

Public Responses to Precautionary Information from the Department of Health (UK) About Possible Health Risks from Mobile Phones

Julie Barnett¹, Lada Timotijevic, Richard Shepherd and Vicky Senior

¹Department of Information Sciences and Computing
Brunel University

Public Responses to Precautionary Information from the Department of Health (UK) About Possible Health Risks from Mobile Phones

© Dr Julie Barnett

Reader in Healthcare Research
Department of Information Systems and Computing
Brunel University
Kingston Lane
Uxbridge, UB8 3PH
tel: +44 (0)1895 266385

ABSTRACT

Understanding public perceptions of health information is of increasing importance in the light of the growing imperatives upon regulators to communicate information about risk and uncertainty.

Communicating the possible health risks from mobile telecommunications is a domain that allows consideration of both public perceptions of uncertain public health information and public responses to precautionary advice. This research reports the results of a nationally representative survey in the UK (n = 1742) that explored public responses to a leaflet issued by the Department of Health (DoH) in 2000 providing information about the possible health risks of mobile phones. The aims of the study were twofold: a) to assess awareness of the leaflet and the extent to which participants could identify the precautionary advice that the leaflet contained as coming from the Government; and b) to examine publics' responses to the current Government precautionary advice about mobile phone health risks; was this associated with increased concern or reassurance? The results indicate the importance of policy makers developing a clear understanding of the possible effects of communicating precautionary advice.

Key words: policy development, uncertainty, risk communication, precaution, mobile phones

1. Introduction

Understanding public perceptions of health information is of increasing importance in the light of the growing imperatives upon regulators to communicate information about risk and uncertainty.

Communicating the possible health risks from mobile phones is a domain that allows consideration of public awareness of the Government precautionary advice about mobile phone health risks and public responses to precautionary advice. Previous work addressing the first dimension of this issue is suggestive of limited awareness of government communications about possible health risks from mobile phones [1]. On the second point, a recent overview of the sparse literature around public perceptions of precautionary advice suggests that the provision of such advice has largely been linked with the intensification of existing public concerns [2]. The present work builds on the largely qualitative work that has been carried out in this area and reports the results of a survey with a nationally representative sample in the UK that explores awareness of and responses to the Department of Health (DoH) leaflet [3] about the possible health risks of mobile phones.

1.1 Precautionary Approaches Around Mobile Phones in the UK

Policy makers in the UK have been grappling with the issue of how to manage the uncertainties associated with the possible health effects of mobile phones. Two particular areas of concern within this have been around communication of uncertainty, and precautionary actions and advice around possible mobile phone health risks.

The last decade has seen huge growth in mobile phone use: recent statistics [4] indicate that there are now 61.2 million mobile phone subscribers in the UK – a number greater than the UK

population. 85% of UK households have mobile phones and 27% of all calls are made from mobile phones. Between 2000 and 2004 the total number of minutes of mobile calls almost doubled from 34 to 62 billion. In the context of this unparalleled growth there has been ongoing expert and intermittent public attention to the possible association between radio waves and negative health impacts.

In the wake of well publicised public concerns, in 1999 the Minister for Public Health instructed the National Radiological Protection Board (NRPB) to set up an independent expert working group to assess the state of research into mobile phones. The resulting report [5] by the Independent Expert Group on Mobile Phones (IEGMP) investigated whether there was any scientific basis for linking mobile phone signals with negative health impacts on concentration, memory and attention as well as cancers and effects on the cardiovascular, endocrine and immune systems. Uncertainties were explicitly recognised as the report concluded that,

“... it is not possible at present to say that exposure to RF radiation, even at levels below national guidelines, is totally without potential adverse health effects, .. the gaps in knowledge are sufficient to justify a precautionary approach”. (para 6.35-6.42).

The recommended precautionary approach found expression in a range of specific actions and pieces of advice. The most important action pertained to the maximum level of exposure to RF radiation emitted from mobile phones. In 1998, the International Commission on Non-Ionising Radiation Protection (ICNIRP) [6] published guidelines in which the recommendation for the maximum levels of exposure to the RF radiation was set to levels 5 times lower for the general public than those previously set by the NRPB [5]. It also stated that the reasoning for this was that some members of the general public may be extra sensitive to the exposure to RF radiation, although there had been no

conclusive scientific evidence to justify this additional safety measure. The ICNIRP recommendation for the public was soon incorporated into a European Council Recommendation [7] and was also recommended by the IEGMP in 2000 and adopted by the UK Government. In 2004, following an extensive review of scientific evidence for health effects of exposure to RF fields, the NRPB [8] upheld the recommendations made by the ICNIRP in 1998 [6] and IEGMP in 2000 [5], welcoming the introduction by government of tighter exposure guidelines for the public.

