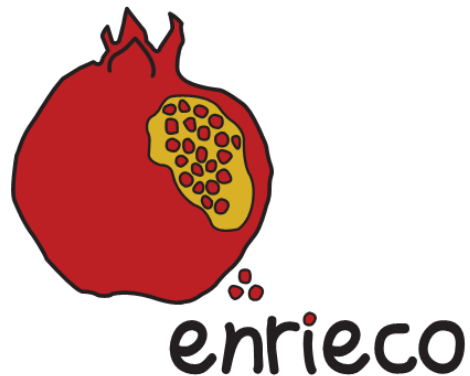


**The ENRIECO Project:**  
**ENVIRONMENTAL HEALTH RISKS IN EUROPEAN BIRTH**  
**COHORTS**



**ENV-FP7-2008-226285**

**Deliverable 14**

**Scientific paper with an inventory of European birth  
cohorts on environment and health**

**DRAFT**

**Work Package 1**



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**European birth cohort studies as a resource for the study of environment and child health: an inventory.**

Authors:

M Vrijheid, M Casas, all WP leaders + 2 members per cohort?, M Nieuwenhuijsen, as part of the ENRIECO consortium

**Keywords:** Birth Cohorts, Environment, Europe, Child health, Inventory.

## Introduction

It is well recognised that the foetus and infant are especially vulnerable to the effects of environmental risk factors that disrupt developmental processes. This is due to critical windows of vulnerability that occur during the rapid growth and development of organs and systems, to immaturities in children's metabolism, and to greater intake and absorption of chemicals from air, water, and food relative to their body weight{Grandjean, 2008 72 /id}. Chemical, physical and biological hazards in the environment include indoor and outdoor air pollution, water contamination, pesticides, heavy metals, persistent organic pollutants (POPs), environmental tobacco smoke (ETS), noise pollution, radiations, allergens, and biological organisms. Each of these may lead to serious health problems ranging from premature birth, low birth weight and congenital anomalies, to respiratory diseases, cancer, learning disabilities, behavioural problems, and possibly even obesity during childhood. The economic and societal costs associated with non-optimal child health are substantial (ref WHO-Martine, do you have it?) and the effects of exposure to environmental risk factors may manifest themselves throughout a life time and even over generations (ref?). Common physical and mental diseases in adult life appear to have at least part of their origin in early life, during gestation, childhood, adolescence and early adulthood{Kuh, 2004 73 /id}.

(check faroes statement) – I don't know what it means

Many epidemiological studies world-wide have attempted to address these issues. Pregnancy and birth cohort studies have played a prominent role in this field because they are designed to study the impacts of early pre and perinatal exposures on child health prospectively at multiple time points during infancy, childhood, adolescence and into adulthood. In the last two decades, new pregnancy and birth cohorts have been set up across Europe and other high income countries (e.g. {Golding, 2001 14 /id;Olsen,

2001 15 /id;Magnus, 2006 16 /id;Hofman, 2004 17 /id;Smith, 2002 45 /id;Eskenazi, 2005 41 /id;Ribas-Fito, 2006 18 /id;Richiardi, 2007 63 /id}, and more are being planned. Some are large general cohorts with multiple aims, while others are smaller and more focused on specific risk factors or specific diseases. Many include some assessment of environmental pollutant exposure, but not all have large expertise in this area. Data from individual cohorts are, by nature, fragmented across cohorts. Whilst it is clear that individual cohorts can, and have, made important contributions to understanding environmental causes of childhood disease and ill-health, it is also becoming increasingly clear that their full potential can only be realised with collaboration across large regions{Kogevinas, 2004 31 /id}.

In Europe, the European Commission (EC) has funded the ENRIECO project (Environmental Health Risks in European Birth Cohorts) to coordinate birth cohort research in Europe in the area of environmental exposures. The ENRIECO project ([www.enrieco.org](http://www.enrieco.org)) recognised that a comprehensive inventory of cohorts was needed as a first step towards improved collaboration, coordination, and future project planning, as well as for effective use of existing data; no inventory of environmental exposure data currently exists. In this paper we present the ENRIECO inventory of European birth cohorts with data on environmental exposures.

## **Methods**

### *Definition and identification of cohorts*

A set of criteria was developed for inclusion of cohorts in the inventory: (i) collect data on at least one environmental exposure topic; (ii) start enrolment during pregnancy or at

birth (or during first year of life if data on birth outcomes is collected from medical records); (iii) have at least one follow-up point after birth; (iv) include at least 200 mother-child pairs. Cohorts that did not fit these criteria were not included in this paper, although passive data collection is still ongoing that could be used for other projects.

