

# Breast cancer mortality among female electrical workers in the United States

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## Abstract

**Background:** Previous epidemiologic studies have suggested that exposure to electric or magnetic fields in occupational and residential environments may cause cancer. Recent experimental findings provide some support for the hypothesis that exposure to extremely low-frequency electromagnetic fields reduces the pineal gland's nocturnal production of the hormone melatonin, thereby increasing susceptibility to sex hormone-related cancers such as breast cancer.

**Purpose:** Our purpose was to assess the evidence that cancer of the female breast might be associated with exposure to extremely low-frequency electromagnetic fields.

**Methods:** Records of women who had breast cancer as the underlying cause of their death (ICD-9 174) and control subjects (four per case) were selected from computer files of U.S. mortality data for the years 1985-1989. Women 20 years and older at the time of their death were eligible for inclusion if they were residents of and died in one of the 24 states that provided death certification records with occupation and industry codes to the National Center for Health Statistics for at least 1 year during the study interval. Data from death certificates were used to classify the case and

control subjects with regard to potential occupational exposure to electric and magnetic fields. Control subjects were a random sample of women who died of any other underlying cause, excluding leukemia and brain cancer.

**Results:** The data analysis contrasted 68 women with breast cancer and 199 controls, all with electrical occupations, with 27,814 women with breast cancer and 110,750 controls, all of whom had other occupations. Electrical workers had excess mortality from breast cancer relative to other employed women [odds ratio (OR) = 1.38; 95% confidence interval (CI) = 1.04-1.82]. Adjusted ORs for specific electrical occupations were 1.73 (95% CI = 0.92-3.25) for electrical engineers, 1.28 (95% CI = 0.79-2.07) for electrical technicians, and 2.17 (95% CI = 1.17-4.02) for telephone installers, repairers, and line workers. There was no excess of breast cancer, however, in seven other occupations held more frequently by women and also involving potentially elevated electrical exposures, including telephone operators, data keyers, and computer operators and programmers.

**Conclusions:** In light of the limitations inherent in death certification data and the design of this study, any conclusions regarding the hypothesis that exposure to extremely low-frequency electromagnetic fields causes breast cancer among women must be limited. Nevertheless, our findings are broadly consistent with that hypothesis and encourage further investigation with improvements in study design and data quality.

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