The main recommendation relating to public information about government precautionary advice was that a leaflet providing clearly understandable information on health related aspects of mobile phone technology should be widely circulated and available at the point of sale. Following this, two leaflets were produced by the Department of Health – one about mobile phones [3] and the other about base stations [9]. The focus of the present article is upon public perceptions of the mobile phones leaflet as not only does it communicate uncertainty but also provides precautionary advice. This leaflet explains that there ‘are significant gaps in our scientific knowledge’ and that in the face of these, there are ways in which ‘you can choose to minimise your exposure to radio waves’. Three pieces of precautionary advice were outlined: keeping calls short, those under 16 minimising non-essential calls and taking account of the Specific Absorption Rate (SAR) associated with the handset¹. A report detailing the way in which the recommendations of the IEGMP had been implemented [8] noted that around 9 million leaflets had been distributed at point of sale, through doctors’ surgeries, post offices, libraries and through local authorities.

Thus far there has been no formal evaluation of this communication and no evidence is available either about to what extent people have come across the leaflet nor whether they are aware about

¹ The SAR value is the amount of energy from radio waves absorbed by the body when using a mobile phone).

what government advises. The literature is suggestive of at least two factors that might be predictive of awareness of risk information – concern about uncertainty and trust. It is reasonable to expect that the existing concern about uncertainty will be linked in some way to the way in which information about the uncertain risk is sought and processed. In addressing the way in which concern affects information-seeking behaviour, we can draw upon an extensive literature that has looked at information that might be perceived as threatening (for a recent overview see [10]). At its most basic, we would expect that individuals who find the threat relevant and significant, for example those who are concerned about uncertainty, will have different strategies in relation to processing the information provided than those who do not [11]. The literature suggests that low and intermediate fear levels typically elicit ‘danger control’ responses such as information seeking [12]. Similarly, Neuwirth [13] noted in a review article, that where individuals perceive a risk they are more likely to seek out information. Other factors, such as trust, have also been linked with the way in which information about the risk is processed [14]. The relationship between trust and information seeking behaviour may be mediated by perceptions of risk [10].

1.2 Public Responses to Uncertainty

Although in one sense precaution, with its emphasis on anticipation of harm, is always at the core of health policy, there has been extensive debate about the possible negative implications of precautionary approaches [15, 16]. Within UK the advice to government was that a precautionary approach should be taken ‘when the level of scientific uncertainty about the likelihood or consequences of the risk is such that the best available scientific advice cannot assess the risk with sufficient confidence to inform decision making’ [17]. Thus, one of the dimensions of adopting a precautionary approach to mobile phones is the need to communicate scientific uncertainty about health risks [18].

There is a growing body of research around public perceptions of the communication of uncertainty. Most of the work in this area has focused upon firstly, the impact of uncertainty upon perceptions of risk or the source of the risk communication, and secondly upon factors that affect public responses to uncertainty. The communication of risk can itself cause increased concern [19, 20], however it is not necessarily the case that communication of uncertainty produces greater concern than ‘certain risk’ estimates do [21, 22, 23]. It is unclear in this literature however to what extent people distinguish between risk and uncertainty.

There is some evidence suggesting that uncertainty can reduce motivation to act as it may confuse and can be used to discount the seriousness of the threat and excuse complacency [22, 24, 25]. On the other hand, under some circumstances the communication of uncertainty may increase the credibility of the information source [21, 26] indeed it may be claims of safety, rather than admissions of uncertainty that are mistrusted [27].

A second focus in research is upon the factors likely to affect the way in which people make sense of uncertain public health information. Differences between individuals in their beliefs and value systems [22] and varying formats for presenting risk information [25] are likely to affect responses to uncertain information. The nature of the risk itself [28] and of changing concerns about other risks on the risk landscape [29] are also important. In considering public responses to precautionary information about mobile phones it is also necessary to note that possible health risks from mobile phones are generally seen as rather less serious than a range of other risks [1, 30, 31]. These data also suggest that the benefits of mobile phones are highly salient, that appreciation of benefits offsets concerns about uncertainty and that over recent years there has been a trend towards fewer people believing that handsets are bad for health.

1.3 Public Responses to Precaution

In addition to communicating scientific uncertainty, the precautionary approach recommended by the IEGMP was also aimed at reducing public concern about the possible health risks of using mobile phones. Indeed public concern was explicitly part of the rationale for setting up the IEGMP [2]. Examination of the IEGMP report itself and the subsequent government response to it makes it clear that precautionary approaches were seen to be a way of addressing and reducing public concern.

The IEGMP [5] prefaced their recommended series of precautionary measures by saying,

“ We recommend that national and local government, industry and the consumer, should all be actively involved in addressing concerns about possible health effects of mobile phones.”

(para 6.40).

