

## **Precautionary Advice about Mobile Phones: Public Understandings and Intended Responses**

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## **1 Introduction**

The precautionary principle emerged several decades ago as a new risk regulation paradigm explicitly addressing the challenges of regulating risks whose effects upon environment and human well-being are complex, substantial and uncertain (Tickner, 2003). Expert debate about when, how, and indeed whether, precaution should form the basis for decision making is ongoing (Stirling, 2007; Peterson, 2007). Much less is known however, about public understandings of precaution or about responses to precautionary action or advice (Wiedemann *et al.* 2007). This paper explores these issues in relation to the precautionary stance adopted in the UK around the regulation of mobile telecommunications. Broadly, the aim of the paper is to examine the nature of attitudes to precaution and the way in which these, along with other relevant variables relate to the intention to adopt relevant behaviours.

This introduction will therefore unfold as follows: a brief introduction to the relevant background to the precautionary stance adopted in the UK around the regulation of mobile telecommunications, an overview of what we know about attitudes to precaution, and finally an examination of how these and other variables might relate to each other in predicting the uptake of relevant intended behaviours.

### 1.1 Precaution and mobile telecommunications in the UK

There is a strong imperative in the communication practices of policy makers and regulators to be transparent about uncertainties in public health information. One recent example in the UK concerns the possible health-related risks of mobile telecommunications (MT). Following the advice of the UK Independent Expert Group

on Mobile Phones (IEGMP) chaired by Sir William Stewart (IEGMP, 2000) a precautionary approach was adopted. The maximum level of exposure to radiofrequency radiation emitted from mobile phones was set to be 5 times below the previously recommended NRPB guidelines, and in line with published guidelines of the International Commission on Non-Ionising Radiation Protection (ICNIRP, 1998). It was also recommended that clear and widely disseminated information should be provided about the possible health risks of MT. Subsequently two leaflets were produced by the Department of Health (DoH) – one about mobile phones and the other about base stations (DoH, 2000a, 2000b<sup>1</sup>). In the leaflet about mobile phones it is explained that there ‘are significant gaps in our scientific knowledge’ and recommendations are made about the specific actions people can take in order to minimise possible exposure to radio waves. Three pieces of precautionary advice were given: keeping calls short, for those under 16 to minimise non-essential calls and to take account of the Specific Absorption Rate (SAR) associated with the handset<sup>2</sup>.

The aims of the leaflet are not explicitly stated, however, tracking the evolution of this situation through the policy process suggests that a key motivation for producing the leaflet and in the advice that was offered was to reduce public concern (Timotijevic and Barnett, 2006). In the light of the recommended actions noted above it is also reasonable to assume that the intention of the communication is that there should be appropriate behaviour change by those who wish to reduce their exposure to potentially harmful emissions.

## 1.2 Attitudes to precaution

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<sup>1</sup> These leaflets were updated in 2005 and are available from [http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH\\_4123979](http://www.dh.gov.uk/en/Publicationsandstatistics/Publications/PublicationsPolicyAndGuidance/DH_4123979)

<sup>2</sup> The SAR value is a measure of the amount of energy from radio waves absorbed by the body when using a mobile phone.

There is a small body of literature directly exploring the impact of a precautionary approach upon the public's perceptions of risk, their levels of trust and their emotional responses. Although the rationale of precaution suggests that its aim is to reassure, the research in this area shows that there are a range of possible responses to communicating precaution and uncertainty. An early think piece in this area suggested that communicating precaution is associated with increased concern following an "inexorable" logic that "there is no smoke without fire" (Burgess 2004:90). That the likely effect of communicating precaution may be to signal risk and promote a culture of fear has been suggested in the works of other sociologists such as Furedi (1997) and Durodie (2003). More recently, empirical work has also examined the effect of communicating government precaution about MT health risks upon public concern. Barnett *et al* (2007a), show that 10% and 15% had come across the base station and mobile phone health risk leaflets respectively. They also note that generally this awareness was associated with increased concern rather than providing reassurance. Participants who were negative about uncertainty and whose knowledge of the leaflets content was poor seemed to be particularly concerned by precautionary advice.

Studies reported by Wiedemann & Shutz (2005) and Wiedemann & Thalmann *et al* (2006) used an experimental design to explore the effects of precautionary advice and the certainty of scientific knowledge upon perceptions of risk and trust. The results of both studies indicate that in the precaution conditions participants reported significantly higher perceived risk of electrosmog than in the baseline condition. Furthermore, precautionary approaches were found to be associated with decreased trust that the health protection of the public was assured. Interestingly however, given that uncertainty is the context in which precautionary advice and action is considered most appropriate, the nature of public responses to precaution did not seem to be sensitive to the presence of uncertainty.

