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Trends in brain tumour incidence in the 60+ age group in Australia from 1982 to 2013

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We recently reported no increase in any brain tumour histological type or glioma location between 1982 and 2013 in Australia that can be attributed to the use of mobile phones[1]. Our analysis included brain tumour incidence in adults aged 20–59 years but Phillips[2] criticised this age-range mentioning that it was inappropriate not to include the 60+ age group which has the highest incidence of brain tumours. In a response to Phillips[3], we reiterated that the age-range in our study was chosen in order to compare our results with the Interphone study[4]. We further mentioned that including cases older than 60 would be more affected by improvements in diagnosis and their inclusion would reduce the chance of assessing mobile phone related changes to tumour incidence.

As a follow up to our original analysis, we investigated the incidence trends of brain tumour histological types and anatomical location in Australians aged 60+ diagnosed between 1982 and 2013. The methods of our follow up analysis were the same as our original study[1] and the observed incidence trends, given as annual percentage change (APC) and 95% confidence limits, were examined over the time periods 1982–1992, 1993–2002 and 2003–2013 (representing increased CT and MRI use, advances in MRI and substantial and increasing mobile phone use, respectively).

There was a total of 20300 eligible brain cancer cases aged 60+ that were diagnosed between 1982 and 2013. The observed incidence trends for glioma were: 3.62 (2.60 – 4.65) during 1982–1992; 0.96 (0.03 – 1.91) during 1993–2002; and 0.30 (-0.41 – 1.02) during 2003–2013. Specifically for glioblastoma the incidence trends were 5.18 (3.75 - 6.63), 2.57 (1.43 - 3.72) and 1.28 (0.47 - 2.10) for the three time periods, respectively. Thus there were substantial and significant increases in the first two periods, concordant with diagnostic improvements, and much smaller or no trend in the third period.

There were decreasing trends in the 60+ age group for brain tumours with unspecified histology during the periods of increased and more precise diagnosis i.e. during 1982–1992 and 1993-2002. With the redistribution of unspecified tumours as was performed in our original study, there were no significant changes to the histological trends.

It has been previously reported that the temporal and parietal lobes are more highly exposed to radiofrequency radiation than other brain sites when using a mobile phone[5]. In the analysis of glioma location of the 60+ age group the incidence trends for the temporal lobe were 10.07 (6.95 - 13.28), 3.93 (1.77 - 6.15) and 3.25 (1.76 - 4.77) for the three time periods, respectively. Specifically in the last period there were 1912 cases of temporal lobe glioma. With the redistribution of a high number of gliomas with unspecified and overlapping location there was a much lower trend for gliomas on the temporal lobe during the period of substantial mobile phone use i.e. 1.69 (0.16 – 3.23) during 2003–2013. Therefore, no significant increased incidence was observed for gliomas of the temporal lobe after accounting for the unspecified tumour locations. For the parietal lobe the incidence trends were 10.07 (7.49 - 12.72), -3.26 (-5.30 – (-1.17)), and -1.28 (-3.07 - 0.55) for the three time periods, respectively. With the redistribution of gliomas with unspecified and overlapping location the trend for parietal lobe tumours decreased further during the period of substantial mobile phone use i.e. -2.58 (-4.16 – (-0.98)).

We also compared the observed incidence of the 60+ age group during the period of substantial mobile phone use (2003–2013) with predicted (modelled) incidence for the same period by assuming a causal association between mobile phone use and glioma (with varying relative risks ranging from 1.5 – 3). Similar to our original results for the 20-59 age group, the predicted incidence rates for the 60+ age group were higher than the observed rates for latency periods up to 15 years.

The pattern of these results is consistent with increased and more precise diagnosis, especially during 1982-1992 and also during 1993-2002. In the last period (2003-2013) there were very small increases in glioblastoma and gliomas of the temporal lobe in the 60+ age group which were most likely due continuing improvements in diagnosis and classification. We maintain that the age range used in our original study was the most appropriate for investigating mobile phone related changes to tumour incidence.

References:

1. Karipidis K, Elwood M, Benke G, et al. Mobile phone use and incidence of brain tumour histological types, grading or anatomical location: a population-based ecological study. BMJ Open 2018;8:e024489.
2. Philips A. Significant flaws and unjustifiable conclusions. Letter to the Editor, BMJ Open, 2019.
3. Karipidis K, Elwood M, Benke G, et al. Response to letter from Alasdair Philips. Letter to the Editor, BMJ Open, 2019.

4. INTERPHONE Study Group. Brain tumour risk in relation to mobile telephone use: results of the INTERPHONE international case-control study. Int J Epidemiol, 2010(39):675–94.
5. Cardis E, Deltour I, Mann S, et al. Distribution of RF energy emitted by mobile phones in anatomical structures of the brain. Phys Med Biol 2008;53:2771–83.