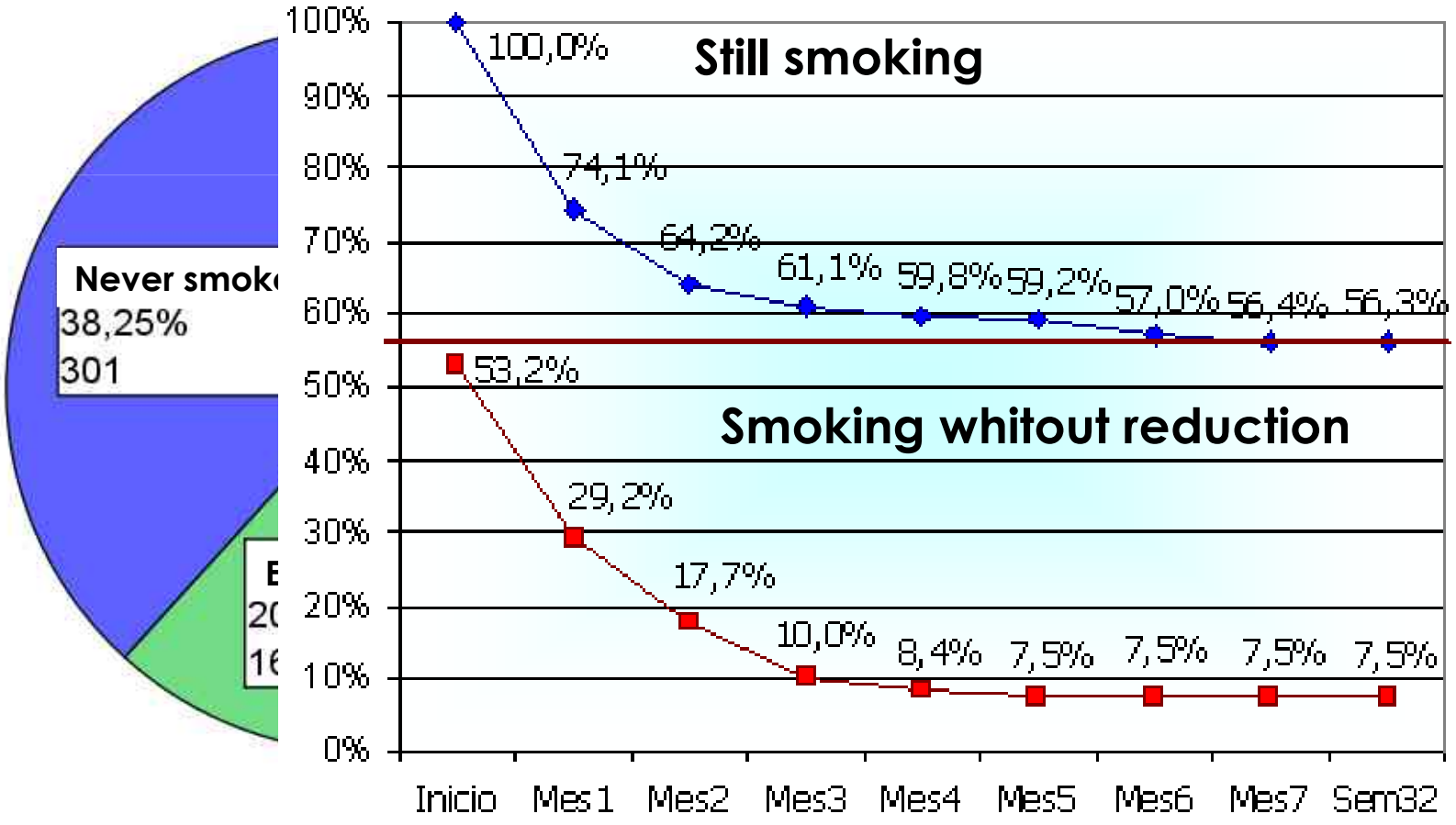
Cord blood Total-Mercury and Fish consumption

Regression coefficients of cord blood T-Hg levels adjusted for total mother's fish intake, age, and country of origin





