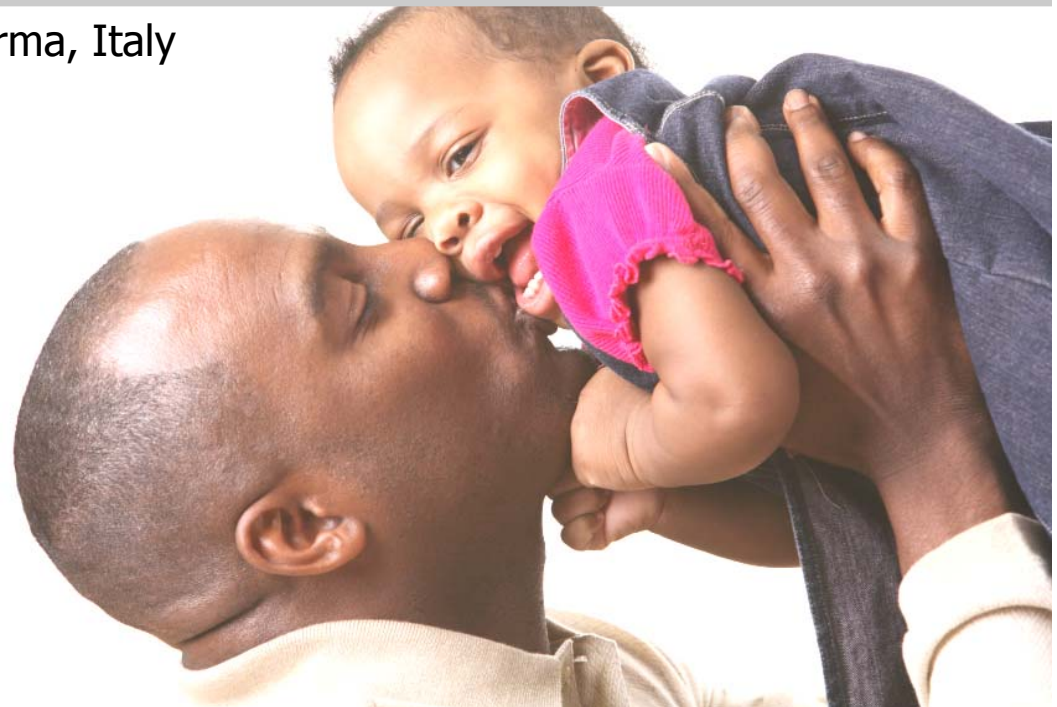


# Environmental Health Risks in European Birth Cohorts (ENRIECO)

Mark J Nieuwenhuijsen PhD

Ministerial Conference in Parma, Italy  
10-12 March 2010



centre for research  
in environmental  
epidemiology



## Programme information:

SEVENTH FRAMEWORK PROGRAMME THEME 6 - ENVIRONMENT  
(INCLUDING CLIMATE CHANGE)

Grant agreement for: \_Coordination and support action (Coordinating)

1 March 2009-28 February 2011

Grant agreement no: 226285

Project co-ordinator: Mark J Nieuwenhuijsen (CREAL, Barcelona)

EC project officer: Tomas Turecki

[www.enrieco.org](http://www.enrieco.org)

## Background:

There are many pregnancy and birth cohorts in Europe, with sample sizes ranging from a few hundred to tens of thousands.

These cohorts are currently collecting a wealth of information on environmental exposures and child health outcomes, but data are often of fragmented nature and there is relatively little coordination to structure and consolidate scattered research.

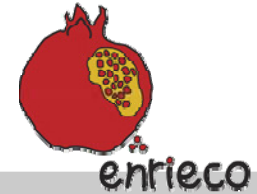
## **Aim:**

To advance our knowledge on specific environment and health causal relationships in pregnancy and birth cohorts by providing support to exploitation of past or ongoing studies.

