SINGLETON CANCER CLUSTER INVESTIGATION

Hunter New England Area Health Service – 21 April 2010

Dr Tony Merritt led this investigation by Hunter New England Population Health (HNEPH). Dr Wayne Smith, Director NSW Environmental Health Branch, and Professor Bruce Armstrong advised on the conduct of the investigation and the analysis of the information collected.

A cluster of 5 cases of brain tumour in a localised area of Singleton Heights was reported by media on Monday 12 April. There were no previous reports to HNEPH in relation to this cluster.

The investigation commenced on 12 April.

INVESTIGATION PROCESS AND RESULTS

1. Review of case data

Interviews were conducted with each case or with immediate family members where the case was deceased. Contact was made with the General Practitioner for four of the cases. The investigation commenced on 12 April and all families had been contacted by 13 April.

The following details were collected: gender, date of birth, tumour pathology, year of diagnosis, age at diagnosis, places of residence over their lifetime, occupational history, hobbies and any specific exposures they were concerned may be linked to the cancer.

These data are not included with the public report for privacy reasons.

The dates of case diagnosis ranged between 1979 and 2008.

There were three different types of tumours, a benign adenoma, a benign meningioma and three neuroepithelial malignancies (one astrocytoma and two glioblastomas).

Three of the affected people were alive and two had died.

All five people with brain tumours had lived in Singleton for 35 or more years. Two had worked in or around coal mines and one had worked with coal trains. No other common factors were identified except for the proximity of their residences.

2. Site inspection

A senior Environmental Health Officer inspected the suburb in which the cluster was reported. No potential local hazards were identified.

3. Review of NSW Cancer Registry data

NSW Cancer Registry data for Brain cancer was reviewed for the Singleton Local Government Area (LGA).

Table 1 (below) reports age standardised rates for all Neurological Cancers (Brain and other Central Nervous System cancers) for the period 1979 to 2008. The rate for the Singleton LGA (based on 28 cases, 26 of which were classified as Brain Cancers) was not significantly different to the NSW average. Similarly rates in Muswellbrook, Cessnock and Maitland, the adjoining LGAs, were not significantly different to the NSW rate.

4. Estimation of the probability of a geographic clustering of brain tumours occurring by chance

The probability of a geographic clustering of four brain tumours occurring in nearby streets somewhere in the Singleton metropolitan area over the 30 year period 1979 to 2008 was calculated.

Case definition and expected case numbers

For the purpose of this calculation the adenoma was not included, on the basis that it is a different type of tumour to brain tumours, it is unlikely to share any risk factors with brain tumours and there are no NSW data on which its frequency in the Singleton LGA could be estimated. The remaining four tumours were included, one of which was benign.

All four tumours occurred in the Singleton metropolitan area in the period 1979 to 2008.

During this period there were a total of 22 brain cancers (malignant tumours) recorded in the NSW Cancer Registry for the Singleton metropolitan area. Benign tumours (such as meningioma) and tumours of uncertain behaviour are not recorded by the Registry.

To provide an estimate of the total number of brain tumours diagnosed during this period, the expected ratio of benign or uncertain behaviour brain tumours to malignant brain tumours was estimated using Victorian Cancer Registry data for the period 2003 to 2007[1]. Data for male and female adults was considered. Lymphomas, which are not tumours of brain tissue, were excluded, as were “cranial/spinal nerve tumours”. The ratio of benign or uncertain behaviour brain tumours to malignant brain tumours was 0.84:1

Using this ratio, the estimated number of benign or uncertain behaviour tumours that would have been diagnosed over this period in the Singleton metropolitan area was thus 19, a total of 41 brain tumours in all.

Population estimation

The cluster was reported in two intersecting streets. The number of streets in the Singleton metropolitan area was used for estimating the proportion of the Singleton population in the two streets in which the four brain tumours occurred.

Singleton Council provided the number of streets currently in the metropolitan area (205) and an estimate of the number in 1979 (154). An average number of 180 streets was used for the calculations

Statistical assessment of the chance of occurrence of geographic clustering

Method 1

Assumption: there are 270 two-street combinations, including nearer parts of cross-streets only. A sensitivity analysis is provided, with a lower bound of 180 combinations the lowest – i.e. all of the cases occurring in a single street.

There was an average of 180 streets over the thirty year period from 1979 until 2008. Using the Poisson distribution, and the expected number of cases from the cancer registry and the expected benign to malignant ratio, there is a 0.001138 probability that four cases could occur purely by chance in one of the 270 two street combinations in a thirty year period; in other words, there is a 0.998862 chance that there would be no such cluster in one of the 270 two street combinations in a thirty year period. Therefore, there is $(0.998862)^{270}$ = 73.5 per cent probability of not experiencing a cluster of four cases in any two street combination in thirty years. That is, there is a 26.5 per cent chance that a cluster of four cases would occur in one of the 270 two street combinations in thirty years. The lowest expected chance is $[1-(0.998862)^{180}]$ = 18.5 per cent.