In accepting the recommended precautionary approach, the government response to the IEGMP report was more explicit in anticipating the expected effects of a precautionary approach [32]:

“The report makes helpful recommendations on measures to reduce public concern about the health impacts of MT technologies.” (para 1.2)

Although, as noted above, there is a growing body of research around public perceptions of the communication of uncertainty, public perceptions of precautionary advice have thus far been the subject of much less attention.

There has been no formal evaluation of the DoH leaflets. In a qualitative study that (among other things) explored public perceptions of the DoH leaflet [1] awareness of the leaflets was low and precautionary advice tended to be conceived of as ‘commonsense’. Other research has more directly addressed the question of the impacts of precautionary advice in relation to mobile phones. The results of these are generally in line with the view that precautionary advice coheres and intensifies existing concerns by implying that ‘there is no smoke without fire’ [33]. Other work [34, 35] also suggests that precautionary advice is unlikely to have the desired effect of reducing concern although a qualitative study of public responses to precaution suggests that this may oversimplify the relationship between precautionary advice and public concerns [2].

1.4 Aims of the Study

In summary, in a context where considerable benefits are perceived from the technology and where mobile phone use is widespread, the DoH leaflet disseminated in the wake of the IEGMP report acknowledged uncertainty and advised precaution. Building on previous qualitative research, a nationally representative survey was commissioned under the Mobile Telecommunications Health Research Programme in the UK to, first, explore public awareness of the DoH leaflet and second, assess responses to the precautionary advice contained in the leaflet. More specifically the aims of the study are to explore:

1. (a) the degree of public awareness of the DoH mobile phones leaflet, (b) the relationship between people’s reported awareness of Government advice and their ability to identify specific pieces of advice as coming from the Government leaflets; (c) the predictors of publics’ ability to correctly identify the Government precautionary advice about mobile phone use.
2. (a) Responses to precautionary advice about mobile phone health risks - do they reassure public about the uncertain mobile phone risks, or are they associated with increased concern?; (b)

factors affecting people's responses to precautionary advice - do they vary as a function of their concern about uncertainty and/or their ability to identify the advice as coming from the Government?

2. Method

2.1 The Survey

The Office of National Statistics (ONS) Omnibus Survey provides nationally representative data on adults aged 18 and over living in private households in Great Britain. The survey achieved an overall response rate of 65 percent. In November 2004 one module of this survey consisted of 19 questions focusing on awareness of the DoH leaflets about phones and base stations, knowledge of leaflet content and public perceptions of the possible health risks of mobile phones and of mobile phone masts. In addition, the ONS Omnibus Survey routinely collects a wide range of social demographic data relating to (for example) age, household and education. These questions were administered through face to face interview.

2.2 Participants

Face to face interviews were conducted with 1742 people in November 2004. Fifty three per cent of the participants were female (n = 925). 47% were male (n = 817). The mean age was 47 years (SD 18.34). Twenty per cent were between 16 and 29 years old, 17% were between 30 and 39 years old, 27% were between 40 and 54 years old and 38% were 55 years or older. Twenty six percent were

the parent (or the partner of a parent) of a child aged under 16 living in the household (n = 452) and 74% (n= 1290) were not.

2.3 The Key Variables

Details of the questions asked in the mobile phone health risks module are as follows:

1. *Awareness of the leaflets*: 2 questions asking respondents if they had come across a Government leaflet about health risks associated with mobile phones/base stations (response options: yes, no, don't know).
2. *Identification of the Government advice*: Respondents were asked to select up to three pieces of practical advice that they believed had been issued by Government from a list of eight. These were (a) to keep your calls short, (b) discourage use of non-essential calls in children and, (c) to consider relative SAR values when buying a new phone (a sentence clarifying the meaning of SAR values was included). The remaining five, though not coming from the Government, were chosen because they were also in the public domain. They were selected from the newspaper clippings about mobile phone health risks and the transcripts of the focus groups on this topic [2]. Spontaneous responses of 'none of these' and 'don't know' were also coded.
3. *Current mobile phone use* was measured on an ordinal scale and assessed using seven response options ranging from 'don't use a mobile phone'(1), through 'less than once a month' (2) up to 'several times a day'(8)
4. *Concern about uncertainty* was assessed with 5 questions asking people how concerned they were about various uncertainties about mobile phones. For example, the questions included: 'How concerned are you that some people may be particularly vulnerable to possible health risks associated with mobile phones?' or 'How concerned are you that current research may underestimate the possible health risks linked to mobile phones?' Responses were on a five point scale ranging from

not at all concerned (1) through moderately concerned (3) to extremely concerned (5). The items were combined into a single scale with good reliability ($\alpha = .92$).

5. *Trust* was operationalised with three single items that previous research [30] suggests represent different dimensions of trust: Value similarity ('The Government has the same opinions as me about possible health risks of mobile phones'); General Trust ('The Government provides all relevant information to the public about possible risks of mobile phones'); and Scepticism ('The Government changes policies regarding the possible health risks of mobile phones without good reasons').