Cohorts were identified from [www.birthcohorts.net](http://www.birthcohorts.net), a searchable webpage which contains currently limited information on a proportion of European birth cohorts, from EC funded studies such as GA<sup>2</sup>LEN (Global Allergy and Asthma European Network), HITEA (Health Effects of Indoor Pollutants: Integrating microbial, toxicological and epidemiological approaches), HIWATE (Health Impacts of Long-Term Exposure to Disinfection By-Products in Drinking Water), NewGeneris (Newborns and Genotoxic exposure risks), and ESCAPE (European Study of Cohorts for Air Pollution Effects), from cohort web pages, publications and personal contacts. Identification of new cohorts is still ongoing.

### *Questionnaires*

An inventory questionnaire was designed to collect general environmental and health information from cohorts. The questionnaire was divided in four sections: A) Basic Protocol Description (identification, basic description, and basic data collection scheme); B) Exposure Assessment (air pollution, water contamination, allergens and biological organisms, metals, pesticides, radiations, smoking and Environmental Tobacco Smoke (ETS), noise, Persistent Organic Pollutants (POPs), occupation, and other contaminants of emerging concern (phthalates, bisphenol A)); C) Outcome Assessment (reproduction and birth outcomes, neurodevelopment, allergies and asthma, cancer, child growth and obesity, sexual maturation, and metabolic syndrome) and D)

Other Information (genotyping, residential history and time-activity, sociodemographic variables, breastfeeding, diet and physical exercise, medical history and anthropometry).

The Inventory Questionnaire was sent to the principal investigators of each cohort and asked to distribute specific sections to the appropriate researchers. The completed questionnaire was then returned to the ENRIECO staff who checked it and if needed, contact the cohort researchers again (by phone or by e-mail) to finish completing the questionnaire. A Microsoft-Access database was firstly constructed with the responses from the cohorts to the Inventory Questionnaire; then, all this data was incorporated in a web-based inventory searchable database. The Access database was simplified and cleaned to show only the variables that we wanted to show on the web. This web-based database will be public available and will be linked to the already existing website [www.birthcohorts.net](http://www.birthcohorts.net). The Microsoft-Access database as well as the web-based searchable database was sent to the cohort members in order to identify errors and inconsistencies.

## **Results**

From March 1 2009 (start of the project) to July 5 2010, a total of 33 European birth cohorts with data on over 350000 children and their parents have been identified (table 1). The geographical distribution of these cohorts is shown in figure 1. They came from 19 different European countries especially from the Northern, Western, and Southern Europe but only 3 cohorts could be identified in the Eastern Europe (Czech Republic Birth Cohort, INUENDO, PCB cohort, and REPRO\_PL). Twenty-two out of 33 cohorts are region-based studies, 6 are nation-based whereas 3 are hospital-based (table 1). Only the Finnish LUKAS and the German MAS cohorts, both of them designed to examine

asthma and allergic diseases, selected children who lived on farms or who had high-risk of being allergic, respectively.

As far as the size of the cohort is concerned, only two studies from Denmark (DNBC) and Norway (MoBa) have recruited  $\geq 100000$  participants each one (table 1). On the other hand, there are numerous medium cohorts (3000-20000 children) focused in multiple settings, and smaller cohorts with less than 2000 children that are specialized in evaluating specific environmental or health topics.

The timescale protocols of ENRIECO cohorts are outlined in figure 2. In most of cohorts (n=16) children are now aged between 5-10 years, in 13 cohorts children are between 10-20 years old and in only 1 cohort children are over 20 years. In 5 recently started cohorts children are less than 5 years old whereas the French EFESE cohort has not started yet. Interestingly, most of cohorts have started the recruitment during pregnancy having information of maternal environmental exposures that could affect the foetus later in life. All cohorts have included all the initial children recruited in the follow-ups with the corresponding response rates, except the Belgian FLEHS cohort (n=1196) that has followed 2 different groups of 200 children each, one focused on allergy and asthma, and the other one on neurodevelopment. It has to be considered that not all follow-ups have been indicated in this timescale as the ENRIECO inventory questionnaire only asked about these time periods. The ALSPAC cohort for instance has followed-up children every year since birth until 13 years, which is not reflected in the figure.

