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Mobile phones

Health risks from mobile phone base stations

D Coggon

Commentary on the paper by Hutter *et al* (see page 307)

Concerns about possible adverse health effects of mobile telephony have focused mainly on the risk of brain tumours in users of mobile phones, but other types of illness have also been linked with the technology. In particular, several epidemiological surveys have suggested associations with non-specific complaints such as headache, tiredness, sleep disturbance, loss of memory, and dizziness. These findings, which echo reports of illness associated with other types of radiofrequency (RF) radiation,¹ relate not only to use of mobile phones,^{2–4} but also to residence near to mobile phone base stations.⁵

Further evidence on the latter is provided in a paper by Hutter *et al* in this issue.⁶ They found that symptoms such as headache, fatigue, and difficulty in concentration were more common in people with higher potential exposures to radiation from nearby base stations, and that the association remained significant after adjustment for various possible confounding factors, including regular personal use of mobile phones.

Given these new findings, how strong is the evidence that residential proximity to mobile phone base stations causes illness, and if it does, what is the underlying mechanism?

A weakness of earlier studies was that both exposure and symptoms were ascertained by questioning participants. As a consequence, risk estimates may have been inflated through biased recall. The study by Hutter *et al* avoided this problem by estimating exposures from

measurements of RF fields in subjects' bedrooms. The method was still not ideal. For practical reasons, measurements could only be short term, and may not have captured the full range of temporal variation at the monitoring site. Moreover, participants spent only part of their time at home, and their exposures at other locations may have been quite different. In general, however, the effects of any resultant misclassification of exposures would be to bias risk estimates towards the null, and not to give spurious associations.

A more important limitation, given the large number of health outcomes examined in the study, is the possibility that some associations occurred by chance. Concerns about this are reduced insofar as positive associations were observed with many of the symptoms examined. However, further confirmation is needed before an elevated risk of such symptoms can be regarded as established.

Even if there were a true association, it would not necessarily imply a toxic effect of RF radiation. Currently there is no known biophysical mechanism by which low level exposures could cause toxicity in a substantial proportion of the general population (the excess prevalence of many symptoms in the Hutter *et al* study was more than 15%), when the same symptoms do not appear to be a problem in many people who regularly use mobile phones for prolonged periods with exposures to the head that are orders of magnitude higher. An alternative possibility is that

illness occurs as a psychologically mediated response to a perceived hazardous exposure. In this respect, it is notable that similar symptoms have also been reported in relation to a diverse range of chemical exposures, again without any demonstrable underlying toxicological mechanism.⁷

Hutter and colleagues tried to address this possibility by adjusting risk estimates for individual beliefs about health risks from base stations, but the fact that associations persisted after this adjustment does not exclude a psychological origin for the symptoms. To give an extreme example, if everyone in the study had identical beliefs, the adjustment would have no impact on risk estimates whatsoever, but risk could still depend importantly on people's beliefs and expectations.

Another way to explore pathogenesis is by testing the effects of exposure experimentally in blinded subjects, an approach that will be valid provided that effects are relatively immediate and do not persist for a long time after last exposure. One such study found a significant reduction in wellbeing with exposure to RF fields similar to those produced by a UMTS (universal mobile telecommunications system) base station, both in subjects who had previously indicated symptoms that they attributed to base stations, and also in healthy volunteers.⁸ However, there was no parallel effect from GSM (global system for mobile telecommunication) type fields, and in an earlier experiment by Hiattinen and colleagues,⁹ the incidence of symptoms in subjects who believed that they were sensitive to radiation from mobile phones was higher during periods of sham than of real exposure. Interpretation of these inconsistencies can only be resolved by further research.

Meanwhile, decisions on the siting of base stations must be made in a context of uncertainty. Hutter and colleagues propose that as a precautionary measure, base stations should be positioned in a way that minimises the exposure of neighbours, and this seems a sensible

policy where other considerations are equal. However, the suspicion of a toxic effect is relatively low, and there may be disadvantages in over-precaution. Evidence is emerging that prior beliefs about the risks from modern technology are an important predictor of symptoms from perceived exposures.¹⁰ Thus, by distorting perceptions of risk, disproportionate precaution might paradoxically lead to illness that would not otherwise occur.

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Correspondence to: Prof. D Coggon, MRC Epidemiology Resource Centre, Southampton General Hospital, Southampton SO16 6YD, UK; dnc@mrc.soton.ac.uk

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