SMOKING at the beginning of pregnancy

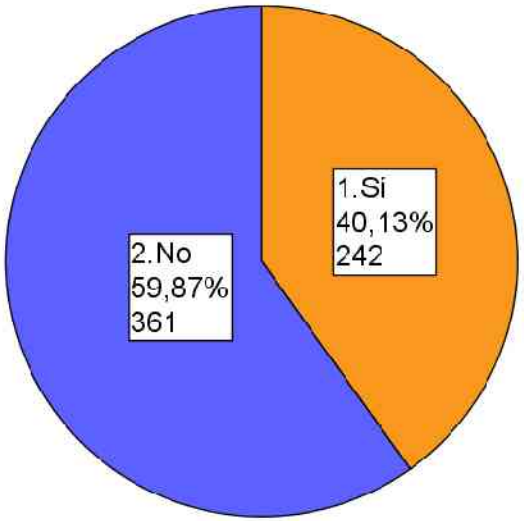


Smoking during pregnancy

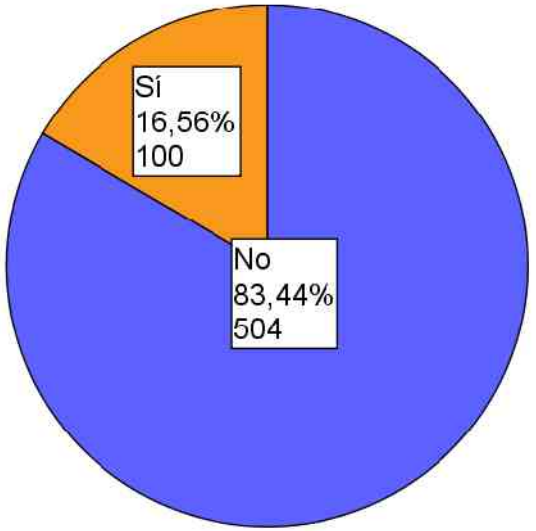
Passive smoking during pregnancy
(Q-, week 32, non-smokers)

Infanci

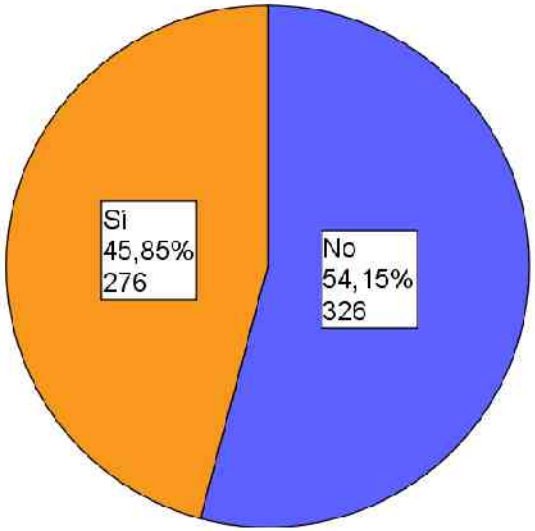
ETS at home



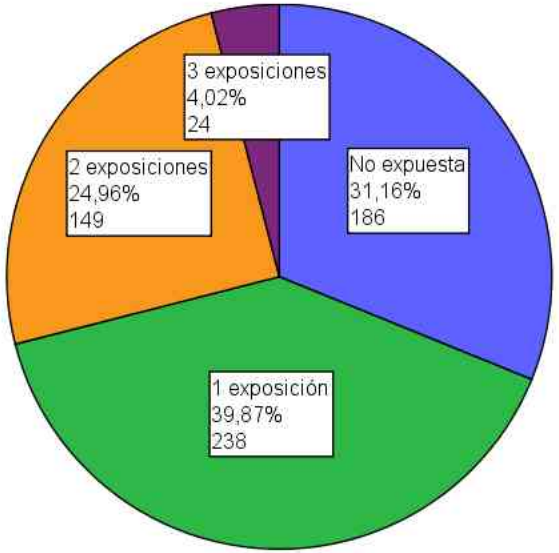
ETS at work



ETS at leisure activities



Total exposure to ETS



Infancia y Medio Ambiente

Occupational exposure

	N	*%*
Chemical substances	**146**	**22.5%**
Solvents	52	8.0%
Cleaning products	78	12.0%
Acids	50	7.7%
Alkales	32	4.9%
Physical hazards	**400**	**61.6%**
Noise	159	24.6%
Vibration	62	9.6%
Electromagnetic fields	237	36.7%
Biological risk	**36**	**5.5%**

Infancia y Medio Ambiente

Preliminary results in Valencia: Conclusions

- A variety of sources of information can be used to assess environmental (prenatal) exposures
- Substantial variability in exposure to ambient (air, water) pollutants. Higher levels in urban areas
- COPs: Prevalence of HCB, DDT and derivates, and PCBs 138, 153, 180; levels are moderate
- High levels of T-Hg in cord blood. Higher concentrations of T-Hg were related to maternal fish intake, particularly to large oily fish species
- High prevalence of smokers, and high passive exposure to ETS
- Occupational exposures to chemical and physical hazards

Infancia y Medio Ambiente

Results in Valencia: Uses of the information

- This information will allow us for:
  - Assessment of population levels of exposure (Valencia, Spain) and its determinants
  - Analyze associations of these exposures with children's health and development
  - Provide useful information to take preventive measures on children's health and development

- Communication:
  - to Public Health Authorities (Hg, tobacco, work)
  - to the participants of INMA
  - to health and environment professionals
  - to the general population

Thank you!

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http://infanciaymedioambiente.org