Retrospective study of mortality after a water pollution incident at Lowermoor in north Cornwall

P J Owen, D P B Miles, G J Draper, T J Vincent

Twenty tonnes of aluminium sulphate were inadvertently emptied into the water supply at the Lowermoor treatment works in north Cornwall on 6 July 1988. The maximum recorded aluminium concentration was 620 000 μg/l compared with the maximum concentration admissible at the time by the European Community of 200 μg/l.[1]

Highly acidic water entered the system, which distributed water to 12 000 local residents. The extent of the pollution was not fully realised for some days, and many residents received water containing large quantities of aluminium and also copper, lead, and zinc, which the acid had caused to leach from pipes.

A panel of experts produced two reports on the incident[2,3]; one of the recommendations was that deaths should be monitored by flagging the health records of residents. The Office for National Statistics flagged records of all residents in the entire postcode sector receiving water from the treatment works; this included people who had not received polluted water. The development of more accurate postcoding has enabled the residents to be split into two groups: those who were supplied by the treatment works and those who were not.

We analysed records of deaths in the population whose records were flagged between July 1988 and December 1997. A previous paper discussed the hospital discharge rates.[4]

Methods and results

We compared mortality in the area with water pollution (n=11 114) with that in an adjacent area free of pollution (n=5359). We also compared death rates with those in Cornwall and the Isles of Scilly, and England and Wales. We corrected death rates for differences in age distribution and sex.

The ratio of the standardised mortality ratios (standardised to England and Wales) for the exposed and unexposed cohorts was 1.08 (95% confidence interval 0.97 to 1.21) (table); the exposed group had higher mortality, but the excess was not statistically significant.

Compared with deaths in Cornwall as a whole, the number of deaths in the exposed group was lower than expected each year: fewer than expected died in the exposed group. The standardised mortality ratio for the exposed population for 1988-97 was 81.6 (77.2 to 86.2), using mortality rates for Cornwall as the standard, and 77.7 (73.5 to 82.0) with England and Wales as standard. For both standards of comparison, significantly fewer people died than expected.

Standardised mortality rates (95% confidence intervals) in groups exposed and unexposed to aluminium sulphate pollution after incident at Lowermoor, north Cornwall

Standard	Exposed population (*E*)	Unexposed population (*U*)	Ratio (*E*/*U*) (95% CI)
England and Wales	77.7 (73.5 to 82.0)	71.8 (65.4 to 78.4)	1.08 (0.97 to1.21)
Cornwall and Isles of Scilly	81.6 (77.2 to 86.2)	75.9 (69.2 to 83.1)	1.07 (0.97 to 1.20)

Comment

We found no statistically significant difference in deaths between the cohort exposed to aluminium sulphate in their water and the non-exposed cohort. The cohort exposed to the pollution had significantly lower mortality than the population of Cornwall and that of England and Wales. This may be because the area has generally low levels of deprivation and historically low death rates. Mortality in the population will continue to be monitored.

Our register of flagged people is incomplete: we may have underestimated the number of deaths in the exposed area and non-exposed area, but this would not be large enough to invalidate our conclusions. The problem is the time interval between the pollution incident in 1988 and the recommendation to flag records in 1991: some people moved away from the area and others moved in. The registration system that the health service had in place at the time did not fully correct for this. It did, however, allow recording of all people still resident at the same address, those who had left Cornwall, and those moving only once within Cornwall—that is, most of those moving.

Cornwall and Isles of Scilly Health Authority, St Austell, Cornwall PL25 4NQ
P J Owen *public health scientist*
D P B Miles *director of public health*
Childhood Cancer Research Group, Department of Paediatrics, University of Oxford, Oxford OX2 6HJ
G J Draper *director*
T J Vincent *programmer*
Correspondence to: P J Owen Pat.Owen@ciosha.cornwall.nhs.uk

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Competing interests: None declared.

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2 Lowermoor Incident Health Advisory Group. *Water pollution at Lowermoor, north Cornwall.* Truro: Cornwall and Isles of Scilly District Health Authority, 1989.
3 Lowermoor Incident Health Advisory Group. *Water pollution at Lowermoor, north Cornwall. Second report.* London: Stationery Office, 1990.
4 Owen PJ, Miles DPB. A review of hospital discharge rates in a population around Camelford in north Cornwall up to the fifth anniversary of an episode of aluminium sulphate absorption. *J Public Health Med* 1995;17:200-4.

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Endpiece

Saving time?

Half our life is spent trying to find something to do with the time we have rushed through life trying to save.

Will Rogers (1949)

Submitted by Himanshu Sharma, senior house officer, Chichester