Responses were on a five point scale ranging from strongly agree (1) to strongly disagree (5). The Scepticism item was recoded such that high scores on all three items indicated higher trust.

6. *Responses to precautionary advice*: was assessed by asking whether the three pieces of advice in the DoH leaflet (see *Identification of Government advice* above) made them feel more concerned or reassured them about the possible health risks. Responses were given on a five point scale ranging from 'greatly increases my concern' (1) to 'greatly reassures me' (5).

2.4 Analytic strategy

The variables of concern about uncertainty, trust and responses to precautionary advice were screened for assumptions of normality. The relationship between socio-demographic and psychosocial variables and awareness of the DoH leaflets were assessed with chi-square tests and t-tests. In addition to descriptive statistics, a logistic regression was used to identify what best predicts correct identification of the three pieces of precautionary advice as coming from the Government leaflets. Responses to precautionary advice are summarised graphically and a Multivariate Analysis of Variance (MANOVA) is used to determine the effects of concern about uncertainty and correct identification of Government advice upon responses to each component of Government precautionary advice.

3. Results

3.1 Awareness of the Department of Health Leaflets

Fifteen per cent of the sample reported having come across the DoH leaflet about mobile phone health risks, 10% reported coming across the masts/base stations leaflet. Eight per cent reported having come across both leaflets. Chi-square tests were carried out in order to identify whether there were any significant relationships between socio-demographic variables and awareness of the mobile phones leaflet. There were no differences between those who did and did not report seeing the leaflets in relation to gender, age, education or between those who were or were not parenting a child under 16. Those that used a phone reported greater awareness of the leaflet than those who did not (chi square = 5.37, df = 1, p= .02).

There was no significant difference between those that had and had not come across the leaflets in their concern about uncertainty. On the trust variables those who report coming across the mobile phones government leaflet reported significantly higher levels of General Trust (m = 2.72) than those who did not (m = 2.34)(t[1531]= 5.7, p~0).

3.2 Identification of precautionary advice in the Department of Health leaflets

Table 1 summarises how successful people were in identifying which pieces of practical advice had been issued by Government. It shows 'keeping calls short' and 'discouraging non-essential calls for those under 16' were both correctly identified by over 25% of the sample. Only 9% recognised that consideration of SAR values was Government advice. It is also noteworthy that almost a quarter of

the sample spontaneously said that none of the advice emanated from Government. Fifty three percent of the sample (n = 926) did not correctly identify any of the advice; 47% (n = 816) identified at least one piece correctly.

- Table 1 about here –

Table 2 depicts the relationship between awareness of the leaflet and correct identification of Government advice in the leaflets. A chi square test reveals that having seen the leaflet is associated with correct identification of at least one piece of advice (chi square = 68.7, df = 1, p ~ 0).

- Table 2 about here –

3.2.1 What Predicts Recognition of Government Advice?

Logistic regression was used to explore how well we can predict identification of government advice, and what the significant predictors are. The analysis examines whether seeing the leaflet significantly increases the likelihood of correctly identifying the safety advice as coming from the Government over and above what people will pick up vicariously or believe emanates from other sources. It was also our aim to examine the role of other factors – specifically concern about uncertainty and trust of Government - in predicting the likelihood of correctly identifying Government advice.

The outcome variable to be predicted was the categorical variable of correct identification of Government advice. There were two levels of this variable: 'no pieces of government advice correctly identified' (0) and 'at least one piece of government advice correctly identified' (1).

Only those variables that had a significant bi-variate association with the outcome variable were considered as predictors. The predictors were entered into the analysis in three blocks: firstly the background variables of age, education, level of mobile phone use (measured on ordinal scale) and whether or not they were parenting a child of under 16 (categorical variable); the second block consisted of the psychosocial variables of concern about uncertainty, general trust and value similarity (continuous variables). The categorical variable ‘awareness of the mobile phone leaflets’ variable was entered in a third block.

A total of 1272 cases were included in the analysis. The entry of each block produced a significantly better fit of the model to the data. The full model was significant (chi square = 102.56, df = 8, $p < .000$). Table 3 gives the summary statistics and shows how important each predictor variable was independently of the effect of the others. The final regression model indicates that more accurate identification of Government advice is associated with higher levels of phone use, greater value similarity with Government, greater concern about uncertainty, and awareness of the Government leaflet. The Cox and Snell pseudo R-square indicates that the fit of the model to the data is modest. The model was more accurate in predicting those that identified at least one piece of advice (66%) than for those that did not (53%).

