Children´s Environmental Health in Germany

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Introduction

Information on environmental health in Germany is available for adults from representative studies in the framework of the German Environmental Survey (GerES). For children, however, there is a lack of representative data which is currently beginning to be filled

What is 'GerES'?

The German Environmental Survey (GerES) is a large scale population study which has repeatedly been carried out by the German Federal Environmental Agency (Umweltbundesamt) with financial support of the German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety. The objectives are

- to generate representative data on the concentration distribution of environmental pollutants in human specimens (blood and urine) and in media like tap water, indoor air, house dust, and food,
- to establish reference values based on these distributions,
- to document spatial and temporal differences in population exposure,
- to improve information on the contribution of contaminants in indoor air, tap water, house dust and food to the body burden of the general population,
- to provide policy makers with information if measures to reduce environmental contamination are necessary.

The first Environmental Survey (GerES I) was carried out in the Federal Republic of Germany in 1985/86. In 1990/92, the survey was repeated (GerES II) and - after the unification of Germany - extended to the former German Democratic Republic. GerES III was carried out in 1998. GerES IV for children has started in May 2003.

All GerES were/are conducted in co-operation with the German National Health Interview and Examination Survey of the Robert Koch Institute, Berlin. Therefore, data gained in both parts can be used for common analyses. The National Health Survey is focussing on health aspects, whereas the GerES is contributing the environmental health part to the whole survey. Therefore, using a short name, the latter is called German Environmental Survey (GerES). Information on GerES can be found on the Internet (http://www.umweltbundesamt.de/survey-e/index.htm) .

Table 1. Overview of the German Environmental Surveys (GerES).

Survey	Year	No of participants	Participation (%)	Age groups	Sampling points
GerES I	1985/86	2731	73	25 - 69	100
GerES IIa	1990/91	2524 453	63	25 - 69 6 - 14	100 100
GerES IIb	1991/92	1763 359	69	18 - 79 6 - 17	50 50
GerES III	1998	4822	55	18 - 69	120
GerES IV	2003/06	*(1800)*	*?*	3 - 14	150

Adults and children in GerES

As shown in **Table 1**, GerES II was a first attempt to include children. However, unlike in the case of adults, these children may not really be called a representative sample because they were living in the households selected as being representative for the adult population. As a next step, a pilot study for a survey focussed on children and adolescents only (GerES IV) has been carried out from March 2001 to March 2002, aimed at children/adolescents aged 0-17 years. This feasibility study with 550 participants was conducted at four sampling locations (rural and urban, East and West Germany).

Questions to be answered by the pilot study were:

- hich is the better way, access via schools or registration offices?
- Which participation rate can be expected, how to increase it (age-specific incentives)?
- Which age group s are adequate with respect to getting blood and urine samples?
- Which is the minimal age for reliable hearing tests?
- What about logistical aspects and practicability of a survey focussed on children and adolescents?

This pilot study provided valuable information applicalbe to the final design of GerES IV which was modified, however, by financial restrictions, too.

Design of GerES IV

The general objectives of GerES IV are:

- to generate representative data on the distribution of environmental pollutant concentrations in biological samples from German children, including a set of reference values (95th percentiles of the distribution indicating the upper bound of the "usual" internal exposure),
- to get insight into the contribution of different compartments (e.g., indoor air, tap water, house dust) to the body burden of children,
- to document spatial and temporal differences in the exposure of children,
- to get more insight into relationships between health and environment,
- to provide a database appropriate to indicating the need of (additional) preventive or control measures to reduce children´s exposure to environmental contaminants.

GerES IV is conducted in cooperation with and linked to the Health Survey for Children and Adolescents of the Robert Koch Institute. Field work for the German Environmental Survey 2003/06 for Children (GerES IV) has started in Mai 2003 and is planned to be completed in May 2006.

Samples and Tools

The participants in GerES are a subsample of the National Health Interview and Examination Survey for Children and Adolescents (KiGGS) carried out by the Robert Koch Institute.

From the KiGGS sample of N=18.000 children and adolescents aged 0-17 years, N = 1800 aged 3-14 years form the GerES IV subsample. At each of the 150 sampling points, one participant per each of the 12 age groups is included.