Smoking/ETS, outdoor air pollution and allergens/biological organisms have been the most studied exposures by the ENRIECO birth cohorts (n=33, n=24, n=24, respectively) (figure 3). Only 11 and 12 cohorts have been included water contamination and radiations in their exposure assessment, respectively. On the other hand, all cohorts



have investigated birth outcomes (n=33), whereas the majority have evaluated growth/obesity (n=31), allergies/asthma (n=30), and neurodevelopment (n=26). Cancer and sexual maturation have been studied for few cohorts (n=12 and n=14, respectively) (figure 4). The ENRIECO database shows the status of work for environmental exposures and health outcomes at the moment that the questionnaire was performed. Consequently, data that are now “ongoing” or “planned” will be done in the near future. Exposure environmental information has been collected by questionnaire for a large number of cohorts whilst others have used biological samples to estimate the total dose absorbed of some pollutants. Table 2 shows the list of biomarkers of exposures measured by ENRIECO cohorts: metals, pesticides/POPs, and other exposures of emerging concern.

## **Discussion**

This paper presents the ENRIECO inventory that brings together over 33 birth cohorts and information on around 350000 children around Europe. In an Editorial published in 2004, Kogevinas et al{Kogevinas, 2004 409 /id} emphasized the need of a close coordination of existing European birth cohorts for three main reasons: (i) increase statistical power, especially for rare outcomes such as childhood cancer or congenital malformations; (ii) efficient design because of the diversity of exposures and outcomes between cohort populations; and (iii) replication of results which is crucial in epidemiological studies. Previous experience from other European networks in the area of mother-child cohort research such as GA<sup>2</sup>LEN, HITEA, HIWATE or ESCAPE has emphasised the need of cooperation and work closely together (refs). The ENRIECO web-based inventory searchable database is the first place that combines information on all European birth and pregnancy cohorts that have data on environment and health.

Most of the recruited birth cohorts were identified from the existing website [www.birthcohorts.net](http://www.birthcohorts.net), whereas others were found from publications, cohort particular website or by “word of mouth”. The 33 European birth cohorts described in this paper fulfill the four inclusion criterion described before; however, we have recruited some other cohorts that did not strictly fulfill these criteria. Some of them do not perform any follow-up after birth: Aarhus Birth Cohort Study from Denmark, APREG from Hungary, and North West Perinatal Survey Unit (NWPSU) from UK. There are other ones that only collected information on smoking as environmental exposure: Northern Finland Birth Cohort 1966 and 1986 (NFBC) from Finland, and Survey of Neonates in Pommerania (SNiP) from Germany. Even though they have not been described in this paper they have been included in the web-based inventory searchable database. Furthermore we know that we missed other cohorts, studies that maybe have not published any data or are still planning the study. However, the recruitment of cohorts is still ongoing and data can easily be entered in the database.

Birth cohorts are not equally distributed around Europe since the largest ones such DNBC and MoBa are located in the North whereas the medium-little cohorts are in the South. The majority of birth cohorts identified are in Western Europe; unfortunately few cohorts could be identified from Eastern Europe. Further research is needed to identify gaps in geographic coverage especially in relation to Eastern Europe.

Smoking, air pollution (outdoor and indoor) and allergens exposures have been assessed by almost all the ENRIECO birth cohorts, whereas few cohorts have assessed radiations, noise or have collected biomarker data on specific exposures such as metals or POPs; environmental contaminant exposures that has increased their interest in recent years. Pregnancy outcomes have been collected for all birth cohorts since they can be easily obtained from hospital records. There are a number of cohorts that are collecting

information about neurodevelopment, allergies/asthma and growth/obesity. On the other hand, there are other exposures that have been poorly studied within birth cohorts in Europe. This is the case of sexual maturation because it can be only assessed in the oldest cohorts, when children are more than 8-10 years old, or childhood cancer that has been usually studied by means of case-control studies and there are only some cohorts that are planning to collect data with linkage to national cancer registries.

Overall, we have received an excellent collaboration between all ENRIECO cohorts' participants. Data collected in this inventory has been used for different working groups within the ENRIECO project. Results from these working groups will be published soon. Data from the database will be updated every 6 months, approximately. Hence, data that is now "planned" or "ongoing" will be "done" in the near future; furthermore, new analysis will be introduced.

