CORRESPONDENCE

Suicide among electric utility workers in England and Wales

Sir,—There is concern that exposure to electric and magnetic fields of the type associated with electrical power lines and equipment could give rise to health effects. Most of the epidemiological studies have focused on cancer,[1] but some have suggested an association with depression[2] and suicide.[3 4] Recent experimental studies support a plausible biological mechanism for these exposures causing depression through an effect on the pineal gland and hence melatonin concentrations.[5]

We examined mortality from suicide in men with occupations likely to have resulted in exposure to electric and magnetic fields, using the British occupational mortality data from two independent decennial supplements (1970–2 and 1979–83).[6 7] Occupational titles selected as potentially exposed were those used by McDowall[7 8] in his similar examination of risk of leukemia. In the same way as McDowall[8] we used proportional mortality ratios (PMRs) to summarise suicide risk to avoid the numerator/denominator bias in standardised mortality ratios (SMRs) for these occupational groups.

The 1970–2 data (table 1) showed no excess proportion of deaths due to suicide in all potentially exposed occupations combined, although PMRs were significantly raised in radio and radar mechanics, and in telegraph and radio operators. The 1979–83 data (table 2) showed suicide mortality in each exposed occupation similar to that expected. In 1979–83, telegraph and radio operators (occupation code 051·3) had a PMR of 74 (O = 5, 95% confidence interval (CI) 24–173), giving a PMR for the two supplements combined of 141 (O = 15, 95% CI 79–233).

In 1979–83 the group radio and radar mechanics was called radio and TV mechanics (occupation code 123·1) but with the same definition. It had a PMR of 144 (O = 23, 95% CI 91–216) giving a combined PMR of 148 (O = 42, 95% CI 107–196).

With the exception of excess suicide in radio and TV mechanics, who were not identified a priori as having particularly high exposure, the results are broadly negative. Imperfect information on outcome (suicide) or on exposure, however, may have diluted an excess risk if one existed. In particular, many workers in occupational groups selected as potentially exposed may not have had significant exposure. As more becomes known about exposure in these occupations, the extent of dilution will become clear. The linesmen and cable jointers group, including power and telephone linesmen, currently has the best documented exposure. Relative to background levels, occupational exposures were raised on average in power linesmen by a factor of about 10,[9] and in telephone linesmen by a factor of about three.[10] The 1970–72 PMR for this group was 68 (O = 5, 95% CI 22–159), and that for 1979–83 (occupation code 122·2) was 132 (O = 10, 95% CI 63–243) giving a low combined PMR of 101 (O = 15, 95% CI 57–167).

The PMRs are also subject to confounding bias in that exposed occupations may be more or less subject to other risk factors for suicide than employed persons generally, who serve as a comparison group. Age has been accounted for in analysis. We have also information on social class, most exposed occupations being in the skilled manual category (IIIM).[7] The PMR for category IIIM was 89 for the 1970–2 data and 86 for the 1979–83

Table 1 Suicide† mortality for men aged 15–64 in electrical occupations: England and Wales 1970–2

Occupations††	*Observed*	*Expected*	*PMR (95% CI)*
024: Radio and radar mechanics	19	12·4	153* (92–239)
025: Installers and repairmen (telephones)	16	28·1	57 (33–93)
026: Linesmen, cable jointers	5	7·3	68 (22–159)
027: Electricians	58	72·5	80 (61–102)
028: Electrical and electronic fitters	6	10·3	58 (21–126)
029: Assemblers (electrical equipment)	2	3·2	63 (8–226)
030: Electrical engineers (so described)	16	19·3	83 (47–135)
128: Telegraph radio operators	10	3·9	256** (123–471)
197: Electrical engineers (professional)	6	6·1	98 (36–213)
198: Electronic engineers (professional)	16	10·2	156 (89–253)
Total	154	173·0	89 (75–104)

*p < 0·05 one sided; **p < 0·01 one sided.
†Based on International Classification of Diseases (ICD) 8th revision E950–959.
††Office of population census and surveys, classification of occupations 1970, HMSO 1970.
Note: produced from microfiche tables 1 and 2.