- Table 3 about here –

3.3 Responses to Precautionary Advice

Figure 1 depicts participant responses to the three pieces of practical precautionary advice given in the DoH leaflet. The profile of scores is similar for each item: for 44% of participants, the advice to

keep the phone-calls short was associated with slightly or greatly increased concern; the other two pieces of advice (discourage calls for under 16s and consider SAR values) were associated with greatly or slightly increased concern for around 48% of participants. A much smaller percentage of people felt reassured about any of the pieces of advice. 24% of participants felt slightly or greatly reassured by the government advice of 'Keeping calls short' and 'Consider SAR values'. Just under 30% of respondents were greatly or slightly reassured by Government discouraging non-essential calls for under-16. It should be emphasised that for all three responses to precautionary pieces of advice variables, the mean score was towards greater concern. There were no differences in responses to precautionary advice between those that had and had not come across the DoH leaflet.

- Figure 1 about here -

In order to explore the effects of concern about uncertainty upon responses to the three different pieces of precautionary advice a Multivariate Analysis of Variance (MANOVA) was carried out. This analysis also allowed us to explore the effects of correct identification of precautionary advice upon responses to it. In summary, the outcome variables were the responses to three pieces of government precautionary advice; the independent variables were concern about uncertainty (high vs. low) and identification of precautionary advice (identified none correctly vs identified one or more correctly).

The overall MANOVA revealed main effects for both concern about uncertainty ($F = 18.26$, $df = 3$, $p \sim 0$) and correct identification of Government precautionary advice ($F = 5.45$, $df = 3$, $p < .001$).

There were no interaction effects. The nature of these effects on each of the dependent variables is summarised in the table of means below (Table 4). For both 'keep calls short' and 'discourage non-essential calls for U-16s', correctly identifying Government advice is associated with being more

reassured – or, bearing in mind what the mean score on these items was, it might be more correct to say “less concerned” - by it. The effect on ‘consult SAR values’ is not significant although the means are trending in the same direction. The effect of concern about uncertainty is significant for all three pieces of advice: those with high concern about uncertainty rate all three pieces of precautionary advice as associated with significantly greater concern than do those with low concern about uncertainty.

- Table 4 about here -

4. Discussion

The aim of this study was to explore awareness of the precautionary advice contained within the DoH leaflet about mobile phone health risks, and public responses to it. 15% of a nationally representative survey indicated that they were aware of the leaflet. The extent to which people recognised the precautionary advice within the leaflet varied for different pieces of advice. Awareness of the leaflet was the best predictor of correct identification of the leaflet content although mobile phone use, trust and concern about uncertainty significantly improved the prediction. Overall, precautionary advice was generally associated with increased concern rather than providing reassurance. Those that were more concerned about uncertainty and those that did not correctly identify Government advice were more concerned about, rather than reassured by, precautionary advice.

Within a nationally representative UK sample, the first aim was to assess awareness of the DoH leaflet, ‘Mobile Phones and Health’. Previous qualitative work had suggested that this might well be

low. Fifteen percent of our sample reported having come across the leaflet. We have no clear indication of what the expected figure was, either in the commissioning of the leaflet, or afterwards, following its distribution. It may be thought that the 15% is rather high, which could be attributed to the way in which the question was formulated to be as broad as possible (i.e. “have you *come across* the leaflet”). There were few relationships between leaflet awareness and demographic variables. It is noteworthy that those who were phone users were marginally more likely to have come across the leaflets than those that were not. It is likely that this relationship between phone use and awareness of the leaflet would be considerably more substantial were the leaflets to be distributed in the box containing a new mobile phone, rather than at the discretion of those at point of sale. One of the clear themes of recent risk research that can be applied to the provision of public health information is that it should be linked with and embedded within people’s everyday practices in a relevant way [1]. Arguably this would be best achieved by consistently receiving information in tandem with receiving a phone.

Awareness of the leaflets was also related to perceptions of the extent to which the Government provides relevant information to the public – those who thought the government provided relevant information were more aware of the leaflet. The reason for this relationship is unclear: it may be that those who have higher trust in government are more attuned to such information. Conversely, being aware of the leaflets may lead to conclusions about the likelihood that the government provides relevant information. The resulting challenge however, is common to both explanations: how to increase the awareness of government communications for those who are distrustful of Government.

It was also our aim in this study to identify the extent to which particular pieces of practical precautionary advice contained in the leaflets were identified as Government advice. Although

keeping calls short and minimising non-essential calls for those under 16 might be considered as commonsense ways to minimise exposure to possible health risks from mobile phones only 31% and 26% respectively selected these options. Arguably overall, recognition of government advice was low: alongside the fact that 53% of participants did not identify *any* of the advice as coming from Government, 23% were unprompted in suggesting that there was no Government advice in the list. It is important to note that people may have been aware of this information but did not believe that it constituted Government advice.

