



# Press Statement

## Childhood Cancer and Distance from High-Voltage Power Lines

*An important paper examining the incidence of childhood cancer in England and Wales and how it relates to distance from major high-voltage overhead power lines has been published. This large epidemiological study has found higher rates of childhood leukaemia among those born within 600 metres of a power line compared with those born further away. Rates of other types of childhood cancer are not raised. The authors of the study do not regard these findings as establishing a definite causal association between childhood leukaemia and exposures to electromagnetic fields from power lines.*

This study by Draper *et al* <sup>(1)</sup> is the largest to date of childhood cancer and power lines. It considers proximity to the power lines rather than electric or magnetic field strengths and has been carried out by an established team with considerable experience of carrying out epidemiological studies on cancer in children. The study involved 29,081 cases of cancer in children aged 0-14 years who were diagnosed during 1962-95. For each case, a matched control was selected. For each case and control, the distance of residence at the time of birth to the nearest high-voltage overhead power line was calculated. The study concerned all 275 and 400 kV overhead lines and a small fraction of 132 kV lines.

Draper *et al* found that, compared with children born more than 600 metres from a line, the risk of leukaemia was greater by a factor of 1.69 for those born within 200 metres and by a factor of 1.23 for those born between 200 and 600 metres; both these elevations were statistically significant. In contrast to leukaemia, there was no tendency for the risk of other childhood malignancies to increase with increasing proximity to a power line.

The controls selected for the leukaemia cases in this study tended to live further from power lines than the controls selected for other cases of childhood cancer. The reason for this is not clear and it is possible that, by chance, the leukaemia controls were unrepresentative. A sensitivity analysis in the paper using the controls for other diagnoses reported a leukaemia risk which was still raised but smaller than that in the main analysis.

### Comparisons with previous studies

A number of epidemiological studies have explored whether there is a link between power lines and childhood cancer. These studies must take into account the possibility that, if any such link were established, it might not be due to fields from the power lines but rather be caused by social or demographic factors that differ between those who live near power lines and those who live further away. A very important study was the UK Childhood Cancer Study (UKCCS) <sup>(2,3,4)</sup>. Another important paper by Ahlbom *et al* <sup>(5)</sup> pooled results from a number of studies of childhood cancer and exposure to magnetic fields in homes carried out in different countries.

The UKCCS found no raised risk of childhood leukaemia for residence within 50 metres of any overhead line. The statistical power of this result derived largely from children living close to lower voltage lines. The UKCCS also found no association between childhood leukaemia and measured levels of electric or magnetic fields, although the small numbers of children with high exposures limited the statistical precision of these results.

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Draper *et al*'s study had some advantages over the UKCCS analyses. For example, it covered cases over a much longer period. Also, since the UKCCS investigators approached parents to collect extra data, the UKCCS may be susceptible to bias because some potential study members did not participate. On the other hand, the UKCCS collected detailed data on the children's exposure to electromagnetic fields, together with data on possible confounding factors. Draper *et al* plan to look at childhood cancer in relation to calculated levels of these fields subsequently.

The study carried out by Ahlbom *et al* <sup>(5)</sup> reported a doubling of relative risk for magnetic fields of 0.4 microtesla ( $\mu\text{T}$ ) or more when compared with fields less than 0.1  $\mu\text{T}$ . (A microtesla is a unit of magnetic flux density.) This appears to be broadly consistent with the findings of Draper *et al* of a raised leukaemia risk close to a line. However, it would be difficult to infer any direct effect of electromagnetic fields on leukaemia risk more than 200 metres from a line, since at this distance the field levels associated with power lines should be very small – lower than exposures in the home from domestic sources of electromagnetic fields.

Draper *et al* estimated that, of the 400-420 cases of childhood leukaemia that occur annually in England and Wales, their results suggest that about five might be associated with living in proximity to high voltage power lines <sup>(1)</sup>. This is higher than previous estimates of about two cases per year in the UK <sup>(6)</sup>, based on the doubling of risk at exposures above about 0.4  $\mu\text{T}$  reported by Ahlbom *et al* <sup>(5)</sup>, although Draper *et al* stressed that their estimate is very imprecise. In particular, it is highly dependent on their findings more than 200 metres from lines, whose interpretation is unclear. The authors emphasised "the uncertainty about whether this statistical association represents a causal relation".

## Conclusions

By virtue of the longer time period covered, the new study provides more precise information on childhood cancer rates in the proximity of high-voltage power lines than does the UK Childhood Cancer Study. However, the absence of field measurements in homes and the lack of information on potential confounders make it difficult to know whether the raised risks reported for leukaemia represent a direct effect of electromagnetic field exposure. The results close to a line appear to be broadly consistent with the raised childhood leukaemia risk reported previously from a combined analysis of magnetic field exposures in homes. However, certain findings, such as the weaker evidence for a raised risk when an alternative set of controls is used and the raised risk reported more than 200 metres from a line, where the magnetic fields from lines are at or below background levels, would suggest that at least some of the increased leukaemia risk may be associated with factors other than electromagnetic fields.

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## Background on protection standards

In 2001, an independent Advisory Group on Non-ionising Radiation <sup>(1)</sup> reviewed the scientific literature on electromagnetic fields and cancer. It concluded that, while most epidemiological studies were consistent with there being no raised risk of cancer, there was some evidence that prolonged exposure to higher levels of power frequency magnetic fields is associated with a small risk of leukaemia in children. However, the majority of higher exposures to magnetic fields are due to variations in the electricity supply and distribution system, the presence of sub stations and equipment in the home, rather than proximity to power lines.

In May 2004, NRPB (now the Radiation Protection Division of the Health Protection Agency) issued new advice on limiting exposure to electromagnetic fields (EMFs)<sup>(2)</sup>. This advice was supported by a comprehensive review of the scientific information prepared by NRPB staff <sup>(3)</sup>. NRPB recommended that the UK adopt the guidelines recommended by the International Commission on Non-Ionizing Radiation Protection (ICNIRP) on exposure to EMFs. These include a five-fold reduction in permissible maximum exposure for members of the public compared with workers. The Advice for limiting exposure to power frequency fields (50 Hz in the UK) is intended to prevent adverse health effects on the brain and central nervous system. They will also reduce the likelihood of perception of the field and microshock discharges between the body and conducting objects in the field. However, in the light of the possible association between childhood leukaemia and exposure at lower levels, it was recommended that the Government should consider the need for further precautionary measures.

The Government has set up a stakeholder group, SAGE, managed by the Department of Health, to explore the implications for a precautionary approach to power frequency electric and magnetic fields and make practical recommendations. SAGE has representation from public concern groups who advocate greater precaution as well as from the power supply industry, government departments and the Health Protection Agency. Its role will be to go beyond the science and consider precautionary policy implications of the science that has already been reviewed. Initial work is expected to include consideration of ways that people can reduce domestic exposures by taking action within their own homes as well as discussions about precautionary approaches to be adopted with respect to power transmission lines and the local supply network.

The present medical consensus is that childhood leukaemia is a biologically diverse disease and is likely to arise by several aetiological pathways. For example, a very recent paper from the UKCCS suggests there may be a link between leukaemia and lack of exposure to infections in infancy<sup>(4)</sup>.

## **References**

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