Interviews and data sheets:

- Basic interview (parents),
- Basic interview (children 8-10 years and 11-14 years),
- Data sheets for documenting home and the immediate surroundings with regard to exposure sources.

The chemical and biological analyses programme is listed in **Table 2.**

Table 2. Overview of the chemical and biological analyses programme of GerES IV

Sample	Age Group	To be analysed
Whole blood, 2 ml	3-6 years	lead, cadmium, mercury
Whole blood, 6 ml	7-14 years	lead, cadmium, mercury, organochlorine compounds such as PCBs, DDE, HCB, HCH
Serum	3-14 years	Mould-specific IgE
Morning urine	3-14 years	Creatinine, arsenic, cadmium, mercury, nickel, nicotine, cotinine
Morning urine (noise programme)	8-14 years	Cortisol, adrenaline, noradrenaline
Morning urine (n=600)	3-14 years	PCP and other chlorophenols, metabolites of pyrethroids, organophosphates, PAHs
House dust (n=600)	3-14 years	Biocides, PCBs, plasticisers (e.g., DEHP), flame retardants
Drinking water	3-14 years	Lead, cadmium, copper, nickel, uranium
Indoor air (n=600)	3-14 years	VOC, aldehydes
Indoor air / dust (n=600)	3-14 years	Mould spores, house dust mite and cat allergens

Special programme on noise:

- Measurement of hearing capacity (age 8+) and outdoor traffic noise, stress markers in morning urine (see **Table 2**).

Some pilot study results

Feasibility:

- A participation rate of some 50 % may be expected. Age-specific incentives are appropriate to increase it.
- Three years seem to be a realistic minimum age for getting blood and urine samples.
- Hearing tests in children younger than 8 years proved to be difficult.

Biomonitoring:

- In comparison with the results from GerES II (1990/92), concentrations of lead in blood, PCP and 1-OH-Pyrene in urine seem to have decreased.
- Concentrations of benzene in indoor air were found to be higher than the European limit value of 5 µg/m³ in about 10 % of indoor samples.
- In 254 urine samples randomly selected, concentrations of DEHP metabolites were higher in boys than in girls. Among the age groups from 3 to 14 years, children aged 13-14 years had the lowest DEHP metabolites level in urine. No correlation could be observed between the levels of DEHP in house dust and DEHP metabolites in urine.

Are children different to adults?

The reason why children are intensively looked at under environmental health aspects is the fact that there are some differences to adults with regard to exposure and metabolism. However, children should not be supposed to be more at risk in all situations.

In the framework of the German Action Programme on Environment and Health (APUG), the brochure ‘Environmental health risks - what are the differences between children and adults?' was published. In a first part, it provides a compilation of information when and why children do show different reactions. Exposure, toxicokinetics, toxicodynamics are discussed, as well as the influence of noise, radiation, and socio-economic factors.

The main conclusions are:

- In the course of their development, children go through different stages of specific exposure and vulnerability to environmental influences.
- In particular phases of their development, children are subject to higher exposure than adults.
- With regard to the uncertainty factors commonly used in deriving guide or limit values, evidence is currently not sufficient to prove that children generally need more protection from environmental pollutants than currently does exist. An intraspecies factor of 10 seems appropriate for generally ensuring that individual differences are adequately taken into account even with regard to the most vulnerable age group.
- However, in cases in which certain toxicants have proved to be particularly harmful to children and this has not been sufficiently taken into account, additional precautions may be necessary.
- Further research into the immunological, endocrinological and especially neuroendocrinological effects of environmental pollutants is necessary with regard to the effects on children at each developmental stage.
- To protect children´s health is important for our society. This includes protection against environmental hazards. Nevertheless, it should not be generally assumed that environmental influences have a greater effect on health in children than in adults. Instead, general guide and limit values should always aim at protecting the most vulnerable group, be it in a particular case children or another subgroup of the population.

The second part of the brochure provides an overview of the use of child-specific safety factors in deriving guide or limit values in Germany. This overview demonstrates that nearly in all cases the specific characteristics of children are taken into account.The brochure is available at

www.apug.de/archiv/pdf/brochure_children_suscept.pdf.

Disclaimer

This paper is reflecting the view of the author. It is not an official statement by the Federal Environmental Agency.

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