Correspondence

Fundamental errors in official epidemiological studies of environmental pollution in Wales

Sirs,

In 2003, Roberts *et al*. published a study on the incidence of cancer in Mold, Flintshire. This followed a report by us of statistically significant excess cancer risks there over the period 1974–89.[1] The data employed were that of the Wales Cancer Registry (WCR), a division of the former Welsh Office. This had been released to Green Audit in 1995 and had been analysed between 1997 and 2000 in order to examine the trend in cancer incidence by distance from the Irish Sea.[2] The WCR was closed down in 1996 and was replaced in 1998 by the Wales Cancer Intelligence and Surveillance Unit (WCISU).

To calculate cancer risks, it is necessary to know the population of the area for which cases are recorded. The WCR small areas were termed areas of residence (AOR). It was the contention of Roberts *et al*.[3] that errors had been made by Green Audit in their calculations; specifically that the ward composition used for the AOR named 71EE MOLD UD was incorrect. The authors described what they believed to be the true composition of this (and nearby) AOR in terms of 1991 census wards. They dismissed any allegations of excess cancer risk which they argued was artefactual due to incorrect base populations.

Recently, we re-examined this issue in connection with a similar argument which has followed our discovery of excess childhood cancer near the Menai Strait area of North Wales.[4] WCISU has followed our study, reporting that there are errors in it due to incorrect ward aggregations, in this case those defining the towns of Bangor and Caernarfon in Gwynedd.[5] Their conclusion has been widely reported in the media and has been endorsed by the Committee on Medical Aspects of Radiation in the Environment (COMARE).

Here, we demonstrate that in fact it is the ward compositions of the AOR employed by Roberts *et al*. and more recently by White *et al*. (WCISU) that are incorrect. This is easy to demonstrate. Table 1 gives the total number of AOR in North Wales into which WCR assigned cases, compared with the AOR employed by Roberts *et al*. to define the ward compositions. These were supplied to us in 2001 by WCISU. It is clear that in the case of Gwynedd, the county is divided by WCISU into five AOR, whereas WCR divided it into 35 AOR. For Clwyd, there were 27 AOR in the WCR database but only seven in the WCISU population aggregates. Our data obtained from Office for National Statistics (ONS) in 1998 show that 71EE MOLD contains just the Mold wards. Roberts *et al*. brought in wards from nearby 71EC HOLYWELL RD, which inflated the base population and reduced the excess risk we found. In the case of childhood cancer in Bangor, the calculation by White *et al*. 2005[5] is even more bizarre since subsumed within the ward list for 74CA BANGOR MB are wards from 74CN OGWEN, 74CC

Table 1 List and number of areas of residence (AOR) assumed by the Wales Cancer Intelligence and Surveillance Unit (WCISU) on the basis of alleged Office for Population Census and Surveys (OPCS) reference manual in Gwynedd and Clwyd and list and number of AOR used by the Wales Cancer Registry (WCR) for coding purposes

Area	*WCISU and alleged OPCS coding manual AOR*	*WCR AOR in which cancer cases are distributed*	*Overall number of AOR assumed in the region*
Gwynedd	74AA, 74CA, 74EA, 74GA, 74JA	74AA, 74AC, 74AE, 74AG, 74AJ, 74AK, 74AL, 74AN, 74AP, 74CA, 74CC, 74CE, 74CL, 74CN, 74EA, 74EC, 74EE, 74EL, 74EN, 74GA, 74GC, 74GE, 74GG, 74GJ, 74GL, 74GN, 74GP, 74JA, 74JC, 74JE, 74JG, 74JJ, 74JL, 74JN, 74JP	WCISU = 5, WCR = 35
Clwyd	71LA, 71CA, 71EA, 71GA, 71GC, 71LA, 71AA, 71EE	71AA, 71AC, 71AL, 71CA, 71CC, 71CL, 71CN, 71EA, 71EC, 71EE, 71EL, 71EN, 71GA, 71GC, 71GE, 71GL, 71GN, 71GP, 71GR, 71GT, 71JA, 71JC, 71JL, 71LA, 71LL, 71LN, 71LP	WCISU = 8, WCR = 27

BETHESDA and 74CE CAERNARFON. We suggest that Roberts *et al.* retract their 2003 paper.