In conclusion, the ENRIECO web-based searchable database inventory is the first place that combines information on all European birth and pregnancy cohorts that have data on environment contaminant exposures and child health. It will facilitate all future collaborations in this field. In particular it is expected to be used by: i) Researchers, to enable more effective exploitation of existing studies; and ii) Policy makers and other stakeholders, to enable them to identify birth cohorts that can provide certain types of information, specifically on environmental exposures.

## Tables and Figures

**Table 1.** General description of ENRIECO birth cohorts: study names (with reference to publication of study design), source population, country, period of enrolment and number of participants (children).

Cohort	Source population	Country	Enrolment	Number of participants
1 ABCD - Amsterdam Born Children and their Development study	Region-based	Netherlands	2003-2004	7863
2 ALSPAC{Golding, 2001 220 /id} - The Avon Longitudinal Study of Parents and Children	Region-based	UK	1991-1992	14062
3 BAMSE{Wickman, 2002 221 /id} - The Stockholm Children Allergy and Environmental Prospective Birth Cohort Study	Region-based	Sweden	1994-1996	4089
4 BiB{Raynor, 2008 29 /id} – Born in Bradford	Region-based	UK	2007-2010	13000
5 Children’s Health and the Environment in the Faroes	Nation-based	Denmark		
Cohort 1			1986-1987	1022
Cohort 2			1994-1995	182
Cohort 3			1997-2000	656
Cohort 5			2007-2009	491
6 Co.N.ER	Hospital-based	Italy	2004-2005	654
7 Czech Early Childhood Health{Dejmek, 2000 395 /id}	Region-based	Czech Republic	1994-1999	4883
8 DNBC{Olsen, 2001 225 /id} – Danish National Birth Cohort	Nation-based	Denmark	1996-2002	96986
9 Duisburg{Wilhelm, 2008 226 /id}	Region-based	Germany	2000-2003	234
10 EDEN{Drouillet, 2009 227 /id}	Hospital-based	France	2003-2006	1873
11 ELFE{Vandentorren, 2009 228 /id} - French longitudinal study of children	Nation-based	France	2011-2012	20000
12 FLEHS{Koppen, 2009 87 /id} - Flemish Environment and Health Survey	Region-based	Belgium	2002-2004	1196
13 Generation R{Jaddoe, 2008 229 /id}	Region-based	Netherlands	2001-2006	9778
14 Generation XXI{Pinto, 2009 230 /id}	Region-based	Portugal	2004-2006	8654
15 GESPII{Porta, 2007 223 /id} - Gene and Environment: Prospective Study on Infancy in Italy	Hospital-based	Italy	2003-2004	708
16 GINIplus{Zirngibl, 2002 231 /id} - German Infant Nutritional Intervention plus influence of pollution and genetics on allergy development	Region-based	Germany	1995-1998	5991
17 HUMIS{Eggesbo, 2009 232 /id} - Norwegian Human Milk Study	Region-based	Norway	2002-2009	2500
18 INMA old – Childhood and Environment		Spain		
Granada	Hospital-based		2000-2002	668

	Menorca	Region-based		1997-1998	482
	Ribera Ebre	Region-based		1997-1999	102
19	INMA new{Ribas-Fito, 2006 233 /id} - Childhood and Environment	Region-based	Spain		
	Asturias			2004-2007	485
	Gipuzkoa			2006-2008	600
	Sabadell			2004-2007	749
	Valencia			2004-2005	787
20	INUENDO{Toft, 2005 234 /id}	Region-based	Greenland, Sweden, Poland, Ukraine	2002-2004	1322
21	KANC{Grazuleviciene, 2009 235 /id} – Kaunas cohort	Region-based	Lithuania	2007-2009	4000
22	KOALA Birth Cohort Study{Kummeling, 2005 236 /id}	Region-based	Netherlands	2000-2003	2834
23	LISApus{Heinrich, 2002 24 /id} – Influences of life-style related factors on the immune system and the development of allergies in childhood	Region-based	Germany	1997-1998	3097
24	LUKAS{Karvonen, 2009 237 /id}	Selected - farmers	Finland	2002-2005	442
25	MAS{Bergmann, 1994 238 /id} - Multicentre Allergy Study	Selected – high risk of allergy	Germany	1990	1314
26	MoBa{Magnus, 2006 239 /id} - The Norwegian Mother and Child Cohort Study	Nation-based	Norway	1999-2008	107400
27	NINFEA{Richiardi, 2007 240 /id}	Nation-based	Italy	2005+	7500
28	PCB cohort - Early Childhood Development and PCB exposures in Slovakia	Region-based	Slovakia	2001-2003	1134
29	PÉLAGIE{Guldner, 2007 241 /id}	Region-based	France	2002-2006	3460
30	PIAMA{Brunekreef, 2002 242 /id} - Prevention and Incidence of Asthma and Mite Allergy	Region-based	Netherlands	1996-1997	3963
31	REPRO_PL{Polanska, 2009 243 /id} - Polish National Birth Cohort/Polish National Multicenter Mother and Child Cohort	Nation-based	Poland	2007-2011	1300
32	RHEA{Chatzi, 2009 244 /id} - Mother Child Cohort in Crete	Region-based	Greece	2007-2008	1500
33	The Leicester Respiratory Cohorts{Kuehni, 2007 246 /id}	Region-based	UK	1998	5400

