Childhood Cancer and Nuclear Energy

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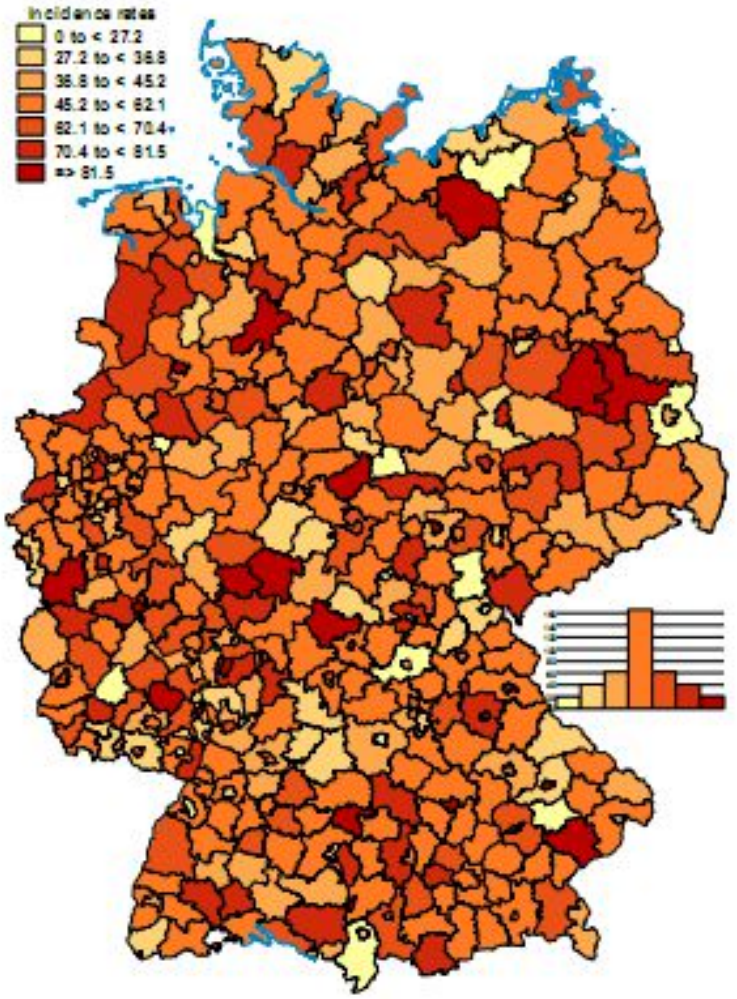
Childhood Cancer and Nuclear Energy

Epidemiologic information

- Rate of cancer cases in Germany for kids <5 yrs:
  absolute cases : 581 per year
  annual incidence: 39-46 per 100,000

- Rate of leukaemia cases in Germay for kids <5 yrs:
  absolute cases: 256 per year
  annual incidence: 11-13 per 100,000

Standardized* incidence rates per million by districts (Landkreise) (Germany 1999-2008)



Sources: Gesundheitsbericht des Bundes 2009 (www.gbe-bunde.de)
Registry of Childhood Cancers (www.kinderkrebsregister.de)