## **Objectives:**

- Make inventories of birth cohorts: health data, environmental exposure data, biological samples, environmental exposure response functions, expertise, access
- Evaluate exposure, health and exposure-response data
- Attempt to combine data from various cohorts
- Make recommendations

# Work Packages



## **WP1.** Inventory of birth cohorts

WP leader: Martine Vrijheid

## **WP2.** Evaluation of exposures

WP leader: Bert Brunekreef

## **WP3.** Evaluation of health outcomes

WP leader: Remy Slama

## **WP4.** Evaluation of exposure-response relationship

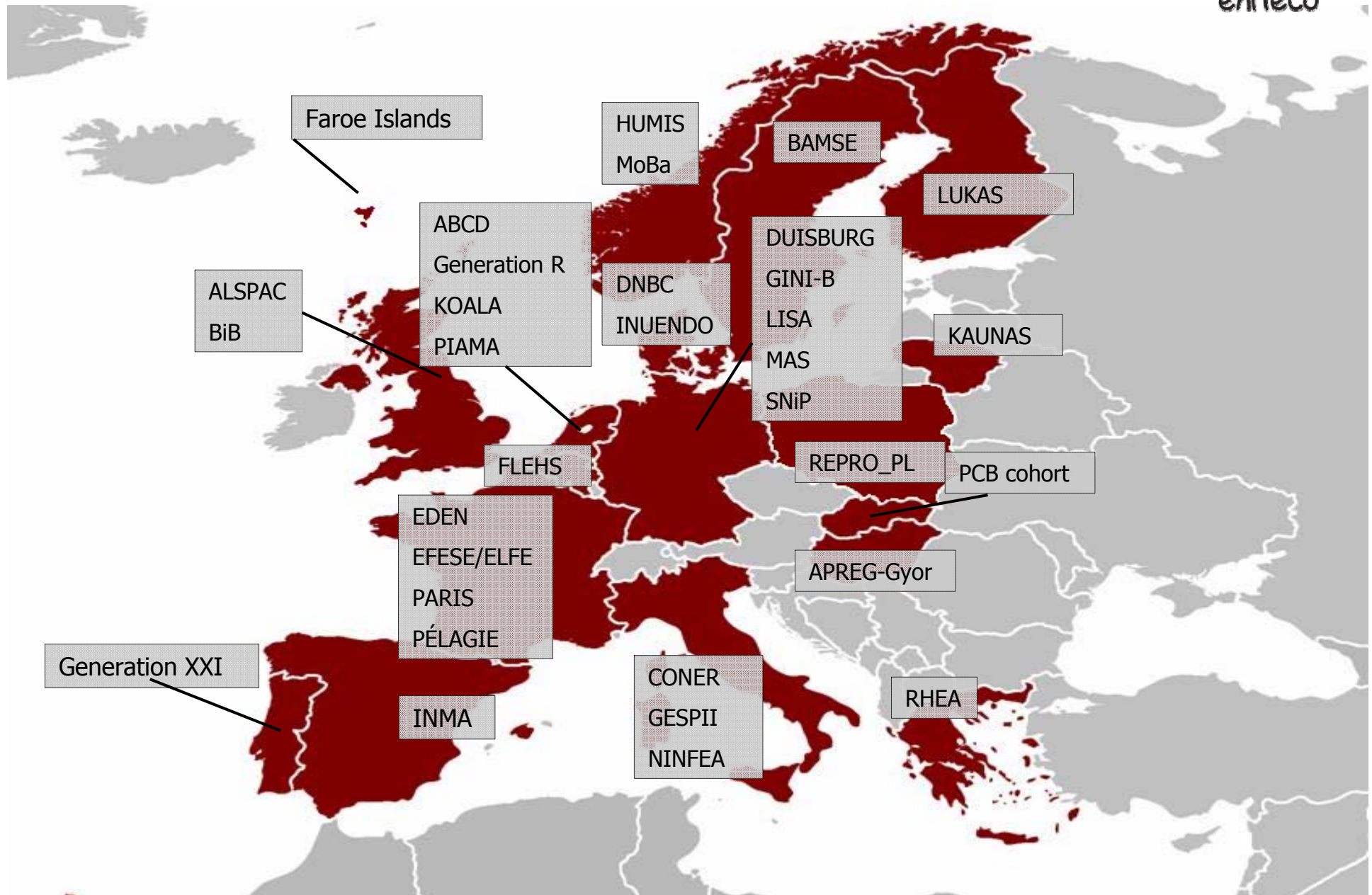
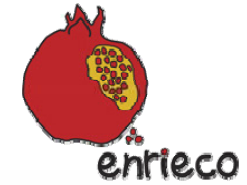
WP leader: Joachim Heinrich

