Literature Review

Health Effects of Wind Turbines and High Voltage Transmission Lines

Record 1 of 25

Author(s): Chapman, S (Chapman, Simon); St George, A (St George, Alexis)

Title: How the factoid of wind turbines causing "vibroacoustic disease' came to be "irrefutably demonstrated'

Source: AUSTRALIAN AND NEW ZEALAND JOURNAL OF PUBLIC HEALTH

Volume: 37

Issue: 3

Pages: 244-249

DOI: 10.1111/1753-6405.12066

Published: JUN 2013

Abstract: Objective : In recent years, claims have proliferated in cyberspace that wind turbines cause a large variety of symptoms and diseases. One of these, vibroacoustic disease (VAD) is frequently mentioned. The aim of this study is to examine the quality of the evidence on how VAD came to be associated with wind turbine exposure by wind farm opponents. Methods: Searches of the web (Google advanced) and major research databases for papers on VAD and wind turbines. Self-citation analysis of research papers on VAD. Results: Google returned 24,700 hits for VAD and wind turbines. Thirty-five research papers on VAD were found, none reporting any association between VAD and wind turbines. Of the 35 papers, 34 had a first author from a single Portuguese research group. Seventy-four per cent of citations to these papers were self-citations by the group. Median self-citation rates in science are around 7%. Two unpublished case reports presented at conferences were found asserting that VAD was irrefutably demonstrated to be caused by wind turbines. The quality of these reports was abject. Conclusions: VAD has received virtually no scientific recognition beyond the group who coined and promoted the concept. There is no evidence of even rudimentary quality that vibroacoustic disease is associated with or caused by wind turbines. Implications: The claim that wind turbines cause VAD is a factoid that has gone viral' in cyberspace and may be contributing to nocebo effects among those living near turbines.

Accession Number: WOS:000319885700008

Record 2 of 25

Author(s): Sermage-Faure, C (Sermage-Faure, C.); Demoury, C (Demoury, C.); Rudant, J (Rudant, J.); Goujon-Bellec, S (Goujon-Bellec, S.); Guyot-Goubin, A (Guyot-Goubin, A.); Deschamps, F (Deschamps, F.); Hemon, D (Hemon, D.); Clavel, J (Clavel, J.)

Title: Childhood leukaemia close to high-voltage power lines - the Geocap study, 2002-2007

Source: BRITISH JOURNAL OF CANCER

Volume: 108

Issue: 9

Pages: 1899-1906

DOI: 10.1038/bjc.2013.128

Published: MAY 14 2013

Abstract: Background: High-voltage overhead power lines (HVOLs) are a source of extremely low-frequency magnetic fields (ELF-MFs), which are classified as possible risk factors for childhood acute leukaemia (AL). The study was carried out to test the hypothesis of an increased AL incidence in children living close to HVOL of 225-400 kV (VHV-HVOL) and 63-150 kV (HV-HVOL).

Methods: The nationwide Geocap study included all the 2779 cases of childhood AL diagnosed in France over 2002-2007 and 30 000 contemporaneous population controls. The addresses at the time of inclusion were geocoded and precisely located around the whole HVOL network.
Results: Increased odds ratios (ORs) were observed for AL occurrence and living within 50 m of a VHV-HVOL (OR = 1.7 (0.9-3.6)). In contrast, there was no association with living beyond that distance from a VHV-HVOL or within 50 m of a HV-HVOL.
Conclusion: The present study, free from any participation bias, supports the previous international findings of an increase in AL incidence close to VHV-HVOL. In order to investigate for a potential role of ELF-MF in the results, ELF-MF at the residences close to HVOL are to be estimated, using models based on the annual current loads and local characteristics of the lines.

Accession Number: WOS:000319125300020

Record 3 of 25

Author(s): Frei, P (Frei, Patrizia); Poulsen, AH (Poulsen, Aslak Harbo); Mezei, G (Mezei, Gabor); Pedersen, C (Pedersen, Camilla); Salem, LC (Salem, Lise Cronberg); Johansen, C (Johansen, Christoffer); Roosli, M (Roosli, Martin); Schuz, J (Schuz, Joachim)

Title: Residential Distance to High-voltage Power Lines and Risk of Neurodegenerative Diseases: a Danish Population-based Case-Control Study

Source: AMERICAN JOURNAL OF EPIDEMIOLOGY

Volume: 177

Issue: 9

Pages: 970-978

DOI: 10.1093/aje/kws334

Published: MAY 1 2013

Abstract: The aim of this study was to investigate the possible association between residential distance to high-voltage power lines and neurodegenerative diseases, especially Alzheimer's disease. A Swiss study previously found increased risk of Alzheimer's disease for people living within 50 m of a power line. A register-based case-control study including all patients diagnosed with neurodegenerative diseases during the years 1994-2010 was conducted among the entire adult population of Denmark. Using conditional logistic regression models, hazard ratios for ever living close to a power line in the time period 5-20 years before diagnosis were computed. The risks for developing dementia, Parkinson's disease, multiple sclerosis, and motor neuron disease were not increased in persons living within close vicinity of a power line. The risk of Alzheimer's disease was not increased for ever living within 50 m of a power line (hazard ratio = 1.04, 95% confidence interval: 0.69, 1.56). No dose-response according to number of years of living within 50 m of a power line was observed, but there were weak indications of an increased risk for persons diagnosed by the age of 75 years. Overall, there was little support for an association between neurodegenerative disease and living close to power lines.