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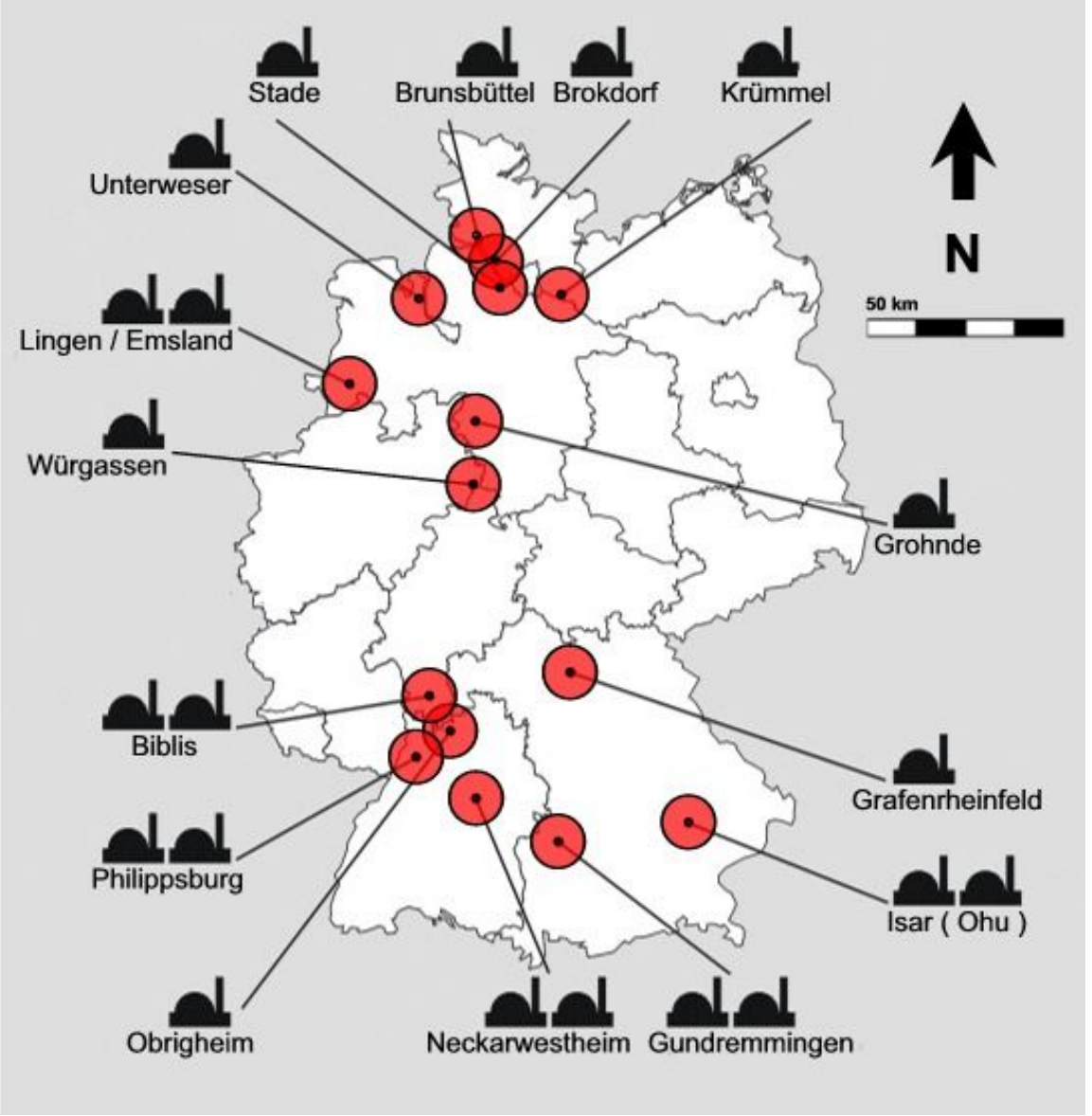
Nuclear energy in Germany

- Germany has 16 nuclear plants:

Gundremmingen
Isar
Philippsburg
Neckarwestheim
Obrigheim
Biblis
Grafenrheinfeld
Würgassen
Grohnde
Emsland
Lingen
Unterweser
Stade
Krümmel
Brokdorf
Brunsbüttel



Childhood Cancer and Nuclear Energy

The KiKK study

- „Epidemiologische Studie zu **K**inderkrebs **i**n der Umgebung von **K**ern**k**raftwerken“ („Epidemiological study about childhood cancer in the vicinity of nuclear plants“)
- **Sponsor:** Federal Bureau for Radiation Safety (BfS)
- **Carried through by**: Childhood Cancer Registry (KKR)
- **Scientific design:** 12 external scientists (6 „pro-nuclear“, 6 „anti-nuclear“)
- **Timeframe:** March 2003 – BfS orders KKR to start investigation
  December 2007 – Publication of the study through KKR and BfS
- **Main publications:**
  - International Journal of Cancer (IJC): Leukaemia in young children living in the vicinity of German nuclear power plants
  - European Journal of Cancer (EJC): Case-control study on childhood cancer in the vicinity of nuclear power plants in Germany

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The KiKK study

- **Leading question:**
  Do radioactive emissions from nuclear plants lead to higher rates of childhood cancer in children below 5 years of age?