## **WP5.** Database building

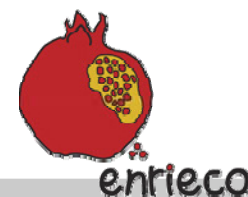
WP leader: Thomas Keil

## **WP6.** Dissemination

WP leader: Manolis Kogevinas



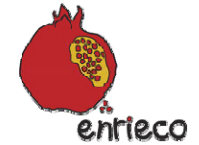
# Birth Cohorts List



| Cohort                  | Country       | Start of enrolment | N participants |
|-------------------------|---------------|--------------------|----------------|
| 1. Aarhus Birth Cohort  | Denmark       | 1990-ongoing       | 90000          |
| 2. ABCD                 | Netherlands   | 2003-2004          | 7863           |
| 3. ALSPAC               | UK            | 1991-1992          | 14062          |
| 4. APREG                | Hungary       | 2000-2006          | 2800           |
| 5. BAMSE                | Sweden        | 1994-1996          | 4089           |
| 6. BiB                  | UK            | 2007-2010          | 13000          |
| 7. Cohort Faroe Islands |               |                    |                |
| Cohort I                | Faroe Islands | 1986-1987          | 1022           |
| Cohort II               |               | 1994-1995          | 182            |
| Cohort III              |               | 1997-2000          | 656            |
| Cohort V                |               | 2007-2009          | 491            |
| 8. CONER                | Italy         | 2004-2005          | 654            |
| 9. DNBC                 | Denmark       | 1996 - 2002        | 96986          |
| 10. Duisburg            | Germany       | 2000-2001          | 234            |
| 11. EDEN                | France        | 2003-2006          | 1873           |
| 12. EFESE/ELFE          | France        | 2011-2012          | 20000          |
| 13. FLEHS               | Belgium       | 2002-2004          | 1196           |
| 14. Generation R        | Netherlands   | 2001-2005          | 9778           |
| 15. Generation XXI      | Portugal      | 2004-2006          | 8654           |
| 16. GESPII              | Italy         | 2003-2004          | 708            |
| 17. GINIplus            | Germany       | 1995-1998          | 5991           |
| 18. HUMIS               | Norway        | 2002-2009          | 2500           |

| Cohort         | Country     | Start of enrolment | N participants |
|----------------|-------------|--------------------|----------------|
| 19. INMA       | Spain       |                    |                |
| Asturias       |             | 2004-2007          | 482            |
| Gipuzkoa       |             | 2006-2008          | 600            |
| Granada        |             | 2000-2002          | 668            |
| Menorca        |             | 1997-1998          | 482            |
| Ribera Ebre    |             | 1997-1999          | 102            |
| Sabadell       |             | 2004-2007          | 749            |
| Valencia       |             | 2004-2005          | 787            |
| 20. INUENDO    | Denmark     | 2002-2004          | 1322           |
| 21. KANC       | Lithuania   | 2007-2009          | 4000           |
| 22. KOALA      | Netherlands | 2000-2003          | 2834           |
| 23. LISA       | Germany     | 1997-1998          | 3097           |
| 24. LUKAS      | Finland     | 2002-2005          | 442            |
| 25. MAAS       | UK          | -                  | -              |
| 26. MAS        | Germany     | 1990               | 1314           |
| 27. MoBa       | Norway      | 1999-2008          | 107400         |
| 28. NFBC 1986  | Finland     | 1985-1986          | 9479           |
| 29. NINFEA     | Italy       | 2005+              | 7500           |
| 30. PCB cohort | Slovakia    | 2001-2003          | 1134           |
| 31. PÉLAGIE    | France      | 2002-2006          | 3460           |
| 32. PIAMA      | Netherlands | 1996-1997          | 3963           |
| 33. REPRO_PL   | Poland      | 2007-2011          | 1300           |
| 34. RHEA       | Greece      | 2007-2008          | 1500           |
| 35. SNiP       | Germany     | 2003-2008          | 4840           |