Accession Number: WOS:000318576300015

Record 4 of 25

Author(s): Roberts, JD (Roberts, Jennifer D.); Roberts, MA (Roberts, Mark A.)

Title: Wind Turbines: Is There a Human Health Risk?

Source: JOURNAL OF ENVIRONMENTAL HEALTH

Volume: 75

Issue: 8

Pages: 8-17

Published: APR 2013

Abstract: The term "Wind Turbine Syndrome" was coined in a recently self-published book, which hypothesized that a multitude of symptoms such as headache and dizziness resulted from wind turbines generating low frequency sound (LFS). The objective of this article is to provide a summary of the peer-reviewed literature on the research that has examined the relationship between human health effects and exposure to LFS and sound generated from the operation of wind turbines.
At present, a specific health condition has not been documented in the peer-reviewed literature that has been classified as a disease caused by exposure to sound levels and frequencies generated by the operation of wind turbines. Communities are experiencing a heightened sense of annoyance and fear from the development and siting of wind turbine farms. High-quality research and effective risk communication can advance this course from one of panic to one of understanding and exemplification for other environmental advancements.
Accession Number: WOS:000316846000002

Record 5 of 25

Author(s): Ollson, CA (Ollson, Christopher A.); Knopper, LD (Knopper, Loren D.); McCallum, LC (McCallum, Lindsay C.); Whitfield-Aslund, ML (Whitfield-Aslund, Melissa L.)

Title: Are the findings of "Effects of industrial wind turbine noise on sleep and health" supported?

Source: NOISE & HEALTH

Volume: 15

Issue: 63

Pages: 148-150

DOI: 10.4103/1463-1741.110302

Published: MAR-APR 2013

Accession Number: WOS:000320062300011

Record 6 of 25

Author(s): Elliott, P (Elliott, Paul); Shaddick, G (Shaddick, Gavin); Douglass, M (Douglass, Margaret); de Hoogh, K (de Hoogh, Kees); Briggs, DJ (Briggs, David J.); Toledano, MB (Toledano, Mireille B.)

Title: Adult Cancers Near High-voltage Overhead Power Lines

Source: EPIDEMIOLOGY

Volume: 24

Issue: 2

Pages: 184-190

DOI: 10.1097/EDE.0b013e31827e95b9

Published: MAR 2013

Abstract: Background: Extremely low-frequency magnetic fields are designated as possibly carcinogenic in humans, based on an epidemiologic association with childhood leukemia. Evidence for associations with adult cancers is weaker and inconsistent.
Methods: We conducted a case-control study to investigate risks of adult cancers in relation to distance and extremely low-frequency magnetic fields from high-voltage overhead power lines using National Cancer Registry Data in England and Wales, 1974-2008. The study included 7823 leukemia, 6781 brain/central nervous system cancers, 9153 malignant melanoma, 29,202 female breast cancer cases, and 79,507 controls frequency-matched on year and region (three controls per case except for female breast cancer, one control per case) 15-74 years of age living within 1000 m of a high-voltage overhead power line.
Results: There were no clear patterns of excess risk with distance from power lines. After adjustment for confounders (age, sex [except breast cancer], deprivation, rurality), for distances closest to the power lines (0-49 m) compared with distances 600-1000 m, odds ratios (ORs) ranged from 0.82 (95% confidence interval = 0.61-1.11; 66 cases) for malignant melanoma to 1.22 (0.88-1.69) for brain/central nervous system cancer. We

observed no meaningful excess risks and no trends of risk with magnetic field strength for the four cancers examined. In adjusted analyses at the highest estimated field strength, >= 1000 nanotesla (nT), compared with <100 nT, ORs ranged from 0.68 (0.39-1.17) for malignant melanoma to 1.08 (0.77-1.51) for female breast cancer.
Conclusion: Our results do not support an epidemiologic association of adult cancers with residential magnetic fields in proximity to high-voltage overhead power lines. (Epidemiology 2013;24: 184-190)

Accession Number: WOS:000314728000002

Record 7 of 25

Author(s): Nissenbaum, MA (Nissenbaum, Michael A.); Aramini, JJ (Aramini, Jeffery J.); Hanning, CD (Hanning, Christopher D.)

Title: Effects of industrial wind turbine noise on sleep and health

Source: NOISE & HEALTH

Volume: 14

Issue: 60

Pages: 237-243

DOI: 10.4103/1463-1741.102961

Published: SEP-OCT 2012

Abstract: Industrial wind turbines (IWTs) are a new source of noise in previously quiet rural environments. Environmental noise is a public health concern, of which sleep disruption is a major factor. To compare sleep and general health outcomes between participants living close to IWTs and those living further away from them, participants living between 375 and 1400 m (n = 38) and 3.3 and 6.6 km (n = 41) from IWTs were enrolled in a stratified cross-sectional study involving two rural sites. Validated questionnaires were used to collect information on sleep quality (Pittsburgh Sleep Quality Index - PSQI), daytime sleepiness (Epworth Sleepiness Score - ESS), and general health (SF36v2), together with psychiatric disorders, attitude, and demographics. Descriptive and multivariate analyses were performed to investigate the effect of the main exposure variable of interest (distance to the nearest IWT) on various health outcome measures. Participants living within 1.4 km of an IWT had worse sleep, were sleepier during the day, and had worse SF36 Mental Component Scores compared to those living further than 1.4 km away. Significant dose-response relationships between PSQI, ESS, SF36 Mental Component Score, and log-distance to the nearest IWT were identified after controlling for gender, age, and household clustering. The adverse event reports of sleep disturbance and ill health by those living close to IWTs are supported.

