

Overview of the epidemiologic studies on the health effects of ELF magnetic and electric fields published in the first trimester of 2012

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1. Reviews

ASSUMPTIONS IN QUANTITATIVE ANALYSES OF HEALTH RISKS OF OVERHEAD POWER LINES.

de Jong A, Wardekker J.A., van der Sluijs J.P.
Environmental Science & Policy. 2012; 16: 114-121.

One of the major issues hampering the formulation of uncontested policy decisions on contemporary risks is the presence of uncertainties in various stages of the policy cycle. In literature, different lines are suggested to address the problem of provisional and uncertain evidence. Reflective approaches such as pedigree analysis can be used to explore the quality of evidence when quantification of uncertainties is at stake. One of the issues where the quality of evidence impedes policy making, is the case of electromagnetic fields. In this case, a (statistical) association was suggested with an increased risk on childhood leukaemia in the vicinity of overhead power lines. A biophysical mechanism that could support this association was not found till date however. The Dutch government bases its policy concerning overhead power lines on the precautionary principle. For The Netherlands, previous studies have assessed the potential number of extra cases of childhood leukaemia due to the presence over overhead power lines. However, such a quantification of the health risk of EMF entails a (large) number of assumptions, both prior to and in the calculation chain. In this study, these assumptions were prioritized and critically appraised in an expert elicitation workshop, using a pedigree matrix for characterization of assumptions in assessments. It appeared that assumptions that were regarded to be important in quantifying the health risks show a high value-ladenness.

Conclusion: The results show that, given the present state of knowledge, quantification of the health risks of EMF is premature. We consider the current implementation of the precautionary principle by the Dutch government to be adequate.

2. Residential exposue

ADULT MORTALITY FROM LEUKEMIA, BRAIN CANCER, AMYOTROPHIC LATERAL SCLEROSIS AND MAGNETIC FIELDS FROM POWER LINES: A CASE-CONTROL STUDY IN BRAZIL.

Marcilio I, Gouveia N, Pereira Filho ML, Kheifets L.
Rev Bras Epidemiol. 2011;14: 580-588.

Recent publications renewed interest in assessing potential health risks for subjects living close to transmission lines. This study aimed at evaluating the association of both distance of home address to the nearest overhead transmission line and of the calculated magnetic fields from the power lines and mortality from leukemia, brain cancer, and amyotrophic lateral sclerosis. We carried out a death certificate based

case-control study accessing adult mortality in the Metropolitan Region of São Paulo, in Brazil. Analysis included 1,857 cases of leukemia, 2,357 of brain cancer, 367 of amyotrophic lateral sclerosis, and 4,706 as controls. An increased risk for mortality from leukemia among adults living at closer distances to transmission lines compared to those living further than 400 m was found. Risk was higher for subjects that lived within 50 m from power lines (OR=1.47; 95% CI=0.99-2.18). Similarly, a small increase in leukemia mortality was observed among adults living in houses with higher calculated magnetic fields (OR=1.61; 95% CI=0.91-2.86 for those exposed to magnetic fields >0.3 µT). No increase was seen for brain tumours or amyotrophic lateral sclerosis.

Conclusion: These findings are suggestive of a higher risk for leukemia among subjects living closer to transmission lines, and for those living at homes with higher calculated magnetic fields, although the risk was limited to lower voltage lines.

STILLBIRTH AND RESIDENTIAL PROXIMITY TO EXTREMELY LOW FREQUENCY POWER TRANSMISSION LINES: A RETROSPECTIVE COHORT STUDY.

Auger N, Park AL, Yacouba S, Goneau M, Zayed J.
Occup Environ Med. 2012; 69:147-149.

The authors assessed associations between residential proximity to extremely low frequency power transmission lines and stillbirth across gestational age.

Data included singleton live births (N=514,826) and stillbirths (N=2033) for 1998-2007 in metropolitan areas of Québec, Canada. Using power transmission line maps, the distances between lines and residential six-digit postal codes (<25, 25-49.9, 50-74.9, 75-99.9, ≥ 100 m) were calculated. Generalised estimating equations were used to compute ORs and 95% CIs for distance and stillbirth, accounting for individual and area characteristics. Early preterm (< 28 weeks), late preterm (28-36 weeks) and term (≥ 37 weeks) stillbirths were examined relative to fetuses-at-risk.