- **Common understanding:**
  The distance to a nuclear plant serves as substitue for the radiation exposure, since this cannot be measured directly.

- **Investigation time:**
  1980 – 2003 = greatest set of data available to the childhood cancer registry

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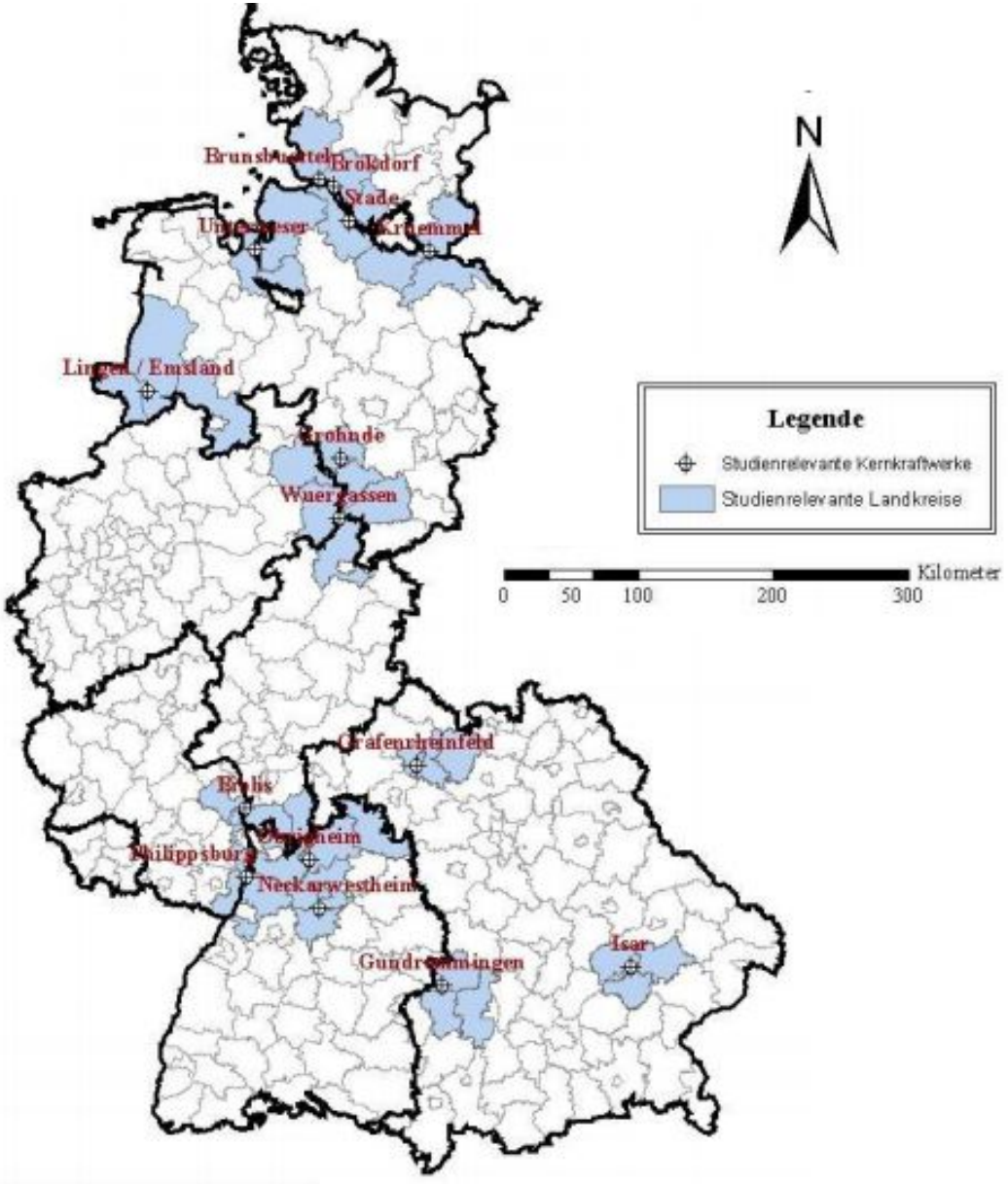
- **Areas of investigation:**