Accession Number: WOS:000311610100005

Record 8 of 25

Author(s): Malagoli, C (Malagoli, Carlotta); Crespi, CM (Crespi, Catherine M.); Rodolfi, R (Rodolfi, Rossella); Signorelli, C (Signorelli, Carlo); Poli, M (Poli, Maurizio); Zanichelli, P (Zanichelli, Paolo); Fabbi, S (Fabbi, Sara); Teggi, S (Teggi, Sergio); Garavelli, L (Garavelli, Livia); Astolfi, G (Astolfi, Gianni); Calzolari, E (Calzolari, Elisa); Lucenti, C (Lucenti, Carlo); Vinceti, M (Vinceti, Marco)

Title: Maternal exposure to magnetic fields from high-voltage power lines and the risk of birth defects

Source: BIOELECTROMAGNETICS

Volume: 33

Issue: 5

Pages: 405-409

DOI: 10.1002/bem.21700

Published: JUL 2012

Abstract: The issue of adverse human health effects due to exposure to electromagnetic fields is still unclear, and congenital anomalies are among the outcomes that have been inconsistently associated with such exposure. We conducted a population-based, case control study to examine the risk of congenital anomalies associated with maternal exposure to magnetic fields (MF) from high-voltage power lines during pregnancy in a community in northern Italy. We identified 228 cases of congenital malformations diagnosed in live births, stillbirths, and induced abortions among women living in the municipality of Reggio Emilia during the period 1998-2006, and a reference group of healthy newborns was matched for year of birth, maternal age, and hospital of birth. We identified maternal residence during early pregnancy and used Geographic Information System to determine whether the residences were within geocoded corridors with MF =0.1 mu T near high-voltage power lines, then calculated the relative risk (RR) of congenital anomalies associated with maternal exposure. One case and 5 control mothers were classified as exposed, and the RR associated with MF =0.1 mu T was 0.2 (95% CI: 0.02.0) after adjusting for maternal education. While small or moderate effects may have gone undetected due to low statistical power, the results of this study overall do not provide support for major effects of a teratogenic risk due to exposure to MF during early pregnancy. Bioelectromagnetics 33:405409, 2012. (C) 2011 Wiley Periodicals, Inc.

Accession Number: WOS:000304750800006

Record 9 of 25

Author(s): de Souza, Suerda Fortaleza; Carvalho, Fernando Martins; de Araujo, Tania Maria; Koifman, Sergio; Porto, Lauro Antonio

Title: Depression in high voltage power line workers.

Source: Revista brasileira de epidemiologia = Brazilian journal of epidemiology

Volume: 15

Issue: 2

Pages: 235-45

Published: 2012-Jun

Abstract: OBJECTIVE: To investigate the association between effort-reward imbalance and depressive symptoms among workers in high voltage power lines.
METHODS: A cross-sectional study among 158 workers from an electric power company in Northeast Brazil. The main independent variables were the Effort-Reward Imbalance Model (ERI) dimensions and the main dependent variable was the prevalence of depression, as measured by the Center for Epidemiologic Studies Depression (CES-D) scale. Data were analyzed by multiple logistic regression techniques.
RESULTS: The group of low reward workers presented a depression prevalence rate 6.2 times greater than those in the high reward group. The depression prevalence rate was 3.3 greater in workers in the situation of imbalanced effort-reward than in those in effort-reward equilibrium.
CONCLUSIONS: The prevalence of depression was strongly associated with psychosocial factors present in the work of electricity workers.

Accession Number: MEDLINE:22782089

Record 10 of 25

Author(s): Bakker, RH (Bakker, R. H.); Pedersen, E (Pedersen, E.); van den Berg, GP (van den Berg, G. P.); Stewart, RE (Stewart, R. E.); Lok, W (Lok, W.); Bouma, J (Bouma, J.)

Title: Impact of wind turbine sound on annoyance, self-reported sleep disturbance and psychological distress

Source: SCIENCE OF THE TOTAL ENVIRONMENT

Volume: 425

Pages: 42-51

DOI: 10.1016/j.scitotenv.2012.03.005

Published: MAY 15 2012

Abstract: Purpose of the research: The present government in the Netherlands intends to realize a substantial growth of wind energy before 2020, both onshore and offshore. Wind turbines, when positioned in the neighborhood of residents may cause visual annoyance and noise annoyance. Studies on other environmental sound sources, such as railway, road traffic, industry and aircraft noise show that (long-term) exposure to sound can have negative effects other than annoyance from noise. This study aims to elucidate the relation between exposure to the sound of wind turbines and annoyance, self-reported sleep disturbance and psychological distress of people that live in their vicinity. Data were gathered by questionnaire that was sent by mail to a representative sample of residents of the Netherlands living in the vicinity of wind turbines
Principal results: A dose-response relationship was found between immission levels of wind turbine sound and self reported noise annoyance. Sound exposure was also related to sleep disturbance and psychological distress among those who reported that they could hear the sound, however not directly but with noise annoyance acting as a mediator. Respondents living in areas with other background sounds were less affected than respondents in quiet areas.
Major conclusions: People living in the vicinity of wind turbines are at risk of being annoyed by the noise, an adverse effect in itself. Noise annoyance in turn could lead to sleep disturbance and psychological distress. No direct effects of wind turbine noise on sleep disturbance or psychological stress has been demonstrated, which means that residents, who do not hear the sound, or do not feel disturbed, are not adversely affected.