We also considered the predictors of correctly identifying Government advice. As with awareness of the leaflets, demographic variables were relatively unimportant. As suggested by the literature in this area, the psycho-social variables of trust and concern about uncertainty were significant predictors of those people who correctly identified Government advice: those that saw their views as similar to those of the Government were more likely to identify Government advice, as were those who were concerned about the uncertainties around mobile phone health risks. Unsurprisingly, the best predictor of correct identification of Government advice was awareness of the leaflet. We can make several reflections on this set of relationships. Firstly, the weak relationship between socio-demographics and the outcome variable can perhaps be explained in relation to the massive penetration of mobile phones across all sections of the population. In these circumstances little differentiation between different socio-demographic groups might be expected. Secondly, the relationships of trust and concern about uncertainty with the outcome variable are suggestive of different 'routes' for knowing what Government advice is. On the one hand, those who adjudge their values to be similar to those of Government may well be attuned to a likely Government position. On the other hand, those who are concerned about the uncertainties of mobile phones risk may seek out such information. Importantly, concern about uncertainty and trust are not linked to the outcome

measure by virtue of awareness of the leaflet: that is, awareness is not mediating the relationship between the psycho-social variables and correct identification of advice.

The second aim of this study was to examine publics' responses to each component of precautionary advice contained within DoH leaflet. The overall pattern of results ties in with previous literature in this area: precautionary advice was generally interpreted as causing concern rather than providing reassurance. This suggests the need for care around the provision of precautionary advice as part of public health information. It seems clear that providing such advice as a response to public concern is unlikely to reassure. Of course there is not a problem *per se* with the notion that the provision of precautionary information about uncertainty leads to asked, rather than answered, questions – this may promote a healthy scepticism and critical trust [30]. Qualitative work suggests that for those with existing strong concerns, information about uncertainty might be used to support their cause [1] and negotiate new facets of the hazard [2, 36].

In interpreting these results it is important to note that the discourse around communicating precaution is that it would lower heightened concerns. However, the results here work in the opposite direction. Those who expressed higher levels of concern about uncertainties had the greatest concerns about precautionary advice. Those who had low existing levels of concern about uncertainty had lower levels of concern around precautionary advice. Interestingly, regardless of the initial level of concern about uncertainty, the general trend is towards increased concern about government advice. However the fact that it is those that are most concerned about uncertainty that are the least reassured by government advice is ironic insofar as an important part of the justificatory discourse around the provision of precautionary advice is that it is in response to public concerns [2]. One possible reason for this links with existing work in this area [33, 34, 35]: for those that are concerned, precautionary advice signals risk and thus intensifies concern. It may also be that public

concern is not in response to the uncertainty embedded within precautionary policies, but to what they perceive as a certain risk in relation to mobile phones.

The results also showed that those who correctly identified at least one piece of Government (precautionary) advice were less concerned by the advice than those who did not. Communication about scientific uncertainties remains a relatively new policy stance and it may be this ‘newness’ that publics are responding to rather than the communication of uncertainty and the provision of precautionary advice *per se*.

It is important not to over simplify the relationship between precautionary advice and concern. As noted above, qualitative work has suggested that the concern-reassurance dimension is not the only way in which people evaluate the provision of precautionary advice [2]. In the survey, the closed response options were on a predetermined scale. Clearly this does not provide any opportunity for the expression of exceptions and shades of meaning.

In conclusion, we can offer some final policy-relevant observations on this issue. Firstly, although the content of the leaflets matches the brief set by the IEGMP, the objectives of the leaflets are somewhat obscure: for example, are they providing information or enabling appropriate behaviour change? Are they aimed at those who are concerned about the possible health risks of mobile phones or at a more general population? For research to effectively evaluate the impact of such communication, greater clarity is needed about these areas. The cross sectional data reported can serve as useful baseline information against which the effect of future communications in this area can be evaluated.

Secondly, it is arguably a tall order to promote awareness and knowledge of government advice about uncertainty and precaution in a context where for most people the personal benefits of phone use are considerably more salient than risks and uncertainties. The obvious integration of mobile phones in so many aspects of our personal and social lives is hardly a credible backdrop for the presentation of uncertainty and of precautionary advice.

A third and related point is to note the dilemma around communicating health information that is hedged about with uncertainty. In the light of the multiple sources of information that are encountered on a daily basis, communication of health risk messages should be clear and relevant and capable of capturing public attention [1]. This is a challenge even when the message is relatively unambiguous. The difficulties are multiplied when the message is drawing attention to uncertain science and potential precautionary actions in the context of broad consensus around substantial benefits.

Finally, communication of a precautionary stance may not reassure concerned publics. Indeed, it is debatable whether the rationale for adopting precautionary advice should be based around the instrumental rationale of reducing public concern. If the aim of public information is to change an aspect of people's behaviour in relation to the uncertain risk, then reduction in concern (or reassurance) would arguably decrease people's willingness to change the risk-relevant behaviour. In the light of the increasing imperative for transparent communication of uncertainty this is likely to prove an ongoing policy challenge.