These studies have all broadly focused upon the way in which precaution triggers concern or provides reassurance. Thus far we know little about the way that these responses relate to how people feel about precaution *in principle*. Do people value precaution? If yes, why is it that when precaution is embodied in actions or advice, it then often seems to signal risk? Timotijevic and Barnett (2006) reported on a series of focus groups examining publics' perceptions of government precaution about MT health risks and their responses to it. This qualitative study afforded a more nuanced exploration of public responses to precaution and drew attention to the link between the trust afforded to government and the perceived validity of a precautionary stance. Their analysis suggested that the level of trust of the proponents of precaution and the perceived relationships between significant stakeholders in the risk regulation context act to intensify or attenuate the extent to which precaution is seen to signal risk. This suggests that trust in those promoting a precautionary stance may mediate the extent to which precaution is seen to signal risk.

In the third and final section of the introduction we will outline other constructs that might be expected to relate to beliefs about precaution and to have a role in predicting the uptake of relevant intended behaviours.

### 1.3 Precaution and uncertainty, trust, risk perception and efficacy

Perhaps the obvious place to start, considering that the recommendations in the Stewart Report were explicitly framed as a response to continuing scientific uncertainties, is around public perceptions of uncertainty. Early work in this area had suggested that communication of uncertainty may lead to increased concern (Morgan et al, 1985, McGregor et al, 1994). Encouragingly, given the increasing expectation that risk managers should be honest in their communication of uncertainty, other work suggests that this produces no greater concern than 'certain risk' estimates do (Johnson & Slovic, 1995; Kuhn, 2000; Bord & O'Connor, 1992).

Indeed qualitative work has suggested that denials of uncertainty and claims of safety are more likely to be mistrusted than admissions of uncertainty (Grove-White, Macnaughton, Mayer *et al.*, 1997).

According to Johnson and Slovic (1995) the communication of uncertainty may be seen as indicative of agency honesty and an increase in source credibility or may be seen as incompetence. In a qualitative study Timotijevic and Barnett (2006) present data suggesting that against a background of low trust and cynicism, being clear about uncertainty may signal a lack of accountability rather than being seen as being indicative of an open and transparent approach to risk management. Kuhn (2000) illustrates how these relationships may vary in relation to the respondents' prior levels of concern.

The assumption behind the provision of precautionary advice is not only that concern will be reduced but also that behaviour change may be one route through which this is achieved. Thus far however, the question of how precautionary information effects willingness to adopt relevant behaviours has not been addressed. More generally, research suggests that openness and greater detail about a risk (i.e. the severity, level of risk and efficacy of response) may lead to greater information seeking and willingness to take actions designed to avoid the hazard (Neuwirth, Dunwoody and Griffin, 2000). However, the extent to which this is the case for uncertain or precautionary advice is unclear. The provision of uncertain information may be linked to complacency and provide excuse for inaction (Kuhn, 2000, Maule, 2004, Roth et al 1990).

As a final reflection on the relationship between perceptions of precaution and of uncertainty we can note that in the experimental studies by Wiedemann *et al.* (2006), both risk perceptions and ratings of trust were unaffected by the explicit mention of uncertainty. This is arguably strange given that justifications for

adopting a precautionary stance are likely to be linked to the presence of an unacceptable level of uncertainty.

We have explored the possible relationships between beliefs about precaution and concern and perception of risk. We have suggested that trust may contribute to evaluating a precautionary approach as valid. We should note though that the domains within which these relationships are explored often do not have relevant parameters of individual behaviour and thus they rather consider *acceptance*. As an example of this, derived in relation to acceptance of genetically modified food, the causal chain model suggests that trust predicts acceptance in a relationship mediated by concern (Poortinga and Pidgeon, 2005). It is certainly a key theme both in the literature and in policy endeavours that the more people trust government, the less they will be concerned (Flynn, Slovic and Kunreuther, 2001).