  Districts with nuclear plants

  Two adjacent districts in main wind direction



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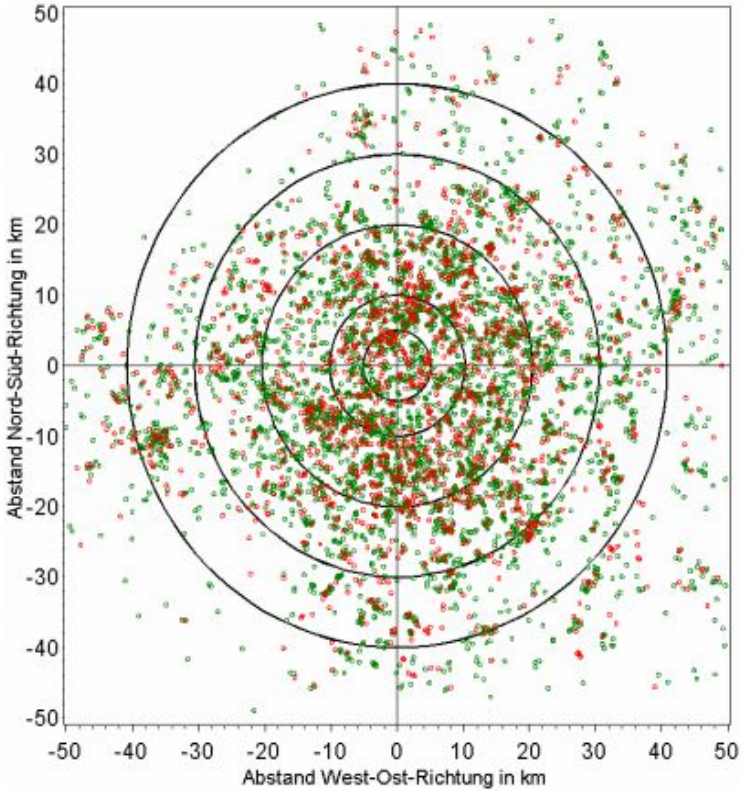
The KiKK study

- **Study design:**
  Case control study of healthy and diseased children in selected districts around and adjacent to nuclar plants

  Questioning of families to rule out confounders

- **Children investigated:**
  1,592 children < 5 years with cancer
  4,735 children < 5 years as controls



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The KiKK study

- **Confounder which were ruled out:**
  - Plausible other risk factors for cancer diseases
  - Age of mother at birth, pregnancy history
  - Radiation exposure of parents before conception
  - Other diseases, drugs, etc.
  - Insecticide exposure, lice treatment, etc.
  - Allergies, vaccinations, etc.
  - Social status
  - Moves in and out of the district recently