Table 2 Suicide† mortality for men aged 20–64 in electrical occupations: England and Wales 1979–80 and 1982–3

Occupations††	*Observed*	*Expected*	*PMR (95% CI)*
027.1, 027.2, 121.3: Electrical and electronic engineers	70	76·9	92 (72–115)
120.2, 120.2, 121.1, 121.2: Electricians, fitters, plant operators	148	132·1	112 (95–131)
048.4, 048·4, 051·2, 051.3: Telephone and radio, telegraph operators	17	17·7	96 (56–154)
120.4, 120.5, 120.6, 120.7, 122.1, 122.2, 123.1, 123.2: Telephone fitters, linesmen, radio and TV mechanics	83	83·8	99 (79–121)
129.5, 129.6, 131.6, 131.7, 134.1, 135.6: Electronic wiremen, coil winders, assemblers	12	13·6	88 (45–154)
108.6, 110.3: Electroplaters	3	3·8	78 (16–228)
022.2: Sound, vision equipment operator	7	6·7	104 (42–214)
Total	341	334·3	102 (91–113)

*p < 0·05 one sided.
†Based on ICD 9th revision E950–959.
††Office of population census and surveys, classification of occupations 1980, HMSO 1980.
Note: produced from microfiche tables 45–52.

data suggesting that adjusting for social class would increase risk estimates slightly.

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Mortality among workers potentially exposed to epichlorohydrin

Sir,—In a recent study, Enterline *et al* (1990;47:269–76) reported the mortality experience of workers at two Shell Oil Company chemical plants. These men had had potential exposure to epichlorohydrin (ECH). That work was supported by Shell, and the Company recognises that the investigation was thorough and well done. We do not share, however, the interpretation that ECH alone or in combination with allyl chloride is associated with deaths due to heart disease.

Our table reproduces the essential findings. The study group as a whole had a mortality from heart disease that is 32% below that of the general population. Furthermore, there is no consistent pattern of excess deaths. Among men with nil or light exposure, the SMR is significantly ($p = 0{\cdot}03$) low even after 20 years or more of follow up. Among the men with moderate or heavy exposure, there is but a slight (less than one observed death in excess) and non-significant ($p = 0{\cdot}89$) excess only 20 years or more after exposure was initiated. In other words, even for this group, there is no true excess of heart disease. Curiously, for all deaths, the average age at death for the moderate to heavy exposure group is 10 years older than that for the nil to low exposure group, and about five years older for deaths due to heart disease—the reverse of that expected for an exposure induced outcome. Important confounders such as smoking and dietary habits were not examined. It should also be pointed out that "follow up" in this study is not necessarily a good surrogate for extent of exposure. That is, the duration of exposure is not the same as the period of follow up.

In the Abstract, the authors state that "The relation of heart disease and exposure does not appear to be an artifact, although the fact that many other causes of death were also related to exposure argues against a casual relation." Finally, we point out that the suggestion that a possible interaction between ECH and allyl chloride is responsible for the "excess" of disease upon heart deaths is a speculation. Enterline *et al* point out that men who had worked in ECH production were more likely to have been exposed to allyl chloride than were other ECH workers. In fact, this study has made no effort to distinguish the effects (if any) of ECH alone from those of ECH in combination with allyl chloride. The authors state on page 276 of the article that "There is little in human or animal experience to suggest a relation between allyl chloride and cardiovascular disease." This statement, we believe, places their interpretation in a more correct perspective.

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Standardised mortality ratio and observed number of deaths (in parentheses) for heart disease according to potential ECH exposure and time since start of exposure (data from Enterline et al)

	Follow up period		
ECH exposure	*< 20 years*	*≥ 20 years*	*All*
Nil, light	56 (6)	39 (5)	47 (11)
Moderate, heavy	73 (7)	105 (17)	93 (24)
All	64 (13)	76 (22)	71 (35)

Author's reply:

I would agree that the findings we reported with regard to heart disease among men with potential exposure to epichlorohydrin are curious. Ross points to the fact that the group of workers we studied had a mortality from heart disease 32% below that of the general population. Whereas this is true, the SMR for these workers was higher than the SMR for heart disease for the chemical plant as a whole.[1] Moreover, as we pointed out in our article, the SMR of 54·4 in the nil to light exposure group 20 years from first exposure was not much different than an SMR of 51·1 for the entire chemical plant. Thus it appeared to us that the SMR of 101·6 for the higher exposure group was the one that was unusual. This points to a problem in using rates for the general population to calculate expected deaths in an industrial cohort.

Ross also points out the age at death in the higher exposure group was roughly five years older than the age at death in the lower exposure group. We did not make this calculation; the difference, however, is probably because the workers in the higher exposure group were older than those