Concern – at least in the stronger variant of worry – is sometimes considered as almost synonymous with risk perception though Sjöberg (1998) cautions against conflating them, noting that a weak relationship is more likely where the sensory experience of the risk is less salient – as would be arguably the case in relation to the possible health risks of mobile phones. As far adoption of relevant behaviours is concerned, increased concern is often considered a pre-requisite. For example, perceived severity and susceptibility to a particular illness are seen as predictors of health behaviours in both the Health Belief Model (Becker, 1974) and in Rogers's model of protection motivation (Rogers, 1983).

Finally, in considering possible predictors of behaviour change the potential role of efficacy should also be noted. It is Bandura (1977) who is best known for demonstrating that self efficacy is a powerful incentive to act. Self efficacy is also a key construct in the Theory of Planned Behaviour (usually referred to as perceived behavioural control) (Ajzen, 1991); it has an important role in predicting intended behaviour change. In the light of the growing literature on the value of public

engagement, this individual level of efficacy has been translated into consideration of the role of a 'belief in 'public efficacy' (Barnett *et al.*, 2007b) that is, the extent to which people believe that the public might be able to affect the course of decision making. Following the logic of the individual level of efficacy it could be argued that, where there is a greater desire for public involvement and influence, there will be a greater willingness to adopt relevant behaviours. This is also in line with the work of Neuwirth, Dunwoody and Griffin (2000) who suggest that where the likely efficacy of behavioural responses is clear there will be a greater willingness to take actions to avoid the hazard. In line with this more social conceptualisation of efficacy we can also consider its likely relationship with trust. Bromley, Curtice and Syd (2001) have suggested that there is a positive relationship between trust and public efficacy although more recently Barnett *et al.* (2007b) have suggested that low trust may rather be linked with higher efficacy. It is unclear how a measure of belief in public efficacy might relate to attitudes to precaution and uncertainty although logically one might predict that if the government were perceived to be uncertain (and this was due to incompetence), that greater public efficacy would be desired. Desired public efficacy is arguably an indicator of the degree to which people believe that people *should* be able to affect the course of decision making, thus logically being linked to a belief in public efficacy. Thus far however, the exact nature of the relationship between desired public efficacy and a belief in public efficacy has not been explored.

#### 1.4. Research aims

This paper therefore explores the way in which people conceptualise precaution and the way in which they react to precautionary advice. It seeks to identify the role attitudes to precaution and other relevant variables may play in predicting the intention to adopt relevant behaviours.



Specifically, we addressed the following research questions in the context of precautionary action and advice around mobile telecommunications:

1. What are people's attitudes to the principle of precaution and how does this relate to emotional reactions to precautionary advice?
2. Does precautionary advice cause concern or reassure?
3. What is the relationship between attitudes to precaution and to uncertainty?

We then develop an explanatory model of intended behaviour change in the context of government precaution about mobile phone health risks. Based on the literature outlined above we had the following hypotheses

- a) the extent to which precaution signals perceived risk of mobile phones will depend on how much those regulating mobile phone risks are trusted.
- b) high perceived government uncertainty will be associated with low trust in government in relation to mobile phones and high worry
- c) the relationship between risk perception and intended behaviour change will be mediated by worry: those who perceive greater risk will be more worried and will state greater intention to change their behaviour
- d) emotional responses to precaution will predict worry and intended behaviour change: that is, concern about precaution will be linked with greater worry and intention to change behaviour
- e) higher trust will lead to lower perception of risk
- f) high uncertainty will be associated with high belief in public efficacy
- g) high public efficacy will be linked to greater intended behaviour change
- h) low trust will be linked with high public efficacy

## **2. Method:**

One hundred and seventy three participants were recruited through adverts placed in newspapers, shops and community centres in the South of England and the

Midlands in October – December 2005. A £5 token incentive was provided to all participants that returned a questionnaire. Sixty one per cent of the participants were female (n = 106); 39% were male (n = 67). Participant ages ranged between 16 and 77 with a mean age of 41 years (SD 13.03). Thirty one percent were the parent (or the partner of a parent) of a child aged under 16 living in the household (n = 54) and 68% (n= 119) were not. Qualifications for 46.6 % of participants had been obtained in higher education, 17.2% in further education and 24.7% achieved school level qualifications. 9.2% did not have any formal qualifications.

Participants completed a postal questionnaire which first contained a series of baseline measures. They then read a short scenario about the potential health risks of mobile phones and of the precautionary approach that the government had adopted in response to this<sup>3</sup> and this formed the context for participants completing a final set of questions. The measures pertinent to the research questions of the present study are summarised in Table 1. This details the name of the measure, the items that are used to construct it, its reliability and – where relevant – the mean and standard deviation. It also indicates whether each measure was part of the baseline (B) or final section of the questionnaire (F).