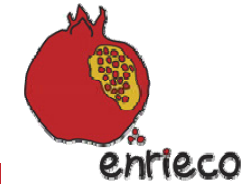
# Exposures



| Cohort               | Air pollution | Water contamination | Heavy Metals | Pesticides | Radiations | POPs | Occupation | Environmental Tobacco Smoke |
|----------------------|---------------|---------------------|--------------|------------|------------|------|------------|-----------------------------|
| Aarhus Birth Cohort  |               |                     |              |            |            | ✓    | ✓          | ✓                           |
| ABCD                 | ✓             |                     | ✓            | ✓          | ✓          |      | ✓          | ✓                           |
| ALSPAC               | ✓             |                     | ✓            | ✓          | ✓          | ✓    | ✓          | ✓                           |
| APREG                | ✓             |                     |              | ✓          |            |      | ✓          | ✓                           |
| BAMSE                | ✓             |                     |              |            |            |      | ✓          | ✓                           |
| BiB                  | ✓             | ✓                   |              |            |            |      | ✓          | ✓                           |
| Cohort Faroe Islands |               |                     | ✓            | ✓          |            | ✓    | ✓          | ✓                           |
| CONER                | ✓             |                     |              |            |            |      | ✓          | ✓                           |
| DNBC                 | ✓             |                     |              | ✓          | ✓          | ✓    | ✓          | ✓                           |
| Duisburg             | ✓             | ✓                   | ✓            |            |            | ✓    | ✓          | ✓                           |
| EDEN                 | ✓             | ✓                   | ✓            |            | ✓          |      | ✓          | ✓                           |
| EFESE/ELFE           | ✓             | ✓                   | ✓            | ✓          | ✓          | ✓    | ✓          | ✓                           |
| FLEHS                | ✓             |                     | ✓            | ✓          |            |      | ✓          | ✓                           |
| Generation R         | ✓             | ✓                   |              | ✓          |            | ✓    | ✓          | ✓                           |
| Generation XXI       |               |                     |              |            |            |      | ✓          | ✓                           |
| GESPII               | ✓             |                     |              |            |            |      |            | ✓                           |
| GINIplus             | ✓             |                     |              |            |            |      |            | ✓                           |
| HUMIS                | ✓             |                     | ✓            | ✓          | ✓          | ✓    | ✓          | ✓                           |
| INMA                 | ✓             | ✓                   | ✓            | ✓          | ✓          | ✓    | ✓          | ✓                           |
| INUENDO              |               |                     | ✓            | ✓          |            | ✓    | ✓          | ✓                           |
| KANC                 | ✓             | ✓                   |              |            |            |      | ✓          | ✓                           |
| KOALA                | ✓             | ✓                   |              |            | ✓          |      | ✓          | ✓                           |
| LISA                 | ✓             |                     |              | ✓          |            |      |            | ✓                           |
| LUKAS                | ✓             |                     | ✓            | ✓          |            | ✓    | ✓          | ✓                           |
| MAS                  | ✓             |                     |              |            |            |      | ✓          | ✓                           |
| MoBa                 | ✓             | ✓                   | ✓            | ✓          | ✓          | ✓    | ✓          | ✓                           |
| NINFEA               | ✓             |                     | ✓            | ✓          | ✓          |      | ✓          | ✓                           |
| PCB cohort           |               |                     | ✓            | ✓          |            | ✓    | ✓          | ✓                           |
| PÉLAGIE              |               | ✓                   | ✓            | ✓          |            | ✓    | ✓          | ✓                           |
| PIAMA                | ✓             |                     |              |            |            |      |            | ✓                           |
| REPRO_PL             | ✓             |                     | ✓            |            |            | ✓    | ✓          | ✓                           |
| RHEA                 |               | ✓                   | ✓            | ✓          | ✓          | ✓    | ✓          | ✓                           |
| SNiP                 | ✓             |                     |              |            |            |      | ✓          | ✓                           |