References

1 Howard CV. *Proof of evidence on the health effects associated with cement kilns on behalf of the Campaign against a New Kiln (CANK)*. Liverpool: University of Liverpool, 2000.

2 Busby CC. High risks at low doses. Proceedings of 4th International Conference on the Health Effects of Low-level Radiation: Oxford, September 24 2002. London: British Nuclear Energy Society, 2002.

3 Roberts R, Steward J, John G. Cement, cancers and clusters: an investigation of a claim of a local excess cancer risk related to a cement works. *J Public Health Med* 2003; **25(4):** 351–7.

4 Busby C, Bramhall R, Parry L. Childhood leukemia near the Menai Strait North Wales. Proceedings of 'Children with Leukemia' International Conference 6th–10th September 2004, London, 2004.

5 White C, Steward J, Wade R. Childhood leukemia, brain tumours and retinoblastoma near the Menai Strait, North Wales 2000–2003; a response to a recent Green Audit Report—nuclear pollution, childhood leukemia, retinoblastoma and brain tumours in Gwynedd and Anglesey wards near the Menai Straits North Wales 2000–2003 by C. Busby PhD. Cardiff: WCISU, 2005.

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Reply

Sirs,

Our study (Roberts *et al.* 2003) addressed the issue of an alleged cancer cluster around a cement works in North Wales. Busby and Howard now raise the issue of the definition of the now obsolete Office for Population Censuses and Surveys (OPCS) area of residence (AOR) codes and the precise coding scheme used in the data extract they obtained from the former Wales Cancer Registry a decade ago in 1995.

The central part of our analysis used modern GIS techniques and high-quality postcoded data aggregated to 1981 census ward boundaries. The results showed no evidence of a cancer cluster around the plant. This conclusion is unaffected by any issues surrounding AOR which we discuss here.

The issue of AOR codes was raised in the paper solely to illustrate the dangers of using such obsolete areas for epidemiology and the risk of spurious clusters arising from inappropriate epidemiological analysis.

In our section on 'Interpretation and application of our findings', we clearly refer to this problem and question the value of any one using AOR codes for this sort of work. The Green Audit analysis by Busby and Howard, which was the source of the alleged cluster the paper addressed, was based on data tabulated by AOR. These AOR were broad bush planning measures designed in the 1970s, in use until the 1990s. Coders in hospitals allocated cases to an AOR from look-up lists. No digitized versions are readily available. As illustrated below, this process generated gross systematic errors by tending to assign to the nearest town, and therefore, using AOR will often generate spurious clusters.

Our *Methods* section stated that AOR 71EE 'was most likely to refer to what the campaigning group study refers to as Mold'. Inference was necessary because the campaigning study authors declined to share with us the actual AOR coding scheme they used—had they done so, they could have cleared this matter up before publication.

It appears in the light of this correspondence 2 years later that the 1161 cases indeed relate to the five Mold wards in the older version used by Green Audit rather than the 12 wards as we thought from the 1992 codes. It is unfortunate that this AOR is coded 71EE in both the 1992 and earlier versions of the OPCS codes.

However, this still results in a spurious cluster. Of the postcodes assigned to 71EE, only 37% actually reside within Mold, and the others are scattered all over the area, and of the 1161 cases of all malignancies attributed to the five wards by Busby and Howard, only 578 were correctly assigned to that area and with another 12 in the surrounding area makes 590. The expected number from the agreed population at risk is 509.5. This gives a relative risk of around 1.2. This is considerably lower than that claimed by Howard and Busby and illustrates how such spurious clusters may arise when using obsolete AOR codes.

Use of AOR coded data and inappropriate analysis generates spurious clusters. Thus, in our view, all previous epidemiological work by Green Audit Wales using these old data should be disregarded. Postcode mapping as used by Welsh Cancer Intelligence and Surveillance Unit (WCISU) and Small Area Health Statistics Unit (SAHSU) is the appropriate methodology to use in the current state of knowledge. We stand by the scientific findings in this paper based upon this.