**Table 2.** Contribution of cohorts to the different exposure topics

Cohort	Exposure topic										
	Air pollution	Water contamination	Allergens & biol. org.	Heavy Metals	Pesticides	POPs	Emerging exposures	Radiations	Smoking & ETS	Noise	Occupation
1. ABCD	x				x			x	x		x
2. ALSPAC			x	x	x		x	x	x	x	x
3. BAMSE	x		x						x		x
4. BiB	x	x							x		x
5. Cohort Faroes				x	x	x	x		x		x
6. CONER	x		x						x	x	x
7. Czech Early Childhood	x								x		x
8. DNBC	x		x		x		x	x	x		x
9. Duisburg	x	x	x	x		X	x		x		x
10. EDEN	x	x		x			x	x	x		x
11. ELFE	x	x		x	x	x	x	x	x		x
12. FLEHS	x		x	x	x	x			x		x
13. GEPS II	x		x						x	x	
14. GINIplus	x		x						x		
15. Generation R	x	x	x		x		x		x	x	x
16. Generation XXI			x						x		x
17. HUMIS	x		x		x	x	x	x	x		x
18. INMA old	x	x	x	x	x	x	x	x	x	x	x
19. INMA new	x	x	x	x	x	x	x	x	x	x	x
20. INUENDO				x		x	x		x		x
21. KANC	x	x							x	x	x
22. KOALA		x	x					x	x	x	x
23. LISA	x		x		x				x	x	
24. LUKAS			x	x	x	x	x		x		x
25. MAS			x						x		x
26. MoBa	x	x	x	x	x	x	x	x	x	x	x
27. NINFEA	x		x		x		x	x	x	x	x
28. PCB cohort				x	x	x	x		x		x
29. PIAMA	x		x						x		

30. PELAGIE		x		x	x	x	x		x		x
31. REPRO_PL	x		x	x		x			x	x	x
32. RHEA	x	x	x	x	x	x	x	x	x	x	x
33. The Leicester Respiratory Cohorts	x								x		x

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**Table 4.** Biological samples collected in the ENRIECO cohorts.

Biological samples	1 <sup>st</sup> trimester	Pregnancy 2 <sup>nd</sup> trimester	3 <sup>rd</sup> trimester	Birth	0-6m	7-18m	Post natal 18-60m	5-10y	10+years
<b>Maternal</b>									
Blood	ABCD, ALSPAC, DNBC, Gen R, Gen XXI, INMA-new, INUENDO, REPRO-PL, RHEA	ALSPAC, DNBC, EDEN, Gen R, Gen XXI, HUMIS, INMA-Menorca, INUENDO, MoBa, REPRO-PL	ALSPAC, BiB, Faroes I-II-III, Duisburg, Gen R, Gen XXI, INMA-Menorca, INUENDO, KANC, KOALA, REPRO-PL	Co.N.ER, Czech Early Childhood Health, ELFE*, Gen XXI, GEPSII, HUMIS, INMA-Granada-Ribera, LUKAS, MAS, MoBa, PCB cohort, REPRO-PL, RHEA	Faroes V, INMA-Ribera	PIAMA	Gen XXI, PIAMA	Duisburg	DNBC
Urine	ALSPAC, Gen R, INMA-new, PÉLAGIE, RHEA	ALSPAC, EDEN, Gen R, MoBa, REPRO-PL, RHEA	ALSPAC, BiB, Gen R, INMA-new, REPRO-PL	ELFE*, HUMIS	Faroes V	INMA-Sabadell	Duisburg, INMA-Asturias*	Duisburg, INMA-Valencia	
Hair	PÉLAGIE		REPRO-PL	Faroes EDEN I-II-III,	Faroes V		ALSPAC		
Nails			INMA-new				ALSPAC		
Breast Milk				Faroes EDEN, INMA-new, cohort	I-II-III, ELFE*, PCB	Faroes V, Duisburg, HUMIS, INMA-Ribera, KOALA, PIAMA			
Saliva	REPRO-PL	REPRO-PL	REPRO-PL		NINFEA, REPRO-PL	INMA-Gipuzkoa-Sabadell, KOALA	FLEHS, INMA-Asturias*-Gipuzkoa	INMA-Sabadell	
<b>Paternal</b>									
Hair						Faroes V	ALSPAC		



