

South West Public Health Observatory

South West Cancer Intelligence Service

Grosvenor House, 149 Whiteladies Road, Clifton, Bristol BS8 2RA

Tel: 0117 970 6474 Fax: 0117 970 6481 Web: www.swpho.nhs.uk Email: julia.verne@swpho.nhs.uk

To: Mr Matthew Hill, BBC

Our ref: HM090212

Date: 8th April 2009

Dear Matthew,

It was good to see you again recently. However, I'm writing with regard to our discussion at the end of January about Breast Cancer incidence in Burnham-on-Sea. The standardised incidence ratio figures that you asked for are attached.

A standardised incidence ratio (SIR) is the ratio of the number of actual cases in an area to the number of cases that would be expected based on the area's population size, age, and the background rates of the disease in question. An incidence ratio of 100 indicates that observed = expected. A ratio of >100 indicates that the observed number is higher than expected.

The confidence intervals and *p* values provide measures of whether the incidence ratio is statistically significant. The 95% confidence interval gives the range within which it is 95% certain that the value of the standardised incidence ratio lies (and may include the value 100, i.e., observed = expected). Small numbers of cases produce wide confidence intervals. The *p* value is the probability of obtaining the observed difference even if no difference actually exists, e.g., a *p* value of 0.1 indicates that there is a 10% chance that the observed difference does not exist, i.e., a 90% chance that it does exist. Usually a *p* value of <0.05 (a >95% probability that the observed difference exists) is taken to be significant. In a multiple analysis (e.g., analysing several different cancer sites or geographic locations to see if one is significant), a more strict interpretation of *p* values may be used, taking *p*<0.01 to be significant.

Leaving aside though the question of how the Burnham area was selected, the table attached shows the standardised incidence ratio calculated using a variety of data sources to calculate the expected number of cases. Using year-by-year background rates for the South West and the most detailed year-by-year population data we calculate that 145 cases were expected, giving a standardised incidence ratio of 115, which is not statistically significant (*p*=0.09). In other words, rates of breast cancer in Burnham are normal compared to the rest of the South West.

For background rates from England and the most detailed population data we calculate that 134 cases were expected leading to a standardised incidence ratio of 125. This is statistically significant (*p*=0.009) and indicates that breast cancer rates are higher in Burnham than the English average. This however is true of the South West as a whole. I've attached an age-standardised graph showing the trends in Breast cancer in the South West region and in England. You can see that the South West as a whole has had higher breast cancer rates than England since the mid-nineties. It is known that breast cancer is more common in more affluent regions due to lifestyle factors such as diet and reproductive choices.

Instead of using year by year population data we might choose to use snapshots from the census years 1991 and 2001. However, this introduces a systematic error because the population is growing during the period in question: underestimating the population underestimates the expected number of cases. We might also choose to use a snapshot of the background rate at one point in time. However choosing 1997 introduces another systematic error. As the attached graph shows the background rate is increasing over the study period and 1997 is an underestimate of its average across the whole period, again underestimating the expected number of cases. Combining both of these choices for our data sources allows us to calculate an expected number of cases of 115 and a standardised incidence ratio of 145, very close to that calculated by Green Audit.

The methodology section of the Research Note published by Green Audit ("Breast Cancer Incidence in Burnham on Sea, Somerset 1994-2004", September 2008) appears to state that these population and background rate snapshots were used to calculate their standardised incidence ratio.

To conclude then, the South West region has historically had a breast cancer rate higher than that of England due to the factors described above. There is no evidence though that the incidence of breast cancer in Burnham-on-Sea is atypical of the South West as a whole, or that it is related to the Hinkley Point power station.

Yours sincerely

Dr Julia Verne

Director: **Dr Julia Verne** BSc, MBBS, MSc, PhD, FFPH South West Regional Public Health Group

Breast Cancer in Burnham on Sea and Somerset 1994-2004

Response to Julia Verne's comments to Matthew Hill Chris Busby PhD

Prof Dr Chris Busby
Green Audit
Castle Cottage
Sea View Place
Aberystwyth SY231DZ
June 9th 2009

For some nine years, a number of reports from Green Audit have drawn attention to significantly high levels of breast cancer mortality and also incidence in the wards of Burnham on Sea, downwind from Hinkley Point nuclear power station and also adjacent to the coast. These reports have implicated routine releases of radioactive material from the plant and also acknowledged leaks.