# Outcomes



| Cohort               | Birth outcomes | Asthma and allergies | Neurodevelopment | Growth and obesity |
|----------------------|----------------|----------------------|------------------|--------------------|
| Aarhus Birth Cohort  | ✓              |                      |                  |                    |
| ABCD                 | ✓              | ✓                    | ✓                | ✓                  |
| ALSPAC               | ✓              | ✓                    | ✓                | ✓                  |
| APREG                | ✓              |                      |                  |                    |
| BAMSE                | ✓              | ✓                    |                  | ✓                  |
| BiB                  | ✓              |                      | ✓                |                    |
| Cohort Faroe Islands | ✓              | ✓                    | ✓                | ✓                  |
| CONER                | ✓              | ✓                    |                  | ✓                  |
| DNBC                 | ✓              | ✓                    | ✓                | ✓                  |
| Duisburg             | ✓              | ✓                    | ✓                | ✓                  |
| EDEN                 | ✓              | ✓                    | ✓                | ✓                  |
| EFESE/ELFE           | ✓              | ✓                    | ✓                | ✓                  |
| FLEHS                | ✓              | ✓                    | ✓                | ✓                  |
| Generation R         | ✓              | ✓                    | ✓                | ✓                  |
| Generation XXI       | ✓              | ✓                    |                  | ✓                  |
| GESPII               | ✓              | ✓                    | ✓                | ✓                  |
| GINIplus             | ✓              | ✓                    | ✓                | ✓                  |
| HUMIS                | ✓              | ✓                    | ✓                | ✓                  |
| INMA                 | ✓              | ✓                    | ✓                | ✓                  |
| INUENDO              | ✓              |                      | ✓                | ✓                  |
| KANC                 | ✓              |                      |                  |                    |
| KOALA                | ✓              | ✓                    | ✓                | ✓                  |
| LISA                 | ✓              | ✓                    | ✓                | ✓                  |
| LUKAS                | ✓              | ✓                    |                  | ✓                  |
| MAS                  | ✓              | ✓                    | ✓                | ✓                  |
| MoBa                 | ✓              | ✓                    | ✓                | ✓                  |
| NINFEA               | ✓              | ✓                    | ✓                | ✓                  |
| PCB cohort           | ✓              | ✓                    | ✓                | ✓                  |
| PÉLAGIE              | ✓              | ✓                    | ✓                | ✓                  |
| PIAMA                | ✓              | ✓                    | ✓                | ✓                  |
| REPRO_PL             | ✓              | ✓                    | ✓                | ✓                  |
| RHEA                 | ✓              | ✓                    | ✓                | ✓                  |
| SNiP                 | ✓              |                      |                  |                    |

# Findings and Implications



There are many pregnancy and birth cohorts (N=35, >400000 children) in Europe with information on environmental exposures and health outcomes

There is fairly good cover of Europe, except Eastern Europe

There is considerable expertise and experience associated with the cohorts, and a great effort goes into them

The cohorts have provided important environmental exposure, health and environmental exposure-response data

The amount and detail of information provided by cohorts on environment and health differs considerably

# Findings and Implications



Greater and more efficient use needs to be made of the existing cohort data at the European level to:

- Provide speedy response to key policy questions
- Provide speedy response to concerns about “new” environmental exposures
- Improve understanding of geographical and cultural inequalities in disease, exposure, and health related behaviours
- Replicate findings with important public health implications in different settings
- Link with routinely collected environmental and health data
- Improve methodological approaches, including protocols of biological and environmental sample collection and analysis.
- Improve statistical power through combined analyses

# Findings and Implications



Cohorts tend to report individually, but recent initiatives have tried to combine data from various cohorts to increase e.g. power (overall and subgroups)

Combining information from different cohorts appears to be beneficial and increase the value of the cohorts and resulting information

Combining data from various cohorts requires careful consideration of the aims, protocols, data, ethical issues, analyses and management, and it is time and labour intensive but potential fruitful

There are currently limited resources to combine existing studies/data

# Findings and Implications



Follow up of existing cohorts is essential to determine health effects in later life of pre natal and early childhood exposure, for which there is some but not conclusive evidence

New pregnancy and birth cohorts are needed to evaluate any potential health effects of new environmental exposures, or existing environmental exposures under new conditions