References

- [1] Petts J, Wheeley J, Homan J, & Niemayer S (2003) Risk Literacy and the Public: MMR, Air Pollution and Mobile Phones, Department of Health: London
- [2] Timotijevic L & Barnett J (2006) Managing the Possible Health Risks of Mobile Telecommunications: Public Understandings of Precautionary Action and Advice, *Health, Risk and Society*, 8, 2, 143-164
- [3] Department of Health (2000) Mobile phones and health. London: Department of Health
- [4] OFCOM (2005) The Communications Market. <http://www.ofcom.org.uk/research/cm/cm05/>
Accessed 07.02.06
- [5] IEGMP (2000) Mobile phones and Health. Didcot, UK: NRPB
- [6] ICNIRP (1998) Guidelines for limiting exposure to time-varying electric, magnetic and electromagnetic fields (up to 300GHz). *Health Physics*, 74(4), 494.
- [7] EC (European Commission)(1999) Council Recommendation of 12 July 1999 on the Limitation of Exposure of the General Public to Electromagnetic Fields (0 Hz to 300 GHz). *Official Journal of the European Communities*, L199, 59 (1999/519/EC)
- [8] National Radiological Protection Board (2004) Mobile Phones and Health, Documents of the NRPB, Vol 15, No 5, Didcot: NRPB
- [9] Department of Health (2000) Mobile Base Stations and Health. London: Department of Health
- [10] Kuttschreuter, M (2006) Psychological determinants of reactions to food risk messages, *Risk Analysis*, 26, 4, 1045-1057
- [11] Witte K and Allen M (2000) A meta-analysis of fear appeals: Implications for effective public health campaigns, *Health Education and Behavior*, 27, 5, 591-615.

- [12] Griffin RJ, Dunwoody S, Neuwirth K (1999) Proposed model of relationship of risk information seeking and processing to the development of preventative behaviours. *Environmental Research Section A*, 80, S230 - S245
- [13] Neuwirth K, Dunwoody S, Griffin RJ (2000) Protection motivation and risk communication, *Risk Analysis*, 20, 721- 734.
- [14] Trumbo CW and McComas KA (2003) The function of credibility in information processing for risk perception, *Risk Analysis*, 23, 2, 343- 353
- [15] Foster KR, Vecchia P & Repacholi MH (2000) Science and the precautionary principle, *Science*, Vol. 288, Issue 5468, 979-981.
- [16] Sunstein CR (2003) The Paralyzing Principle. *Regulation*, Winter 2002-2003, 32-37
- [17] ILGRA (2002) The Precautionary Principle: Policy and Application, Interdepartmental Liaison Group of Risk Analysis. <http://hse.gov.uk/aboutus/meetings/ilgra/pppa.htm>. Accessed 28/02/06
- [18] Tickner J, Kriebel D & Wright S (2003) A compass for health: re-thinking precaution and its role in science and public health, *International Journal of Epidemiology*, 32, 489 – 492.
- [19] Morgan MG, Slovic P, Nair I, Geisler D, Macgregor D, Fischhoff B, Lincoln D, Florig K (1985) Powerline Frequency Electric and Magnetic Fields: A Pilot Study of Risk Perception, *Risk Analysis*, 5, 2, 139 – 149.
- [20] McGregor DG, Slovic P & Morgan GM (1994) Perception of Risks from Electromagnetic Fields: A Psychometric Evaluation of a Risk-Communication Approach, *Risk Analysis*, 14, 5, 815 - 828
- [21] Johnson BB & Slovic P (1995) Explaining uncertainty in health risk assessment: Initial studies of its effect on risk perception and trust. *Risk Analysis* 15, 485 - 494