- Table 1 about here -

Several measures listed here have been taken from other sources: social and specific trust (Poortinga and Pidgeon, 2003); government uncertainty (Frewer *et al.*, 2002) and perceived risk of mobile phones (taken from measures about perceived food-related risks, e.g. Sparks and Shepherd – in relation to food risks, 1994; Miles and Frewer, 2003 – also relating to food) and Poortinga and Pidgeon (2003). In common with many studies in this area we are using a measure of intended behaviour

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<sup>3</sup> Two dimensions of the scenario were manipulated: the rationale for adopting precautionary approach to the management of mobile phone health risks (scientific uncertainty vs. public concern) and the context in which precaution was presented (mobile phone risks vs. mobile phone risks and benefits). There were no significant main or interaction effects of the manipulations upon any of the precaution variables or on any of the other variables in the final model. Of course the information provided does form the context within which all of the final measures were completed. A copy of the text can be obtained from the first author.

change. We acknowledge the difficulties inherent with such measures but also recognise that the intention to change behaviour is one of the strongest predictors of behaviour change (Conner and Armitage, 1998).

### **3 Results:**

#### 3.1 Precaution in principle and in practice

Using oblimin rotation, exploratory factor analysis was conducted to explore the structure underlying nine items intended to assess attitudes to precaution in principle. Two factors were extracted, cumulatively explaining 69% of variance. The first factor was defined by three items: precautionary approach shows government is vigilant (.74), precautionary approach is best way of keeping us safe (.71) and a precautionary approach makes me feel confident government are protecting public (.89). We named this factor “precaution is good governance”. Two items loaded well on the second factor: precautionary approach was unnecessary (.69) and precautionary approach makes people unnecessarily concerned (.86), which was called “the value of precaution”. The correlations between the two precaution in principle variables was .21 (see Table 2) suggesting that they are conceptually distinct. Examination of the mean scores in Table 1 suggests that people tend to be positive about the value of precaution although they are less positive about precaution when it is linked with governance. The correlations in Table 2 also indicate that there was no relationship between either of the ‘precaution in principle’ variables and emotional responses to precaution.

- Table 2 about here -

#### 3.2 Precautionary approaches: concern or reassurance?

Replicating Barnett *et al.* (2007a) we considered the three pieces of precautionary advice that were provided in the DoH mobile phones leaflet and asked respondents whether this advice increased their concern or reassured them about the possible health risks.

Figure 1 below shows that the profile of scores was similar for all three items: between 50-60% participants rated each piece of advice as slightly or greatly increasing their concern.

- Figure 1 about here -

### 3.3 Precaution and uncertainty

The third aim was to explore the relationship between the measure of perceived government uncertainty and the two precaution variables. The correlations can be seen in Table 2. There was no relationship between the value of precaution and perceived government uncertainty. Similarly there was no relationship between emotional responses to precaution and perceived government uncertainty. There was a significant relationship ( $r = -.33$ ) between government uncertainty and the 'precaution is good governance'. However the direction of this relationship is the opposite to the rationale for adopting a precautionary stance would suggest. Here we see that the more people perceive that the government is uncertain about the health risks associated with mobile phones, the less they are likely to judge precaution as good governance.

### 3.4 Modelling intended behaviours

A correlation matrix was constructed between the ten variables of interest: Intended Behaviour; Emotional Responses to Precautionary Advice; Precaution as Good

Governance, Value of Precaution, Social Trust; Specific Trust; Desired Public Efficacy; Worry, Perceived Risk and Uncertainty (Table 2).

The correlations indicate that Emotional Responses to Precautionary Advice was not significantly associated with any other variable and thus it will not be considered further here. Also contrary to our expectations, there were no significant relationships between Uncertainty and Perceived Risk and Precaution is Good Governance and Perceived Risk and thus these paths were not included in the SEM.

In the light of these modifications the final model is shown in Figure 2:

- Figure 2 about here -

The model was tested using Lisrel analysis (Jöreskog and Sörbom, 1996). The analysis showed that the model was a good fit of the data and that it provided a plausible explanation of intended behaviour change (Chi Square = 316.07,  $p=0.007$ ,  $df = 257$ , RMSEA = 0.036, 90% Confidence Interval for RMSEA = 0.020 - 0.049; Chi Square Ratio = 1.23). All paths but one were significant: Uncertainty was not predictive of Specific Trust. The model predicted 64% of variance in Intended Behaviour Change ( $R^2 = .64$ ).