Biological samples	1 <sup>st</sup> trimester	Pregnancy 2 <sup>nd</sup> trimester	3 <sup>rd</sup> trimester	Birth	0-6m	7-18m	Post natal 18-60m	5-10y	10+years	
Blood	INMA-Menorca, INUENDO	EDEN, Gen R, INMA-Menorca, INUENDO, MoBa	INMA-Menorca, INUENDO	Gen XXI, MAS	LUKAS	PIAMA	INMA-Asturias*, PIAMA			
Nails							ALSPAC			
Urine						Faroes V				
Saliva						KOALA	INMA-Asturias*-Gipuzkoa	INMA-Sabadell*		
<b>Offspring</b>										
Cord blood				ALSPAC, BiB, Faroes I-II-V, Co.N.ER, Czech Early Childhood Health, DNBC, Duisburg, EDEN, Gen R, Gen XXI, GEPSII, HUMIS, INMA (all), LISA, LUKAS, MAS, MoBa, PCB cohort, PÉLAGIE, REPRO-PL, RHEA						
Blood				KANC, LISA, MAS	Faroes III, INMA-Ribera, PCB cohort, PIAMA	BiB, Faroes II-III-V*, INMA-Ribera, LUKAS, PCB cohort, PIAMA	ALSPAC, BiB, Faroes II, Duisburg, Gen XXI, INMA-Menorca-Ribera, KOALA, LISA, LUKAS, PCB cohort, PIAMA,	ABCD*, ALSPAC, Faroes I-II-III, Duisburg, EDEN*, Gen R, GINIplus, INMA-Sabadell*-Valencia*, KOALA, LISA,	ALSPAC, Faroes I, GINIplus, LISA, PIAMA*	

Biological samples	1 <sup>st</sup> trimester	Pregnancy 2 <sup>nd</sup> trimester	3 <sup>rd</sup> trimester	Birth	0-6m	7-18m	Post natal 18-60m	5-10y	10+years
Urine				INMA-Ribera		INMA-Sabadell, MAS, RHEA*	Duisburg, ELFE*, FLEHS, INMA-Granada-Ribera, MAS	RHEA* LUKAS, PCB cohort, PIAMA ALSPAC, Czech Early Childhood Health, Duisburg, EDEN*, ELFE*, FLEHS, Gen R, INMA-Sabadell*-Valencia*, LISA, LUKAS, MAS	ALSPAC, LISA
Hair				EDEN, INMA-Asturias-Gipuzkoa-Sabadell		ALSPAC, Faroes I-II-V*, EDEN, RHEA*	ALSPAC, Faroes II, EDEN, ELFE*, INMA-Asturias*-Granada-Menorca-Ribera	Faroes I-II, EDEN*, INMA-Sabadell*-Valencia*	Faroes I,
Nails						ALSPAC, INMA-Sab	ALSPAC		
Saliva			BiB		NINFEA	INMA-Gipuzkoa-Sabadell, KOALA	ELFE*, Gen R*, INMA-Asturias*-Gipuzkoa-Menorca	Gen R*, INMA-Sabadell*	ALSPAC, LISA, PIAMA*, Leicester*

