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Research Article

Statistical association between cancer incidence and major-cause mortality, and estimated residential exposure to air emissions from petroleum and chemical plants.

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Abstract

An ecologic study design was used to investigate the relationship between exposure to air emissions produced by the petroleum and chemical industries, and average annual cancer incidence and major cause mortality rates among whites in Contra Costa County, California. Estimates for the exposure to major industrial sources of sulfur dioxide, hydrocarbons and oxides of nitrogen were used to subdivide the county by level of exposure to petroleum refinery and chemical plant emissions. Cancer incidence and major cause mortality rates were then calculated for whites in each of the exposure areas. In both males and females, residential exposure to petroleum and chemical air emissions was associated with an increased incidence of cancer of the buccal cavity and pharynx. In males, age-adjusted incidence rates for cancers of the stomach, lung, prostate and kidney and urinary organs were also associated with petroleum and chemical plant air emission exposures. In both sexes, we found a strong positive association between degree of residential exposure and death rates from cardiovascular disease and cancer, and a less strong positive association between exposure and death rates from cerebrovascular disease. There was also a positive association in men for deaths from cirrhosis of the liver. Although these observed associations occurred across areas of similar socioeconomic and broad occupational class, confounding variables and the "ecologic fallacy" must be considered as possible explanations. In particular, the stronger findings in men suggest an occupational explanation of the cancer incidence trends, and the effect observed in cirrhosis mortality suggests that lifestyle variables such as alcohol consumption were not adequately controlled for. While the public health implications of our findings remain unclear, the evidence presented is sufficient to warrant follow-up studies based on individual data in which possible biases can be more readily controlled.

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