Worry about risk was the strongest predictor of Intended Behaviour Change ( $\beta=.74$ ,  $t=7.65$ ). The relationship was, as predicted, in a positive direction, indicating that those who felt more concerned about mobile phone risks were more likely to report that they intend to change their mobile phone-related behaviour. As hypothesised Desired Public Efficacy was also a significant predictor of Intended Behaviour Change ( $\beta=.22$ ,  $t=2.71$ ). The respondents who felt that the public should influence government decisions in relation to mobile phone risk regulation were more likely to indicate an intention to change their behaviour. Worry about the potential health risks of mobile phones mediated the effect of the Perceived Risk of mobile phones

( $R^2=.86$ ): the more risk people perceived the more they were worried about these risks ( $\beta=.93$ ,  $t=7.92$ ). Specific Trust (that government appropriately regulates mobile phone health risks) was predictive of Perceived Risks ( $R^2=.51$ ) The negative direction here indicates that it is those who do not believe that government appropriately regulates mobile phone health risks that report heightened Perceived Risk of mobile phones ( $\beta=-.72$ ,  $t=-5.89$ ). Specific Trust was directly predicted by Precaution is Good Governance ( $R^2=.55$ ): those who said precaution was good governance were more likely to believe that government appropriately regulated mobile phone health risks ( $\beta=.42$ ,  $t=5.32$ ). General Trust in government was also predictive of Specific Trust in government's regulation of mobile phones ( $\beta=.43$ ,  $t=5.52$ ). Of the two Precaution in Principle variables only the Value of Precaution was predictive of Perceived Risk ( $\beta=.35$ ,  $t=3.36$ ): those assenting to the value of precaution perceived greater health risk from mobile phones. Finally, Desired Public Efficacy mediated the effect of two variables upon Intended Behaviour Change. First, those who perceived more government uncertainty were more likely to say that the public should influence decision making ( $\beta=.23$ ,  $t=2.66$ ). General Trust was a negative predictor of Desired Public Efficacy ( $\beta=-.34$ ,  $t=-3.78$ ): lower trust is linked with higher desired public efficacy. Together these two variables explained 20% of the variance in the public efficacy measure.

#### **4 Discussion**

This study investigated the way in which precaution is conceptualised in principle and how people react to precautionary advice. It also constructed a plausible model of the role that these and other variables have in predicting the intention to adopt relevant behaviours.

Our first aim was to explore people's attitudes to the principle of precaution and discern how this relates to feelings of concern or reassurance around precautionary

advice. Thus far there has been no empirical consideration of beliefs about precaution *in principle*. Rather the emphasis in the literature has been upon whether precautionary advice is associated with feelings of concern or reassurance. The results of this study suggested at least two dimensions of how people think about precaution in principle: firstly in relation to its value or necessity *per se* and secondly as more anchored to notions of governance. It is noteworthy that the relationship between the two constructs themselves is not particularly strong and also that they relate differently to other important constructs. To take trust as an example, positive social and specific trust is significantly associated with the belief that precaution is good governance and yet it is unrelated to beliefs about the value of precaution. The difference between the two precaution in principle variables is even more pronounced in relation to worry. Here, there is a significant positive association between worry and a belief in the value of precaution and a significant negative association between worry and the belief that precaution is good governance: high levels of worry are associated with thinking that precaution is valuable and also that it is not good governance. The emotional reaction to precautionary advice, that is, whether it was related to concern or reassurance, was unrelated to both of the precaution in principle variables.

To address the second aim we considered in more detail the relationship between particular pieces of precautionary advice and whether or not this advice led to feelings of concern or rather provided reassurance. This provides an opportunity to replicate part of the study of Barnett *et al.*, (2007a) and the results here closely mirror those found in their nationally representative survey. Contrary to what might be expected from the official discourse around the provision of precautionary advice, in the context of mobile phones at least, the advice was more strongly linked with concern than with providing reassurance. Generally, and not unreasonably, this finding has led to the recommendation that precautionary advice or action should not be seen as a way in which to reduce public concern. However, the lack of relationship that we have noted between these more emotional responses to

precaution and the more belief based assessments of precaution in principle might lead us to suggest that responses to the provision of precautionary advice are rather more complex than might first appear. Overall, precaution – in principle – is valued although there is much less certainty that it represents good governance. It is perhaps this ambivalence about the relationship between precaution and governance that provides a clue as to why particular pieces of precautionary advice are seen to cause concern rather than provide reassurance. It is quite feasible, and in line with the qualitative findings of Timotijevic and Barnett (2006), that the uncertain status of precaution vis-à-vis good governance and the way in which precautionary advice is more linked to concern than reassurance is a product of the generally low levels of trust in government to manage health risks in general and health risks from mobile phones in particular.