Accession Number: WOS:000304214200006

Record 11 of 25

Author(s): Mroczek, B (Mroczek, Bozena); Kurpas, D (Kurpas, Donata); Karakiewicz, B (Karakiewicz, Beata)

Title: Influence of distances between places of residence and wind farms on the quality of life in nearby areas

Source: ANNALS OF AGRICULTURAL AND ENVIRONMENTAL MEDICINE

Volume: 19

Issue: 4

Pages: 692-696

Published: 2012

Abstract: Background: The quality of life has three main characteristics: it always refers to the living conditions of an individual; it is measured both with subjective and objective indicators; and it is a multidimensional concept.
Aim of the study: To assess how the quality of life is affected by the close proximity of wind farms.
Material and methods. The study group consisted of 1,277 Polish adults (703 women and 574 men), living in places located near wind farms. The mean age was 45.5 +/- 16.10. Some 33.2% of participants lived more than 1,500 m from wind farms; 17% - below 700 m. The research tool consisted of the Norwegian version of the SF-36 General Health Questionnaire, the Visual Analogue Scale (VAS) for health assessment, and original questions.
Results: Regardless of the distance between a place of residence and a wind farm, the highest quality of life was noted within the physical functioning subscale (mean 76 +/- 27.97), and the lowest within the general health (mean 55.3 +/- 24.06). Within all scales, the quality of life was assessed highest by residents of areas located closest to wind farms, and the lowest by those living more than 1,500 m from wind farms.
Conclusions: Close proximity of wind farms does not result in the worsening of the quality of life. Similar research should be conducted before any intended investment, and at least 6 months after construction of a wind farm.

Accession Number: WOS:000313298600016

Record 12 of 25

Author(s): Knopper, LD (Knopper, Loren D.); Ollson, CA (Ollson, Christopher A.)

Title: Health effects and wind turbines: A review of the literature

Source: ENVIRONMENTAL HEALTH

Volume: 10

Article Number: 78

DOI: 10.1186/1476-069X-10-78

Published: SEP 14 2011

Abstract: Background: Wind power has been harnessed as a source of power around the world. Debate is ongoing with respect to the relationship between reported health effects and wind turbines, specifically in terms of audible and inaudible noise. As a result, minimum setback distances have been established world-wide to reduce or avoid potential complaints from, or potential effects to, people living in proximity to wind turbines. People interested in this debate turn to two sources of information to make informed decisions: scientific peer-reviewed studies published in scientific journals and the popular literature and internet.
Methods: The purpose of this paper is to review the peer-reviewed scientific literature, government agency reports, and the most prominent information found in the popular literature. Combinations of key words were entered into the Thomson Reuters Web of Knowledge(SM) and the internet search engine Google. The review was conducted in the spirit of the evaluation process outlined in the Cochrane Handbook for Systematic Reviews of Interventions.
Results: Conclusions of the peer reviewed literature differ in some ways from those in the popular literature. In peer reviewed studies, wind turbine annoyance has been statistically associated with wind turbine noise, but found to be more strongly related to visual impact, attitude to wind turbines and sensitivity to noise. To date, no peer reviewed articles demonstrate a direct causal link between people living in proximity to modern wind turbines, the noise they emit and resulting physiological health effects. If anything, reported health effects are likely attributed to a number of environmental stressors that result in an annoyed/stressed state in a segment of the population. In the popular literature, self-reported health outcomes are related to distance from turbines and the claim is made that infrasound is the causative factor for the reported effects, even though sound pressure levels are not measured.
Conclusions: What both types of studies have in common is the conclusion that wind turbines can be a source of annoyance for some people. The difference between both types is the reason for annoyance. While it is acknowledged that noise from wind turbines can be annoying to some and associated with some reported health effects (e.g., sleep disturbance), especially when found at sound pressure levels greater than 40 db(A), given that annoyance appears to be more strongly related to visual cues and attitude than to noise itself, self reported health effects of people living near wind turbines are more likely attributed to physical manifestation from an annoyed state than from wind turbines themselves. In other words, it appears that it is the change in the environment that is associated with reported health effects and not a turbine-specific variable like audible noise or infrasound. Regardless of its cause, a certain level of annoyance in a population can be expected (as with any number of projects that change the local environment) and the acceptable level is a policy decision to be made by elected officials and their government representatives where the benefits of wind power are weighted against their cons. Assessing the effects of wind turbines on human health is an emerging field and conducting further research into the effects of wind turbines (and environmental changes) on human health, emotional and physical, is warranted.

Accession Number: WOS:000295468500001

Record 13 of 25

Author(s): Shepherd, D (Shepherd, Daniel); McBride, D (McBride, David); Welch, D (Welch, David); Dirks, KN (Dirks, Kim N.); Hill, EM (Hill, Erin M.)