# CHICOS - “Developing a Child Cohort Research Strategy for Europe”

- **“FP7 HEALTH-2009-3.3-4: Birth/Mother-Child Cohorts co-ordination.**
- **Project Coordinator:**
  - Martine Vrijheid (CREAL, Barcelona)
- **Cohorts, Partners:**
  - Danish National Birth Cohort
  - RHEA, Greece
  - NINFEA, Italy
  - Generation R, The Netherlands
  - MoBa, Norway
  - ALSPAC, Bristol, UK
  - INMA, Spain
- **Start:** Jan 2010, 3 years
- **EC Project Officer:** Kevin McCarthy



# CHICOS

## Outcome Themes

- Perinatal outcomes
- Asthma, respiratory health, allergies
- Obesity, vascular and metabolic health
- Neuro-cognitive and behavioural development
- Accidents and injuries
- Infectious diseases
- Childhood cancer

## Determinant Themes

- Social/cultural inequalities
- Nutrition and physical activity
- Life-style exposures
- Environmental exposures
- Biobanks and genetics
- Multiple determinants (integrated risk assessment)



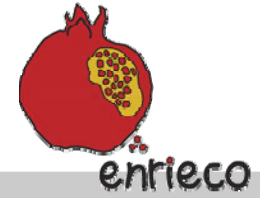
# THE ENRIECO TEAM



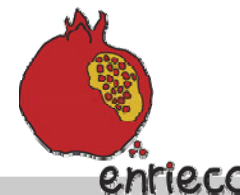
Barcelona  
workshop 2009



# Ongoing work



# WP2: Exposure evaluation



**WP leader: Bert Brunekreef**

## Working Group

## Responsible person

Air pollution

Ulrike Gehring

Water Contamination

Mark Nieuwenhuijsen

Allergens/Biological organisms

Joachim Heinrich

Metals

Jordi Sunyer

Pesticides

Sylvaine Cordier

Emerging Exposures (phthalates, BPA, PFCs, BFR)

Martine Vrijheid

Radiations: EMF/UV/ionising

Martine Vrijheid

Second Hand Tobacco Smoke (SHS)

Magnus Wickman

Noise

Thomas Keil

Persistent organic pollutants (POPs)

Jens Peter Bonde

# WP3: Outcome evaluation



**WP leader: Remy Slama**

## **Working Group**

Birth Outcomes

Allergies/Asthma/Respiratory Disease (RD)

Neurobehaviour

Cancer

Child Growth / Endocrine & Metabolic Disorders

## **Responsible person**

Remy Slama

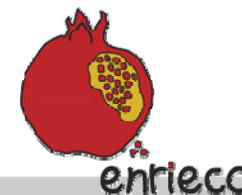
Thomas Keil

Jordi Sunyer

Manolis Kogevinas

Marie Aline Charles

# WP4: Exposure-Response evaluation



**WP leader: Joachim Heinrich**

## Working Group

## Responsible person

Air pollution and Birth outcomes

Manolis Kogevinas

Air pollution and Allergy/Asthma/RD

Bert Brunekreef

Allergens/biological organism and Allergy/Asthma

Joachim Heinrich

SHS and Birth outcomes

Constantine Vardavas

Pesticides and Birth outcomes

Sylvaine Cordier

Water contaminants and Birth outcomes

Mark Nieuwenhuijsen

Occupation and Birth outcomes

Martine Vrijheid

Metals and Birth outcomes

Jordi Sunyer

Metals and Neurobehaviour

Jordi Sunyer

POPs and Birth outcomes

Jens Peter Bonde

POPS and Neurobehaviour

Jordi Sunyer

Noise and Asthma/Birth outcomes

Thomas Keil

# Case Studies combining studies



| WP  | Case study   | Responsible person                                      |
|-----|--|---|
| WP2 | Occupational Exposures during pregnancy  | Sylvaine Cordier  |
| WP3 | POPs; PCB153 and birth weight  | Jens Peter Bonde  |
| WP5 | Case study on dampness and the association with asthma and allergy in European birth cohorts | Chen-Chih Mey<br>Joachim Heinrich<br>Christina Tischler |
|     | Case study on foetal tobacco smoke exposure and asthma among 4-6 year olds                   | Magnus Wickmann   |
|     | Case study on foetal tobacco smoke exposure and wheezing among 0-2 year olds                 | Constantine Vardavas                                    |