\*planned or ongoing

**Table 2.** Biomarkers of exposure measured by ENRIECO birth cohorts.

<i>Cohort</i>	<i>Metals<sup>1</sup></i>	<i>Pesticides and POPs<sup>2</sup></i>	<i>Other exposures<sup>3</sup></i>
ALSPAC	Hg, Pb, Cd, Mn, As, Se, TMS	-	PFCs
Children's Health and the Environment in the Faroes	Hg, Pb, Se	DDT/DDE, dieldrin/endrin, heptachlor, mirex, PCB, chlordane, organometallic compounds, toxaphene	BPA, phthalates, PFCs, BFR
DNBC	-	-	PFCs
Duisburg	Hg, Pb, Cd, Se	DDT/DDE, HCB, HCH, PCB, PCDFs, PCDDs	BPA, phthalates, BFR, PFCs
EDEN	Hg, Pb, Cd, Mn, B	-	BPA, phthalates, phenols
ELFE	Hg, Pb	AMPA, atrazine, carbamates, pyrethroids, organochlorines	BPA, phthalates, organotin, BFR, PFCs
FLEHS	Pb, Cd	DDT/DDE, HCB, PCB, PCDDs	-
Generation R	-	organophosphates, organochlorines	BPA, phthalates
HUMIS	-	DDT/DDE, HCB, HCH, mirex, PCB, PCDFs, PCDDs, toxaphene	phthalates, BFR
INMA old	Hg, Pb, Cd, Mn, As, Ni, TMS	organochlorines, DDT/DDE, HCB, HCH, PCB	BPA, phthalates, phenols, BFR
INMA new	Hg, Pb, TMS,	DDT/DDE, HCB, HCH, PCB	BPA, phthalates, phenols, BFR, PFCs
INUENDO	Hg, Pb, Cd	DDT/DDE, HCB, PCB	phthalates, BFR, PFCs,
KANC	Mn, Fe	-	-
LUKAS	Hg, Pb, Cd, As, Se	DDT/DDE, organometallic compounds, polychlorinated naphthalene, PCB, PCDFs, PCDDs	phthalates, BFR
MoBa	Not specified but planned	DDT/DDE, PCB	BPA, phthalates, BFR
PCB cohort	Hg, Pb	DDT/DDE, HCB, HCH, PCB	phthalates, PFCs
PÉLAGIE	Hg	aldrin, DDT/DDE, dieldrin/endrin, heptachlor, HCB, PCB, organophosphorous, triazine, alachlore, metolachlore, acetolachlore, propour	phthalates, BFR
REPRO_PL	Hg, Pb, Cd, Se	PCB, PCDFS, PCDDs, dioxine, furanes	-
RHEA	Hg, Pb, Cd, As, Mn	DDT/DDE, HCB, PCB, PCDDs	phthalates, BFR, PFCs

<sup>1</sup>Hg: mercury, Pb: lead, Se: selenium, Cd: cadmium, Mn: manganese, B: boron, As: arsenic,, Zn: zinc, Cr: chromium, Ni: nickel, Fe: iron, TMS: total metals spectrum.

<sup>2</sup>DDT/DDE: dichlorodiphenyltrichloroethane/dichlorodiphenyldichloroethylene, HCB: hexachlorobenzene, PCB: polychlorinated biphenyls, HCH: hexachlorocyclohexane, PCDFs: polychlorinated dibenzo furans, PCDDs: polychlorinated dibenzo-p-dioxins, AMPA: aminomethylphosphonic ACIC.