- [22] Kuhn K M. (2000) Message format and audience values: Interactive effects of uncertainty information and environmental attitudes on perceived risk, *Journal of Environmental Psychology*, 20, 41-51
- [23] Bord RJ & O'Connor RE (1992) Determinants of risk perceptions of a hazardous waste site, *Risk Analysis*, 12,3, 411 - 416
- [24] Maule AJ (2004) Translating Risk Management Knowledge: The lessons to be learned from Research on the Perception and Communication of Risk, *Risk Management: an International Journal*, 6, 2, 15-27
- [25] Roth E, Morgan MG, Fischhoff B, Lave L. (1990) What do we know about making risk comparisons, *Risk Analysis*, 10, 375-387
- [26] Johnson BB & Slovic P (1998) Lay views on uncertainty in environmental health risk assessment. *Journal of Risk Research*, 1,4, 261 - 269
- [27] Grove-White R, Macnaughton P, Mayer S and Wynne B (1997) *Uncertain World: Genetically Modified Organisms, Food and Public Attitudes in Britain*. Lancaster: Centre for the Study of Environment Change, University of Lancaster
- [28] Miles S & Frewer LJ (2003). Public perception of scientific uncertainty in relation to food hazards. *Journal of Risk Research*, 6(3): 267-283
- [29] Barnett J & Breakwell GM (2003) The Social Amplification of Risk and the Hazard Sequence: The October 1995 OC Pill Scare, *Health, Risk and Society*, 5, 3, 301-13.
- [30] Poortinga, W. & Pidgeon, N. (2003). Exploring the Dimensionality of Trust in Risk Regulation. *Risk Analysis*, 23, 961-972.
- [31] MORI (2004) *Mobile Telephony and Health: Public Perceptions in Great Britain*. Research Study conducted for GSM Association, Mobile Manufacturers Forum and Mobile Operators Association, MORI, Feb 2004

[32] Department of Health (2004) *Mobile Phones and Health: Government responses to the report from the IEGMP (Stewart Group)*

http://www.dh.gov.uk/PublicationsAndStatistics/Publications/PublicationsPolicyAndGuidance/PublicationsPAmpGBrowsableDocument/fs/en?CONTENT_ID=4096744&MULTIPAGE_ID=4903699&chk=EM/9E%2B Accessed May 2005.

[33] Burgess A (2004) *Cellular phones, public fears and a culture of precaution*, Cambridge: Cambridge University Press

[34] Sandman P (2004) Because people are concerned: How should public 'outrage' affect application of the precautionary principle. <http://psandman.com/articles/vodafone.pdf>
Accessed on 28/02/06

[35] Wiedemann P M & Schütz H (2005) The Precautionary Principle and Risk Perception: Experimental Studies in the EMF Area, *Environmental Health Perspectives*, 113, 4, 402-405.

[36] Breakwell GM & Barnett J (2001) *The Impact of Social Amplification on Risk Communication*, Contract Research Report 322/2001, Health and Safety Executive, London: Sudbury

Table 1: Percentage of participants identifying Government advice

	Total %	n
1. Keep your calls short	31	536
2. Only use a hands-free headset for health reasons	29	477
3. Discourage use for non-essential calls in children under 16	26	452
4. None of these	23	392
5. Regularly change side of your head	14	244
6. Hold the handset away from your head while dialling	10	172
7. Consider relative SAR values when buying a new phone.	9	157
8. Don't carry phones in trouser pockets	7	113
9. Pregnant women should keep phone away from stomach	5	89
10. Don't know	16	269
Base	1730	2901

*The size of the total n reflects the fact that participants were asked to identify 3 pieces of Government advice

Table 2: Cross tabulation of leaflet awareness and correct identification of leaflet content

Knowledge of leaflet content	Come across leaflet	
	Yes	No
<i>Identified no advice correctly</i>	79 (29.5%)	816 (59%)
<i>Identified at last one piece correctly</i>	189 (70.5%)	615 (43%)

Table 3: Predictors of correct identification of government advice

Included	B	95% CI for OR		
		Lower	OR	Upper
Constant	-2.47		.085	
Phone use	-.05*	1	1.05	1.12
Age	-.008	.88	.99	1.12
Education	.17	.99	1.18	1.43
Parent of under 16s	.19	.93	1.21	1.6
Concern re uncertainty	.30***	1.12	1.34	1.51
General trust	.06	.94	1.07	1.21
Value similarity	.22**	1.09	1.24	1.21
Seen leaflet	.95***	1.89	2.59	3.6

* $p < .05$; ** $p < .01$; *** $p < .001$; Chi square=102.56, $df=8$, $p < .000$; Cox&Snell $R^2=.075$ (final model)

Table 4: Mean Scores on Responses to Precautionary Advice Variables by Correct Identification of Government Advice and Concern about Uncertainty

CORRECT ID OF GOV ADVICE							
	YES		NO		F	df	p
	mean	SD	mean	SD			
Keep calls short	2.82	1.05	2.62	1.00	15.04	1, 1188	~0
Only essential calls for U16s	2.78	1.21	2.62	1.14	7.59	1, 1188	.006
Consult SAR values	2.69	1.13	2.60	1.09	1.89	1, 1188	NS

CONCERN ABOUT UNCERTAINTY							
	HIGH		LOW		F	df	p
	mean	SD	mean	SD			
Keep calls short	2.61	1.20	2.87	.85	27.94	1, 1188	~0
Only essential calls for U16s	2.60	1.35	2.86	1.02	23.17	1, 1188	~0
Consult SAR values	2.46	1.30	2.88	.91	52.57	1, 1188	~0

5 point response scale from 'greatly increases my concern' (1) to 'greatly reassures me' (5).