Dr Julia Verne, now a member of the Committee on Medical Aspects of Radiation in the Environment (COMARE), but in her capacity as Director of the "South West Public Health Observatory" has consistently denied or marginalised the findings despite her data showing the numbers to be broadly accurate. In her latest attempt to argue that there is no real excess risk for breast cancer in Burnham on Sea she wrote to Matthew Hill of the BBC on 8th April (her ref: HM090212).

The essence of her argument is that she writes that for breast cancer incidence, Green Audit's calculations agree broadly with those which she has carried out. These show expected numbers of cases from 1994-2004 to be 113, observed 167. The observed numbers were supplied by SWPHO in 2008 following a Freedom of Information request by StopHinkley. This gives a Relative Risk (Standardised Incidence Ratio) of 1.48 for which the two tailed p-value is 0.000005.

Her own calculation gave an expected number of 115 cases and her SIR is therefore 1.45. Her p-value is given in the letter as 0.00007. Both these p-values are much lower than the normally employed cut off for statistical significance of 0.05 (It is a low p-value that increases the statistical significance).

However, Verne goes on to dismiss this finding on the basis that "the incidence of breast cancer in the South West is already significantly high", and so the rates in Burnham on Sea should not be seen as unusual or related to its proximity to Hinkley Point. Some rates are shown in a graph on page 4 of the "Factsheet No 4: Breast Cancer in the South West" available on the internet site of the SWPHO. In this graph Average Age Standardised Incidence Rates (ASR) for the South West 1998-2000 can be read as 125 per 100,000 (blue line on graph) and for Somerset the value is 133. The caption states that the South West figures are just above the national average. It is important to note that this graph is for the *three years 1998-2000* and is therefore not comparable with the period 1994-2004 which was studied by Green Audit and for which the SIR was 1.48.

In her letter, she begins by explaining the meaning of p-value. This is necessary in

order for her later to argue that the new SIR she says she calculated of 115 is not statistically significant at $p = 0.09$. Her explanation of p-value is misleading. Strictly what she has defined is a *two tailed* p-value and that is what she is using. Such a p-value also incorporates the likelihood that the results are lower than expected as well as higher than expected. However, in this case we have a prior hypothesis which is that the radiation from the plant is causing increased breast cancer (not that it is decreasing the rate) and so a one tailed test or a Poisson test would be appropriate. Under such a model, the 115 would give a p-value below 0.05.

However, it is extremely hard to see how she manages to obtain an expected number of cases of 145 given that earlier she obtained 115. It is difficult to see how she can have achieved this. It would mean inflating the effective base population at risk by 26% (145/115) or using a 26% inflation of the base risks by setting the control population risk at 26% greater than the level she used in obtaining the 115.

Apparently she employs year by year populations and year by year rates, first for England, then for Somerset. But these must be guesses since no one knows what the population is between censuses. I have no access to her data to replicate what seems to give a most unlikely result, given the data I have from published sources which I present here.

I have obtained the mean rates for the counties comprising the South West (including Somerset) from 1991-1999 from the Office for National Statistics Cancer Atlas of the UK SMPS No 68 (Palgrave MacMillan 2005). I attach five diagrams/maps which show quite clearly for the period 1991-1999 the mean rate in Somerset was *not* higher than the National Average. It should be noted that this argument relates to incidence. The mortality rates for breast cancer in Burnham on Sea are also high, for the north ward consistently approaching twice the national average. Again, the maps do not show that Somerset has a rate higher than the averages. Indeed, if there is any increased risk in the South West, it is driven by Dorset. Verne's calculations purport to show that there is no statistically significant excess of breast cancer incidence in Burnham; however there is, in fact, as I have shown elsewhere, statistically significant mortality from breast cancer in Burnham North. It is hard to see how there is an excess mortality and not an excess incidence: the two usually are in a fixed ratio so long as there are no differences in medical care.

To conclude, I find Verne's arguments to be misleading with regard to the interpretation and unsupported by the published data. Finally I point out that her connection with COMARE suggests a conflict of interest.

In my expert opinion there is a highly statistically significant excess of breast cancer in Burnham on Sea which, together with the excess infant mortality, points clearly to the effects of releases from the nuclear plant.