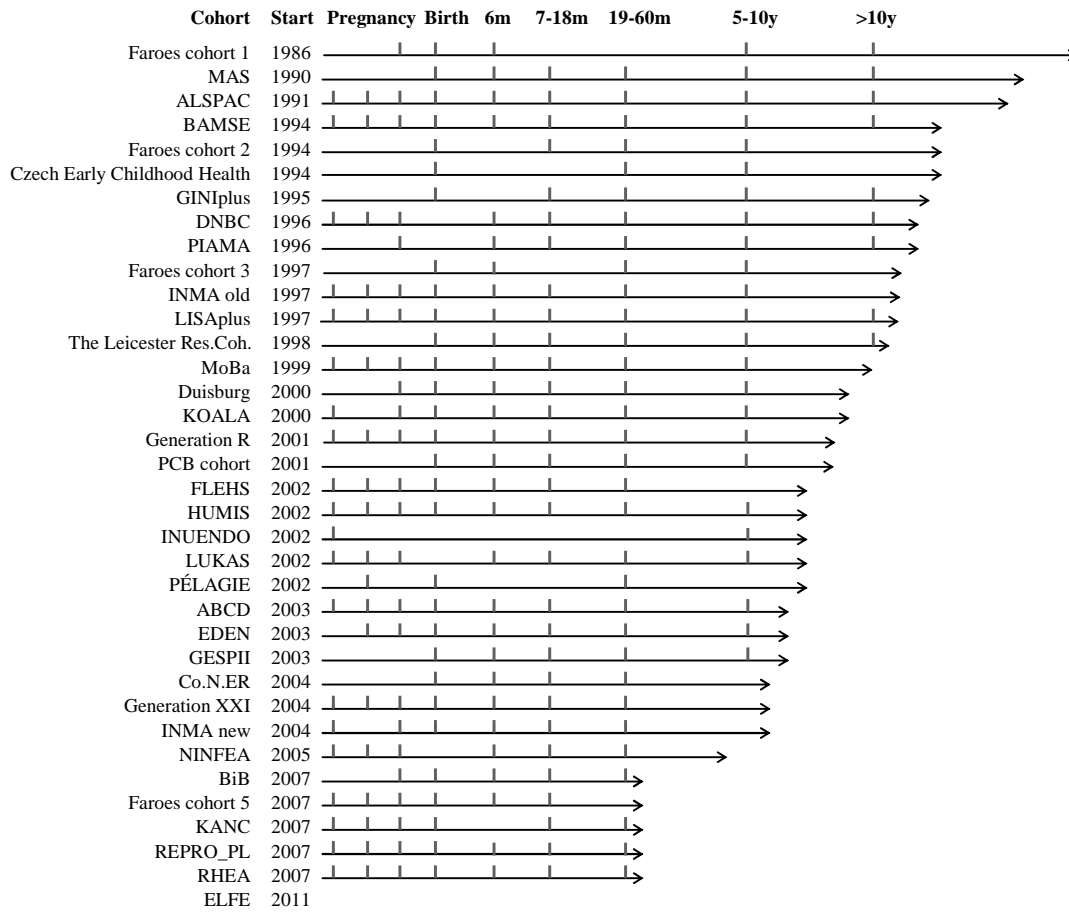
<sup>3</sup>BFR: brominated flame retardants, PFCs: perfluorinated compounds, BPA: bisphenol A.

Work can be “done”, “ongoing” or “planned” (not specified).

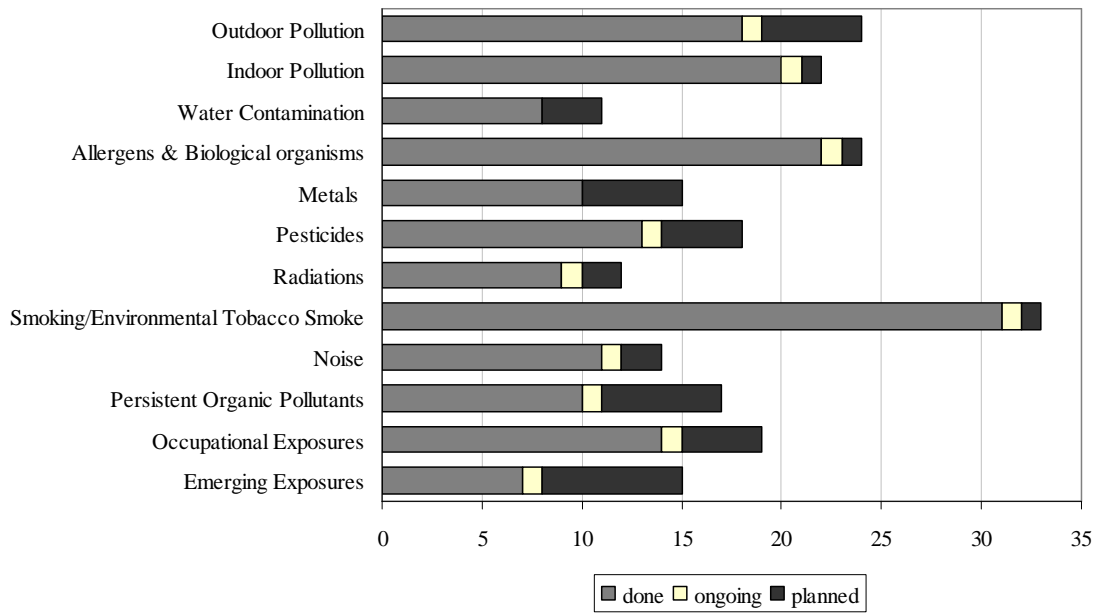
**Figure 1.** ENRIECO birth cohorts. Partners of the project (logo)



**Figure 2.** ENRIECO birth cohorts: start of enrolment and time points of follow-up (vertical bars).



**Figure 3.** ENRIECO birth cohorts and status of work per environmental exposures.



**Figure 4.** ENRIECO birth cohorts and status of work per health outcomes.