The third aim of this study was to explore the nature of the relationship between attitudes to precaution and to uncertainty. A key rationale for invoking a precautionary approach is the presence of uncertainty. It is not, therefore unreasonable to expect the effect or the appreciation of precautionary advice to be heightened where uncertainty is perceived. In the experimental studies by Wiedemann and Schütz (2005) uncertainty did not interact with precaution in affecting risk perception. In our questionnaire, the correlations show a similar picture in that there is no relationship between beliefs about government Uncertainty and either Emotional Responses to Precaution or the Value of Precaution. The correlation between Precaution is Good Governance and Uncertainty is significant, however, the direction of this is contrary to what we might expect from the common rationale for adopting a precautionary stance. We rather see that the more people perceive that the government is uncertain about the health risks associated with mobile phones, the less they are likely to judge precaution as good governance (and the lower their trust – both general social trust and also specific to the possible health risks of mobile phones). This is certainly in line with the observation made by Timotijevic and Barnett (2006) suggesting that where



government is distrusted and there is scientific uncertainty, precautionary advice may be seen as a strategy for Government to manage its position (for example, as a cue that government wishes to relinquish responsibility for managing the risks). Acknowledged uncertainty by a distrusted government, rather than indicating absence of conclusive evidence, may be taken to signal a certain risk.

Our final aim was to develop a plausible explanatory model of intended behaviour change in the context of the precautionary stance adopted by the UK Government around mobile phone health risks. We tested the role of eight variables in predicting intended behavioural change: government uncertainty, general trust, precaution as good governance, the value of precaution, trust about regulation of mobile phones, perceived mobile phone risks, worry about risks and desired public efficacy. The final model has indicated that there are two paths that are predictive of intended behaviour change: one through worry about mobile phone health risks and the other through desired public efficacy. The first path showed that those who had high levels of worry about mobile phone risks were more likely to intend to change their mobile phone related behaviour. The second showed that those with a higher desire for public efficacy were more likely to intend to change their mobile phone related behaviour.

Notwithstanding the well documented 'gap' that often exists between intentions and behaviour, it is interesting that it is worry about risk that is the strongest predictor of intended behaviour. Indeed, this is in line with recent risk perception literature which signalled importance of affect in making judgements about risk (Slovic *et al*, 2004). The primacy of worry in the current study suggests that careful thought must be given to the precise aim of communicating uncertain or precautionary information. To the extent that one aim of providing precautionary advice is to encourage the uptake of relevant behaviours, then arguably this will best be achieved in the context of high perceived risk and high worry. Paradoxically though,

as noted earlier, a key discourse around the provision of precautionary advice is the reduction of public concern.

In line with the way in which self efficacy is often a key predictor of behaviour change, Desired Public Efficacy also influenced the desire for agency and predicted Intended Behaviour. Perhaps more interesting however are the predictors of Desired Public Efficacy itself. The finding that low levels of Social Trust are predictive of Desired Public Efficacy is in line with the findings of Barnett *et al.*, (2007b) indicating that greater distrust of government is more prevalent among those with a higher belief in public efficacy. Interestingly, government Uncertainty is also associated with Desired Public Efficacy. Taken together, low trust and a perception of government uncertainty seem to be related to a greater desire for the public to make a difference and, in turn, a greater willingness to review one's own behaviour. A great deal of research in recent years has noted that in a fast changing scientific technological landscape trust is seen as a necessary prerequisite for the management of uncertain risks (see Siegrist, Earle & Gutscher, 2007). Low trust is believed to impact negatively upon the way in which the public respond and act upon risk communication material (Walls et al, 2004). Thus the building of trust has arguably often been considered instrumentally - as a means to the end of acceptance of technological change. The current findings, in noting the way in which low trust can lead to a greater desire for public efficacy and in turn to a willingness to review behaviours might be considered as a check to over extending this perspective. This links with the recent literature suggesting the value of 'critical trust' (Poortinga and Pidgeon, 2003; Walls et al, 2004). This, argues for a more nuanced understanding of trust as healthy scepticism about the proponents of a particular position. Arguably, for precautionary advice to appropriately impact upon public behaviours, it should not be used to increase trust or reduce public concern. To the contrary, a degree of healthy scepticism may be desirable.