Title: Evaluating the impact of wind turbine noise on health-related quality of life

Source: NOISE & HEALTH

Volume: 13

Issue: 54

Pages: 333-339

DOI: 10.4103/1463-1741.85502

Published: SEP-OCT 2011

Abstract: We report a cross-sectional study comparing the health-related quality of life (HRQOL) of individuals residing in the proximity of a wind farm to those residing in a demographically matched area sufficiently displaced from wind turbines. The study employed a nonequivalent comparison group posttest-only design. Self-administered questionnaires, which included the brief version of the World Health Organization quality of life scale, were delivered to residents in two adjacent areas in semirural New Zealand. Participants were also asked to identify annoying noises, indicate their degree of noise sensitivity, and rate amenity. Statistically significant differences were noted in some HRQOL domain scores, with residents living within 2 km of a turbine installation reporting lower overall quality of life, physical quality of life, and environmental quality of life. Those exposed to turbine noise also reported significantly lower sleep quality, and rated their environment as less restful.
Our data suggest that wind farm noise can negatively impact facets of HRQOL.

Accession Number: WOS:000295892500002

Record 14 of 25

Author(s): Pedersen, E (Pedersen, Eja)

Title: Health aspects associated with wind turbine noise-Results from three field studies

Source: NOISE CONTROL ENGINEERING JOURNAL

Volume: 59

Issue: 1

Pages: 47-53

Published: JAN 2011

Abstract: Wind farms are a new source of environmental noise. The impact of wind turbine noise on health and well-being has not yet been well-established and remains under debate. Long-term effects, especially, are not known, because of the short time wind turbines have been operating and the relatively few people who have so far been exposed to wind turbine noise. As the rate of new installations increases, so does the number of people being exposed to wind turbine noise and the importance of identifying possible adverse health effects. Data from three cross-sectional studies comprising A-weighted sound pressure levels of wind turbine noise, and subjectively measured responses from 1,755 people, were used to systematically explore the relationships between sound levels and aspects of health and well-being. Consistent findings, that is, where all three studies showed the same result, are presented, and possible associations between wind turbine noise and human health are discussed. (C) 2011 Institute of Noise Control Engineering.

Accession Number: WOS:000288368300006

Record 15 of 25

Author(s): Wartenberg, D (Wartenberg, Daniel); Greenberg, MR (Greenberg, Michael R.); Harris, G (Harris, Gerald)

Title: Environmental justice: A contrary finding for the case of high-voltage electric power transmission lines

Source: JOURNAL OF EXPOSURE SCIENCE AND ENVIRONMENTAL EPIDEMIOLOGY

Volume: 20

Issue: 3

Pages: 237-244

DOI: 10.1038/jes.2009.11

Published: MAY 2010

Abstract: Environmental justice is the consideration of whether minority and/or lower-income residents in a geographic area are likely to have disproportionately higher exposures to environmental toxins than those living elsewhere. Such situations have been identified for a variety of factors, such as air pollution, hazardous waste, water quality, noise, residential crowding, and housing quality. This study investigates the application of this concept to high-voltage electric power transmission lines (HVTL), which some perceive as a health risk because of the magnetic fields they generate, and also as esthetically unpleasing. We mapped all 345 kV and higher voltage HVTL in New York State and extracted and summarized proximate US Census sociodemographic and housing characteristic data into four categories on the basis of distances from HVTL. Contrary to our expectation, people living within 2000 ft from HVTL were more likely to be exposed to magnetic fields, white, of higher income, more educated and home owners, than those living farther away, particularly in urban areas. Possible explanations for these patterns include the desire for the open space created by the rights-of-way, the preference for new homes/subdivisions that are often located near HVTL, and moving closer to HVTL before EMFs were considered a risk. This study suggests that environmental justice may not apply to all environmental risk factors and that one must be cautious in generalizing. In addition, it shows the utility of geographical information system methodology for summarizing information from extremely large populations, often a challenge in epidemiology. Journal of Exposure Science and Environmental Epidemiology (2010) 20, 237-244; doi:10.1038/jes.2009.11; published online 8 April 2009

Accession Number: WOS:000276952700005

Record 16 of 25

Author(s): Keith, SE (Keith, Stephen E.); Michaud, DS (Michaud, David S.); Bly, SHR (Bly, Stephen H. R.)

Title: A proposal for evaluating the potential health effects of wind turbine noise for projects under the Canadian Environmental Assessment Act

Source: JOURNAL OF LOW FREQUENCY NOISE VIBRATION AND ACTIVE CONTROL

Volume: 27

Issue: 4

Pages: 253-265

Published: 2008

Abstract: The Canadian Environmental Assessment Act (CEAA) requires certain projects with federal government triggers to undergo an environmental assessment before receiving federal government approval. On request under CEAA, Health Canada provides advice on the health effects of noise to responsible authorities for wind turbine projects. The advice that Health Canada provides on the health effects of noise is generally based only on well-accepted scientific evidence for a link between noise exposure and health. For quiet rural areas, in which annoyance reactions towards intruding noise may be augmented, this paper proposes noise mitigation if predicted wind turbine noise levels exceed 45 dBA at noise sensitive receptors. In this proposal, a cautious approach is adopted by using predicted noise levels that are evaluated at the wind speed that produces the highest wind turbine noise, and background noise is evaluated in calm winds. This accounts for sheltering by obstructions. Wind speed gradient effects related to stable atmospheric conditions are also accounted for with this approach. The proposal is based on predicted project-noise related changes in long-term high annoyance, rattle and sleep disturbance. Noise mitigation for wind turbine construction noise is proposed based on potential for expectation of complaints.