There was no association between distance and preterm stillbirth. The odds of term stillbirth for <25 m were greater compared to ≥ 100 m (OR 2.25, 95% CI 1.14 to 4.45), but no dose-response pattern was apparent.

Conclusion: A graded dose-response trend between distance to lines and odds of stillbirth was not found, but the likelihood of term stillbirth was elevated for residences within 25 m of power transmission lines. Residential proximity to transmission lines is unlikely to be associated with stillbirth, but more research is needed to rule out a possible link.

3. Exposure assessment

EXPOSURE TO ELECTROMAGNETIC FIELDS FROM LAPTOP USE OF "LAPTOP" COMPUTERS.

Belliemi CV, Pinto I, Bogi A, Zoppetti N, Andreuccetti D, Buonocore G.
Arch Environ Occup Health. 2012; 67: 31-36.

Portable computers are often used at tight contact with the body and therefore are called "laptop." The authors measured electromagnetic fields (EMFs) laptop computers produce and estimated the induced currents in the body, to assess the safety of laptop computers. The authors evaluated 5 commonly used laptop of different brands. They measured EMF exposure produced and, using validated

computerized models, the authors exploited the data of one of the laptop computers (LTCs) to estimate the magnetic flux exposure of the user and of the fetus in the womb, when the laptop is used at close contact with the woman's womb. In the LTCs analyzed, EMF values (range 1.8-6 μ T) are within International Commission on Non-Ionizing Radiation (NIR) Protection (ICNIRP) guidelines, but are considerably higher than the values recommended by 2 recent guidelines for computer monitors magnetic field emissions, MPR II (Swedish Board for Technical Accreditation) and TCO (Swedish Confederation of Professional Employees), and those considered risky for tumor development. When close to the body, the laptop induces currents that are within 34.2% to 49.8% ICNIRP recommendations, but not negligible, to the adult's body and to the fetus (in pregnant women). On the contrary, the power supply induces strong intracorporal electric current densities in the fetus and in the adult subject, which are respectively 182-263% and 71-483% higher than ICNIRP 98 basic restriction recommended to prevent adverse health effects.

Conclusion: Laptop is paradoxically an improper site for the use of a LTC, which consequently should be renamed to not induce customers towards an improper use.

TIME DEPENDENCE OF 50 HZ MAGNETIC FIELDS IN APARTMENT BUILDINGS WITH INDOOR TRANSFORMER STATIONS.

Yitzhak NM, Hareuveny R, Kandel S, Ruppin R.
Radiat Prot Dosimetry. 2012; 149: 191-195.

Twenty-four hour measurements of 50 Hz magnetic fields (MFs) in apartment buildings containing transformer stations have been performed. The apartments were classified into four types, according to their location relative to the transformer room. Temporal correlation coefficients between the MF in various apartments, as well as between MF and transformer load curves, were calculated. It was found that, in addition to their high average MF, the apartments located right above the transformer room also exhibit unique temporal correlation properties.

4. Leukaemia studie

MATERNAL SMOKING DURING PREGNANCY AND RISK FOR CHILDHOOD LEUKEMIA: A NATIONWIDE CASE-CONTROL STUDY IN GREECE AND META-ANALYSIS.

Klimentopoulou A, Antonopoulos CN, Papadopoulou C, Kanavidis P, Tourvas AD, Polychronopoulou S, Baka M, Athanasiadou-Piperopoulou F, Kalmanti M, Sidi V, Moschovi M, Petridou ET.
Pediatr Blood Cancer. 2012; 58: 344-351.

Maternal smoking during pregnancy has been often implicated in the development of childhood leukemia with ambiguous results. Hence, the authors conducted a meta-analysis aiming to summarize current evidence and quantify any tentative impact. They retrieved one cohort (553 leukemias compared to 1,440,542 children), 20 case-control studies and also analyzed the updated Greek case-control dataset with unpublished data, yielding in total 11,092 cases and 25,221 controls.

Odds ratios reported in the studies included ranged from 0.70 to 2.20 for acute lymphocytic (ALL) and from 0.60 to 2.17 for acute myelocytic leukemia (AML). The combined effect regarding the association of maternal smoking (any vs. no) and leukemia risk was 1.03 for ALL (95% CI=0.95-1.12, random effects model) and

0.99 for AML (95% CI=0.90-1.09, fixed effects model). The results remained unchanged when sensitivity analyses were undertaken of studies reporting same maternal smoking periods, those focusing only on childhood leukemia deaths or investigations which did not clearly define AML subtype.