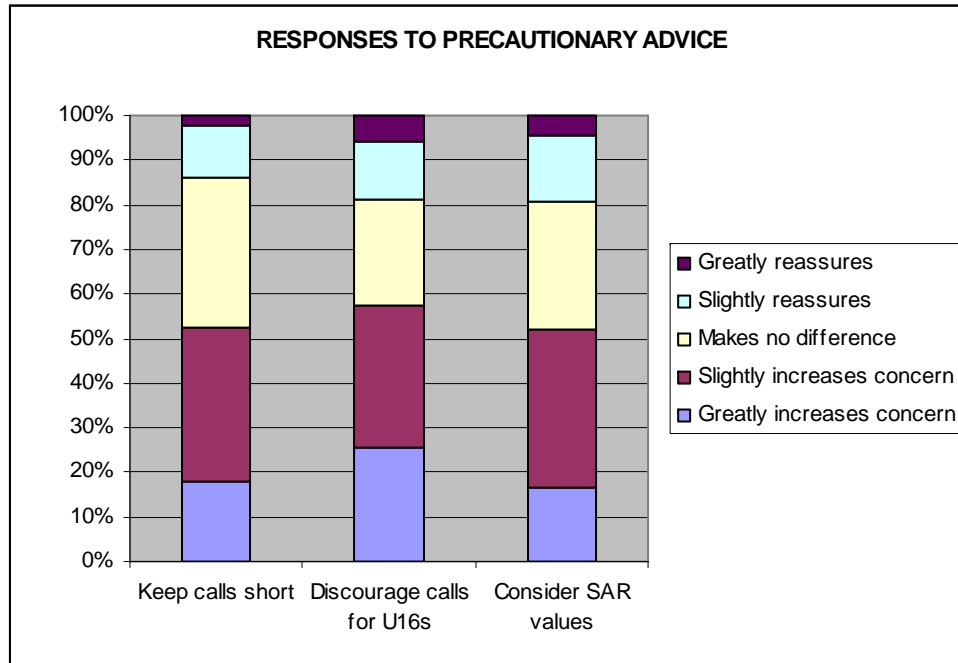
In conclusion, we have seen in the domain of possible health risks of mobile phones, that assent in principle to the value of precaution or agreement that it constitutes good governance does not mean that precautionary advice will reassure. We have also suggested that it is important to take account of the way in which the context of low trust in government affects how precaution is viewed and precautionary advice is perceived: against this backdrop precaution may be considered a valuable stance but this does not mean that it is seen as good governance or that it will reduce concern. As might be expected, attitudes to precaution do not play a clear role in predicting relevant intended behaviours. The important role of worry in increasing the willingness for behaviour change does however draw attention to a potential paradox for those communicating precautionary actions and advice. On the one hand the discourse of precaution is aimed at reducing concern yet on the other the uptake of relevant behaviours is largely triggered by worry.