Accession Number: WOS:000262903000001

Record 17 of 25

Author(s): Pedersen, E (Pedersen, Eia); Waye, KP (Waye, Kerstin Persson)

Title: Wind turbine noise, annoyance and self-reported health and well-being in different living environments

Source: OCCUPATIONAL AND ENVIRONMENTAL MEDICINE

Volume: 64

Issue: 7

Pages: 480-486

DOI: 10.1136/oem.2006.031039

Published: JUL 2007

Abstract: Objectives: To evaluate the prevalence of perception and annoyance due to wind turbine noise among people living near the turbines, and to study relations between noise and perception /annoyance, with focus on differences between living environments.
Methods: A cross-sectional study was carried out in seven areas in Sweden across dissimilar terrain and different degrees of urbanisation. A postal questionnaire regarding living conditions including response to wind turbine noise was completed by 754 subjects. Outdoor A-weighted sound pressure levels (SPLs) were calculated for each respondent. Perception and annoyance due to wind turbine noise in relation to SPLs, was analysed with regard to dissimilarities between the areas.
Results: The odds of perceiving wind turbine noise increased with increasing SPL (OR 1.3; 95% Cl 1.25 to 1.40). The odds of being annoyed by wind turbine noise also increased with increasing SPLs (OR 1. 1; 95% Cl 1.01 to 1.25). Perception and annoyance were associated with terrain and urbanisation: (1) a rural area increased the risk of perception and annoyance in comparison with a suburban area; and (2) in a rural setting, complex ground (hilly or rocky terrain) increased the risk compared with flat ground. Annoyance was associated with both objective and subjective factors of wind turbine visibility, and was further associated with lowered sleep quality and negative emotions.
Conclusion: There is a need to take the unique environment into account when planning a new wind farm so that adverse health effects are avoided. The influence of area-related factors should also be considered in future community noise research.

Accession Number: WOS:000247402600010

Record 18 of 25

Author(s): Yamazaki, S (Yamazaki, Shin); Sokejima, S (Sokejima, Shigeru); Mizoue, T (Mizoue, Tetsuya); Eboshida, A (Eboshida, Akira); Kabuto, M (Kabuto, Michinori); Yamaguchi, N (Yamaguchi, Naohito); Akiba, S (Akiba, Suminori); Fukuhara, S (Fukuhara, Shunichi); Nitta, H (Nitta, Hiroshi)

Title: Association between high voltage overhead transmission lines and mental health: A cross-sectional study

Source: BIOELECTROMAGNETICS

Volume: 27

Issue: 6

Pages: 473-478

DOI: 10.1002/bem.20227

Published: SEP 2006

Abstract: We examined the association between residential proximity to 60 Hz high voltage (22-500 kV) overhead transmission lines (HVOTLs) and mental health (MH). The subjects were 223 mothers with a mean age of 37 years. The distance from the subject's residence to the closest HVOTL was measured on a map. MH status was assessed by the SF-36 Health Survey, which was scored on a 0-100 point scale, and an individual with a score of 52 points or less was defined as having poor MH. Logistic regression models were used to examine the association between the distance from the subjects' residence to the closest HVOTL and MH status. The prevalence of poor MH was 15%. Among the 223 subjects, 10 lived within 100 m of a HVOTL. The adjusted odds ratios (OR) for poor MH among those who lived 101-300 m or within 100 m from HVOTL

were 1.29 (95% confidence interval (CI): 0.35-10.13) and 1.87 (95% CI: 0.35-10.13), respectively, against the reference category (300+ m). MH status was not significantly associated with the distance between the subject's residence and the closest HVOTL.

Accession Number: WOS:000240078000007

Record 19 of 25

Author(s): Baumgardt-Elms, C (Baumgardt-Elms, C); Schumann, M (Schumann, M); Ahrens, W (Ahrens, W); Bromen, K (Bromen, K); Stang, A (Stang, A); Jahn, I (Jahn, I); Stegmaier, C (Stegmaier, C); Jockel, KH (Jockel, KH)

Title: Residential exposure to overhead high-voltage lines and the risk of testicular cancer: results of a population-based case-control study in Hamburg (Germany)