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The KiKK study

- **Results:**

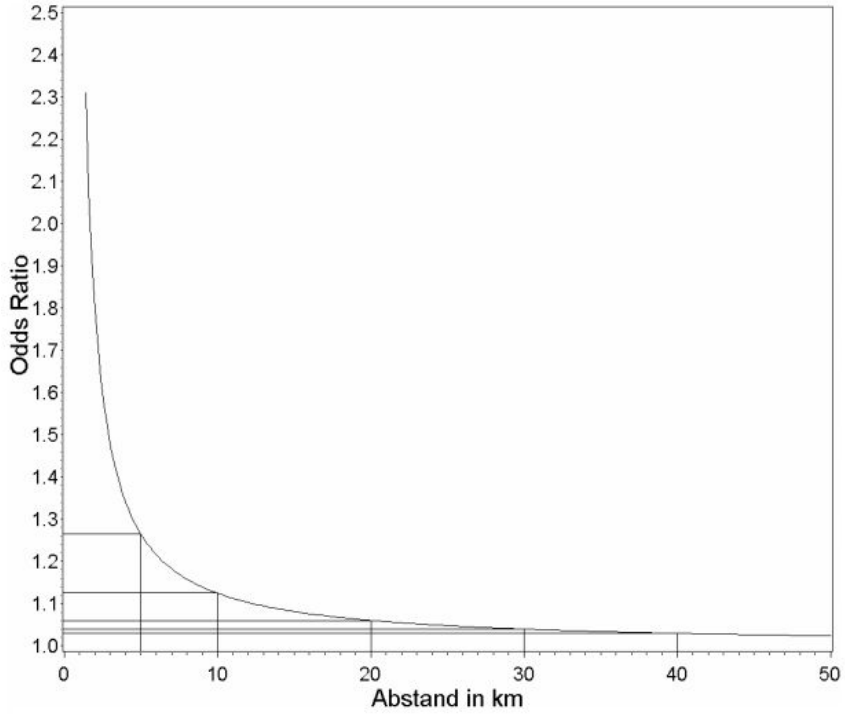
Significant rise in the incidence of childhood cancer in the vicinity of nuclear plants

The closer a child lives to a nuclear plant, the higher its risk to develop cancer

< 50 km: 08–18 % more cases than expected

< 10 km: 20–40 % more cases than expected

< 5 km: 60–75 % more cases than expected



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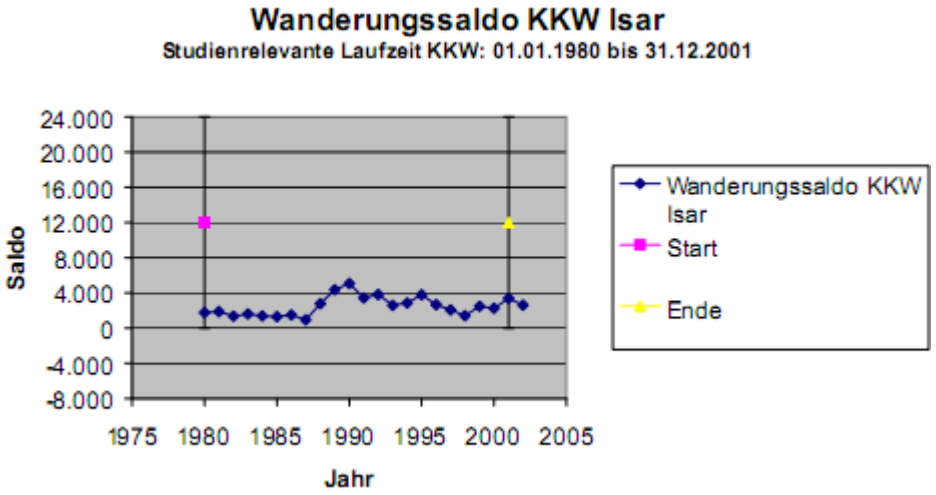
The KiKK study

- **Results:**

All other confounders were able to be ruled out as possible alternative causes of the rise in incidence. None showed a significant correlation.

Only the distance to a nuclear plant remained as the only significantly correlated parameter in all 16 study areas.