Conclusion: The findings of the meta-analysis challenge the limits of traditional epidemiology to provide sound inferences when point estimates of constituent studies range around the null. In particular, this study provides no support to a hypothesis linking maternal smoking during pregnancy with subsequent development of main childhood leukemia subtypes. Further investigations employing molecular and genetic epidemiology, however, might be needed in the hope to reveal even minimal risks pertaining individuals with specific susceptibility to tobacco compounds who sustain high environmental exposures prenatally or postnatally.

PARENTAL PRENATAL SMOKING AND RISK OF CHILDHOOD ACUTE LYMPHOBLASTIC LEUKEMIA.

Milne E, Greenop KR, Scott RJ, Bailey HD, Attia J, Dalla-Pozza L, de Klerk NH, Armstrong BK.

Am J Epidemiol. 2012; 175: 43-53.

The association between parental smoking and risk of childhood acute lymphoblastic leukemia (ALL) was investigated in an Australian population-based case-control study that included 388 cases and 868 controls aged <15 years, recruited from 2003 to 2006. Both of the child's parents provided information about their smoking habits for each year from age 15 years to the child's birth. Data were analyzed by logistic regression. Maternal smoking was not associated with risk of childhood ALL, but the odds ratio for paternal smoking of ≥ 15 cigarettes per day around the time of the child's conception was 1.35 (95% confidence interval: 0.98, 1.86). The associations between parental smoking risk of childhood ALL did not differ substantially by immunophenotypic or cytogenetic subtype. Meta-analyses of paternal smoking, including results from the Australian Study of Causes of Acute Lymphoblastic Leukemia in Children and those of previous studies, produced summary odds ratios of 1.15 (95% confidence interval: 1.06, 1.24) for any paternal smoking around the time of the child's conception and 1.44 (95% confidence interval: 1.24, 1.68) for smoking ≥ 20 cigarettes per day at that time.

Conclusion: Study results suggest that heavier paternal smoking around the time of conception is a risk factor for childhood ALL. Men should be strongly encouraged to cease smoking, particularly when planning to start a family.

IS BIRTH WEIGHT ASSOCIATED WITH CHILDHOOD LYMPHOMA? A META-ANALYSIS.

Papadopoulou C, Antonopoulos CN, Sergentanis TN, Panagopoulou P, Belechri M, Petridou ET.

Int J Cancer. 2012; 130: 179-189.

Several risk factors have been identified for childhood lymphomas. The purpose of this meta-analysis was to synthesize current evidence regarding the association between birth weight with primarily the risk for non-Hodgkin lymphoma (NHL), given its similarity to acute lymphoblastic leukemia, Hodgkin lymphoma (HL) and any category of lymphoma. Two cohort (278,751 children) and seven case-control studies (2,660 cases and 69,274 controls) were included. Effects estimates regarding NHL, HL and any lymphoma were appropriately pooled using fixed or random effects model in two separate analyses: specifically, high was compared to

normal or any birth weight. Similarly, low was compared to normal or any birth weight. No statistically significant association was found between high birth weight, as compared to normal birth weight, and risk for NHL plus Burkitt lymphoma (OR = 1.17, 95% CI = 0.76-1.80, random effects), HL (OR = 0.94, 95% CI = 0.64-1.38, fixed effects) or any plus Burkitt lymphoma (OR = 1.09, 95% CI = 0.76-1.56, fixed effects). A null association emerged when low was compared with normal birth weight for NHL plus Burkitt lymphoma (OR = 1.07, 95% CI = 0.71-1.62, random effects), HL (OR = 0.94, 95% CI = 0.54-1.65, fixed effects) or any plus Burkitt lymphoma (OR = 1.02, 95% CI = 0.79-1.33, fixed effects). Accordingly, no association was found when high or low birth weight was compared to any birth weight.

Conclusion: Although current evidence suggests no association, birth weight might be a too crude indicator to reveal a genuine association of fetal growth with specific lymphoma categories; hence, there is an emerging need for use of more elaborate proxies, at least those accounting for gestational week.