Source: INTERNATIONAL ARCHIVES OF OCCUPATIONAL AND ENVIRONMENTAL HEALTH

Volume: 78

Issue: 1

Pages: 20-26

DOI: 10.1007/s00420-004-0550-1

Published: FEB 2005

Abstract: Background: In a population- based case - control study we examined the association between residential exposure to overhead high-voltage lines and testicular cancer. Methods: We recorded the residential biography of cases with testicular cancer identified by the Hamburg Cancer Registry and of controls that were randomly selected from the mandatory registry of residents in Hamburg. The study included 145 incident cases between 15 and 69 years of age, diagnosed between 1995 and 1997, and 313 controls, matched for age in 5-year strata. In model A, exposure was defined by distance (ever vs never). Model B took into account residence time and the inverse distance from the nearest high-voltage line. It distinguished between low and high exposure, the never exposed persons serving as a reference group. Odds ratios (ORs) and corresponding 95% confidence intervals (CIs) were calculated by unconditional logistic regression. For men below the age of 40 years and men aged 40 years and over separate analyses were carried out. Results: Within a corridor of 100 m the prevalence of exposure to high-voltage lines in Hamburg was 6.9% in cases and 5.8% in controls (OR= 1.3; 95% CI= 0.56 - 2.80). In the more complex model B we found an OR of 1.2 (95% CI= 0.60 - 2.47) for low exposure and 1.7 (95% CI= 0.91 - 3.32) for high exposure. Younger men show slightly increased risks in both models. Conclusions: In all, residential exposure to high-voltage lines did not seem to be a major risk factor for testicular cancer in our study. Yet, the fact that risks for men below the age of 40 years were slightly increased in both exposure models deserves further attention.

Accession Number: WOS:000227445700002

Record 20 of 25

Author(s): Mizoue, T (Mizoue, T); Onoe, Y (Onoe, Y); Moritake, H (Moritake, H); Okamura, J (Okamura, J); Sokejima, S (Sokejima, S); Nitta, H (Nitta, H)

Title: Residential proximity to high-voltage power lines and risk of childhood hematological malignancies

Source: JOURNAL OF EPIDEMIOLOGY

Volume: 14

Issue: 4

Pages: 118-123

DOI: 10.2188/jea.14.118

Published: JUL 2004

Abstract: BACKGROUND: Epidemiologic studies of electromagnetic fields and childhood cancers have focused on home exposure. The authors investigated whether residence in districts near high-voltage power lines is associated with childhood hematological malignancies, using small area analysis.
METHODS: Among 50,000 children in a city in Japan, 14 cases aged younger than 15 years were diagnosed with these malignancies in the period from 1992 through 2001. A total of 294 districts constituting this city were classified according to their proximity to high-voltage power lines (either 66 kV or 220 kV). Mantel-Haenszel rate ratio is used to calculate incidence rate ratio and its 95% confidence interval (CI).
RESULTS: Compared to districts of which no area fell within 300 m of high-voltage power lines, districts in which at least 50% of the area fell within 300 m of high-voltage power lines demonstrated an increased risk (incidence rate ratio: 2.2; 95% CI: 0.5-9.0). The association was strengthened for homes in which patients had resided for the longest interval of their lives (incidence rate ratio: 3.4; 95% CI: 0.9-13.2). Point-in-time measurements showed no increase in magnetic field levels for patient homes in districts near the lines.
CONCLUSION: An increased, albeit nonsignificant, risk of childhood hematological malignancies associated with residential proximity to high-voltage power lines warrants further investigations.

Accession Number: WOS:000223137500003

Record 21 of 25

Author(s): Feychting, M (Feychting, M); Forssen, U (Forssen, U); Rutqvist, LE (Rutqvist, LE); Ahlbom, A (Ahlbom, A)

Title: Magnetic fields and breast cancer in Swedish adults residing near high-voltage power lines

Source: EPIDEMIOLOGY

Volume: 9

Issue: 4

Pages: 392-397

DOI: 10.1097/00001648-199807000-00008

Published: JUL 1998

Abstract: We conducted a case-control study to test the hypothesis that residential magnetic field exposures increase the incidence of breast cancer. The study was based on people who had lived within 300 m of 220- or 400-kV power lines in Sweden at any time between 1960 and 1985. We identified 699 cases of breast cancer in women and 9 cases in men. One matched control per female case and eight per male case were selected at random. Estrogen receptor information was available for a subset of female cases. We assessed magnetic field exposure through calculations of the magnetic fields generated by the power lines before diagnosis. For calculated magnetic field levels greater than or equal to 0.2 microtesla (mu T) closest in time before diagnosis, we estimated the relative risk to be 1.0 [95% confidence interval (CI) = 0.7-1.5] for women and 2.1 (95% CI = 0.3-14.1) for men. Women younger than 50 years of age at diagnosis had a relative risk of 1.8 (95% CI = 0.7-4.3). For women with estrogen receptor positive breast cancer, the relative risk was estimated at 1.6 (95% CI = 0.6-4.1), using the exposure cutoff point greater than or equal to 0.1 mu T. Among estrogen receptor-positive women younger than 50 years at diagnosis, the relative risk increased to 7.4 (95% CI = 1.0-178.1).

Accession Number: WOS:000074286900008

Record 22 of 25

Author(s): Koifman, S; Ferraz, I; Viana, T S; Silveira, C L; Carneiro, M T; Koifman, R J; Sarcinelli, P N; Mattos, R de C; Lima, J S; Silva, J J; Moreira, J C; Ferreira, M de F; Fernandes, C; Bulcao, A C

Title: Cancer cluster among young Indian adults living near power transmission lines in Bom Jesus do Tocantins, Para, brazil.