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- **Concrete numbers:**

48 cancer cases expected in children < 5 yrs, 5 km around a nuclear plant
77 cancer cases actually recorded (+ 60%)
= 29 additional cases in children < 5 yrs 5 km around a nuclear plant 1980-2003
29/13,373 = 0,22% attributable risk
= 1.2/581 additional cases per year

17 leukaemia cases exected in children < 5 yrs, 5 km around a nuclear plant
37 leukaemia cases actually recorded (+ 120%)
= 20 additional cases in children < 5 yrs 5 km around a nuclear plant 1980-2003
20/5,893 = 0,34% attributable risk
= 0.8/256 additional cases per year

20 of 29 additional cancer cases were leukaemia (69%; expected were 30%)

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The KiKK study

- **Concrete numbers:**

Additional cases in all investigates areas 50 km around nuclear plants:

121-275 additional cases of cancer in children < 5 yrs 1980-2003

5-12 additional cases of cancer in children < 5 yrs per year

83-190 additional cases of leukaemie in children < 5 yrs 1980-2003

3-8 additional cases of leukaemie in children < 5 yrs per year

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The KiKK study

Interpretation of the results:

- **Nuclear industry:** We adhere to the permissible radiation levels so we are not to blame and after all, we're talking about very few cases
- **Cancer registry:** The radiation emitted is too low to explain the results.
- **Scientific experts:** Radiation cannot be ruled out as a cause of the results
- **IPPNW:** We fear that the previous assumptions regarding radiation risk – especially regarding the effects of low-level radiation on children and embryos have been false and need to be revised.

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Medical effects of radiation:

Information of the nuclear industry:

• Annual max. level of radiation for people living near nuclear plants	0.3	mSv
• Calculated total exposure 5 km distant from a nuclear plant:	0.0003200	mSv
• Annual natural radiation exposure in Germany	1.4	mSv
• Annual radiation exposure through medical examinations	1.8	mSv

Information of the Federal Bureau for Radiation Safety:

• Deterministic teratogenic damage	from 100	mSv
• Stochastic teratogenic damage	from 20	mSv

Sources: Federal Bureau of radiation safety (www.bfs.de)

KiKK Study, German Childhood Cancer Registry

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Medical effects of radiation:

- Current guidelines regarding medical effects of radiation are mainly based on the d data of the unclear bomb drops on Hiroshima and Nagasaki (high-level γ-radiation)

- Newer studies show that these models are insufficient, since they do not take into account corpuscular radiation (low-level radiation from α- and β-emitters)

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Explanation for the high incidence of childhood cancer:

- Nuclear plants emit radioactive particles such as strontium-90 or tritium
- Wind and rain spread these to the surrounding countryside
- Animals and humans take them up through air, water and food
- The unborn child is exposed to them through its mother's blood

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Possible explanations for the discrepancies

- Peak radiation measurements are covered up through quarterly/annual averaging
- Data of radiation from nuclear plants is kept secretby the industry in Germany
- Accidents happen frequently and are not always reported or admitted
- The radiation sensitivity of embryos is much higher than that of the standard industry “reference man“ - a Caucasian 1.80m, 80 kg healthy male.
- The effects of low-level radiation are being systematically ignored

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What needs to be done now?

- Organize follow-up studies
- Adequate information of the population
- Promote existing studies dealing with the effects of low-level radiation, many of them published very recently
- Exchange the “reference man” with a “reference embryo”

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Sources:

- Kaatsch et al. Epidemiologische Studie zu Kinderkrebs in der Umgebung von Kernkraftwerken (KiKK-Studie) – Vorhaben 3602S04334. Dt. Kinderkrebsregister, Mainz. urn:nbn:de:0221-20100317939. Salzgitter, 2007.
- E.Cardis. Cancer Mortality in 400 000 Worker Study. IARC Brit Med J 2005.
- Jahresberichte des Dt. Kinderkrebsregisters Mainz (www.kinderkrebsregister.de)
- Informationen des Bundesamt für Strahlenschutz (www.bfs.de)
- Gesundheitsbericht des Bundes 2009 (www.gbe-bunde.de)