Method 2

The area in which the cases occurred represented about $1/70^{th}$ of the total residential area of current metropolitan Singleton. Using the Poisson distribution, and the expected number of cases from the cancer registry and the expected benign to malignant ratio, there is a 0.00282719 probability that four cases could occur purely by chance in one of the 70 possible areas in a thirty year period; in other words, there is a 0.99717281 chance that there would be no such cluster in one of the 70 areas in a thirty year period. Therefore, there is $(0.99717281)^{70}$ = 82.2 per cent probability of not experiencing a cluster of four cases in any area in thirty years. That is, there is a 17.8 per cent chance that a cluster of four cases would occur in one of the 70 areas in thirty years. This is the chance of exactly four cases. Using the same methodology, the probability that four *or more* cases would occur in such an area is 19.4 per cent.

Conclusion

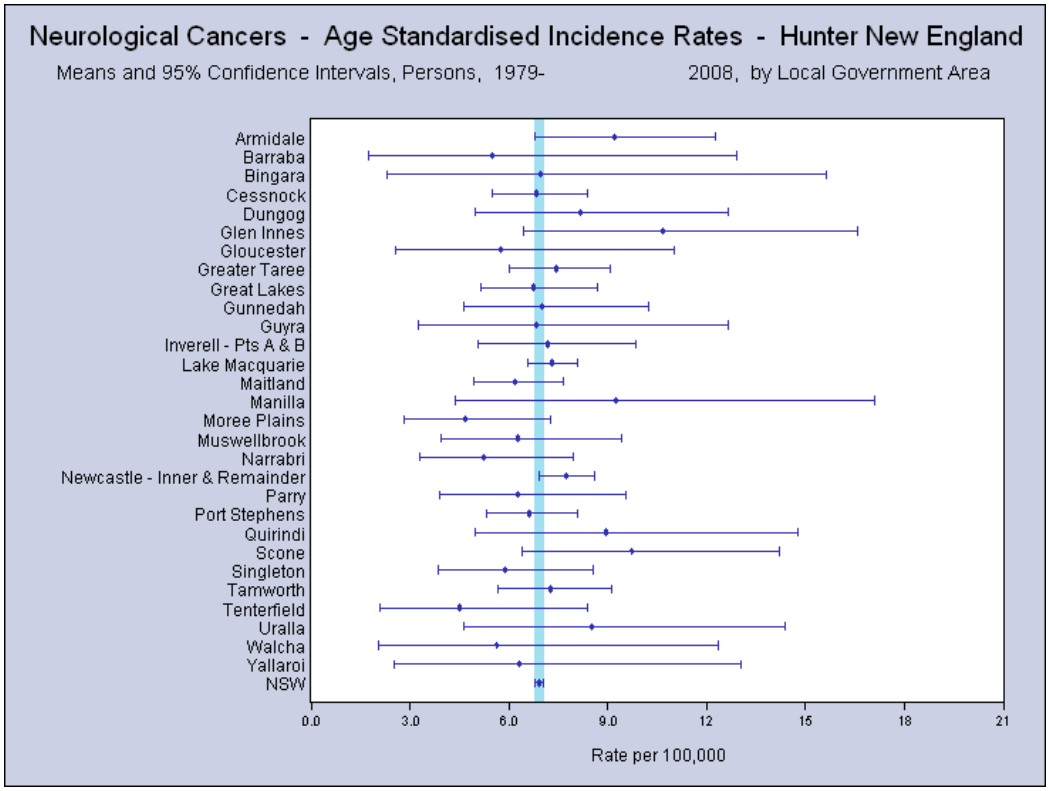
The probability that a cluster of 4 brain tumours would occur in a similar area or combination of streets is most likely about 1 in 5.

ASSESSMENT

Following review of the information collected and results of the analyses, Professor Armstrong advised that the geographical location of these brain tumour cases is most likely to be a chance occurrence. He based this opinion on the lack of any increase in brain tumour rates in the Singleton Local Government Area as a whole compared to NSW, the lack of a specific environmental hazard in the part of Singleton in which the cases lived that might be linked with brain tumour occurrence, and the reasonable probability that such a geographical grouping could occur by chance alone.

Professor Armstrong has recommended that further investigations are not likely to be useful.

Table 1. Neurological Cancers in HNE 1979 – 2008 by LGA



References

1. Cancer Council Victoria Epidemiology Centre. Canstat: Cancers of the brain and central nervous system. 2010; 48. Available at http://www.cancervic.org.au/downloads/about_our_research/canstats/more_canstats/canstats-48.pdf