Source: Cadernos de saude publica

Volume: 14 Suppl 3

Pages: 161-72

Published: 1998

Abstract: A case study was carried out to explore the occurrence of a cancer cluster in 1992 among young indian adults adults living in an Amazonian village near two 500 kV power transmission lines that began operating a decade ago. Current blood levels of DDT and organophosphorus pesticides and metal levels in hair samples were measured. Extremely low magnetic field exposure was determined during current daily activities carried out by the Indian villagers. Taking into account the cancer incidence rates in different Brazilian cities, the probability of the occurrence of this cluster by chance was considered remote ($p < 0.003$, Poisson distribution). High blood levels of p,p'-DDT (median levels ranging from 26 to 58 ppb) were observed. As a whole, this community showed a pattern of low exposure to organophosphorus pesticides, and high recent exposure was only observed in a few blood samples. Continuous exposure to extremely low electromagnetic fields originated in the power transmission lines (which reached 95.0 mG under the lines) was observed on several opportunities during daily activities carried out by Indian villagers. Further observational studies should evaluate the interaction between exposure to extremely low electromagnetic fields and prior exposure to tumor initiators in cancer development.

Accession Number: MEDLINE:9819474

Record 23 of 25

Author(s): Tynes, T (Tynes, T); Haldorsen, T (Haldorsen, T)

Title: Electromagnetic fields and cancer in children residing near Norwegian high-voltage power lines

Source: AMERICAN JOURNAL OF EPIDEMIOLOGY

Volume: 145

Issue: 3

Pages: 219-226

Published: FEB 1 1997

Abstract: The aim of the nested case-control study reported here was to test the hypothesis that exposure to electromagnetic fields of the type generated by high-voltage power lines increases the incidence of cancer in children aged 0-14 years. The study population comprised children who during at least one of the years 1960, 1970, 1980, 1985, 1987, or 1989 had lived in a census ward crossed by a high-voltage power line. The cases were diagnosed from 1965 to 1989 and were matched to controls by year of birth, sex, and municipality, Exposure to electric and magnetic fields was calculated by means of computer programs in which power line characteristics and distance were taken into account. No association was found between exposure to time-weighted average exposure to magnetic fields and cancer at all sites, brain tumors, lymphoma, or leukemia. Cancer at other sites showed elevated odds ratios in the two highest exposure categories in some, but not ail, measures of exposure. This study provides little support for an association between children's exposure to magnetic fields and cancer and no support for an association between leukemia and such exposure, but no firm conclusions can be drawn owing to the small numbers involved.

Accession Number: WOS:A1997WF17600003

Record 24 of 25

Author(s): Beale, IL (Beale, IL); Pearce, NE (Pearce, NE); Conroy, DM (Conroy, DM); Henning, MA (Henning, MA); Murrell, KA (Murrell, KA)

Title: Psychological effects of chronic exposure to 50 Hz magnetic fields in humans living near extra-high-voltage transmission lines

Source: BIOELECTROMAGNETICS

Volume: 18

Issue: 8

Pages: 584-594

DOI: 10.1002/(SICI)1521-186X(1997)18:8<584::AID-BEM7>3.0.CO;2-Z

Published: 1997

Abstract: The validity of several published investigations of the possibility that residential exposures to 50 Hz or 60 Hz electromagnetic fields might cause adverse psychological effects, such as suicide and depression, may have been limited by inadequate controlling for confounders or inadequate measurement of exposures. We investigated the relationships between magnetic field exposure and psychological and mental health variables while controlling for potential confounders and careful characterising individual magnetic field exposures. Five-hundred-and-forty adults living near transmission lines completed neuropsychological tests in major domains of memory and attentional functioning, mental health rating scales and other questionnaires. Magnetic field measurements were taken in each room occupied for at least one hour per day to provide an estimate of total-time-integrated exposure. The data were subjected to joint multivariate multiple regression analysis to test for a linear relation between field exposure and dependent variables, while controlling for effects of possible confounders. Performance on most memory and attention measures was unrelated to exposure, but significant linear dose-response relationships were found between exposure and some psychological and mental health variables. In particular, higher time-integrated exposure was associated with poorer coding-test performance and more adverse psychiatric symptomatology. These associations were found to be independent of participants' beliefs about effects of electromagnetic fields. (C) 1997 Wiley-Liss, Inc.

Accession Number: WOS:A1997YD72500007

Record 25 of 25

Author(s): ADAMS, JG (ADAMS, JG); ZHANG, J (ZHANG, J); MORGAN, MG (MORGAN, MG); NAIR, I (NAIR, I)

Title: A METHOD FOR EVALUATING TRANSMISSION-LINE MAGNETIC-FIELD MITIGATION STRATEGIES THAT INCORPORATES BIOLOGICAL UNCERTAINTY

Source: RISK ANALYSIS

Volume: 15

Issue: 3

Pages: 313-318

DOI: 10.1111/j.1539-6924.1995.tb00324.x

Published: JUN 1995

Abstract: A method to determine how much reduction in public exposure to power frequency magnetic fields can be obtained for different levels of investment is presented. Which if any "effects function" best describes the relationship between field exposure and biological effect is uncertain at this time. Also, in a particular context such as construction of new transmission lines there are a variety of different technologies which might be used to reduce exposure. We describe and demonstrate a method by which exposure reduction supply curves (i.e., the cost of purchasing different amounts of exposure reduction given various mitigation options) can be estimated parametrically for different exposure conditions and effects functions, and we display illustrative results.

Accession Number: WOS:A1995RF15500003