Table 1: Composite variables: items, reliability and means

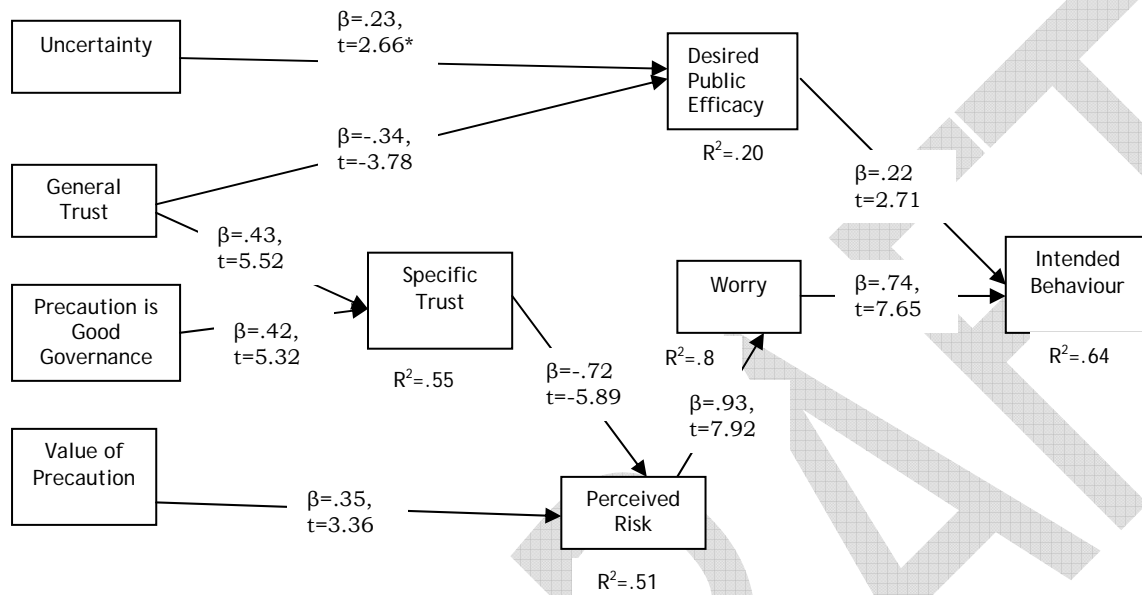
INDEX	ITEMS	RESPONSE OPTIONS	RELIABILITY	MEAN (SD)
<b>PRECAUTION as GOOD GOVERNANCE (F)</b>	A precautionary approach shows that the government is vigilant; A precautionary approach is the best way of keeping us safe; A precautionary approach makes me feel confident that the government are protecting me	(1) disagree to (5) agree	$\alpha = .82$	2.91 (0.85)
<b>VALUE of PRECAUTION (F)</b>	A precautionary approach makes people unnecessarily concerned (reversed) and A precautionary approach is unnecessary (reversed).	(1) disagree to (5) agree	$\alpha = .72$	3.76 (0.84)
<b>EMOTIONAL RESPONSES to PRECAUTION (F)</b>	Government advice recommends that people should keep their mobile phone-calls short; Government advice recommends that non-essential calls for those under 16 should be discouraged; Government advice recommends that customers should consider relative SAR values when buying a new phone	(1) greatly increases my concern to (5) greatly reassures me	$\alpha = .91$	2.47 (0.98)
<b>SPECIFIC TRUST IN GOVERNMENT MANAGEMENT OF PHONE RISKS (B)</b>	I feel confident that the British government adequately regulates mobile phones health risks; I feel that the way the government makes decisions about mobile phone health risks is fair; The government is doing a good job in regulating mobile phone health risks	(1) disagree to (5) agree	$\alpha = .84$	2.62 (.78)
<b>PERCEIVED GOVERNMENT UNCERTAINTY ABOUT HEALTH RISKS OF MOBILE PHONES (F)</b>	Government is unsure about whether there are health risks associated with mobile phones; The government is unsure about the extent of the health risk posed by mobile phones; The government is unsure about who may be affected by health risks of mobile phones.	(1) disagree to (5) agree	$\alpha = .89$	3.62 (.70)
<b>DESIRED PUBLIC EFFICACY AROUND DECISION MAKING ABOUT MOBILE PHONES (B)</b>	<i>How much influence should the public have on decision making in each of these areas?</i> Scientific research that is conducted in relation to potential health risks of mobile phones; Government decisions on how to regulate potential health risks associated with mobile phones; The way telecom industry manages potential health risks of mobile phones.	(1) none at all to (4) a great deal	$\alpha = .83$	3.12 (.64)
<b>WORRY ABOUT POSSIBLE HEALTH RISKS (F)</b>	How worried are you personally about the potential health risks of mobile phones?	(1) not at all to (5) very	Single item	2.52 (.99)

<b>INTENDED BEHAVIOUR</b> (F)	I will seek information about health risks of mobile phones/base-stations because I am concerned about possible health risks; I will use mobile phone to make calls less often than I used to because I am concerned it may damage my health; I will continue using my mobile phone as usual (reversed)	(1) disagree to (5) agree	$\alpha = .79$	2.75 (.96)
<b>GENERAL SOCIAL TRUST</b> (F)	I feel that the way the government makes decisions about various health risks is fair. The government listens to concerns about health risks that are raised by the public. The government is doing a good job in regulating various health risks.	(1) disagree to (5) agree	$\alpha = .87$	2.57 (.84)
<b>PERCEIVED RISK TO HEALTH FROM MOBILE PHONES</b> (F)	How likely is it that mobile phones will have long-term negative health effects; How would you assess the risks, if any, to human health from mobile phones for British society; How serious are the possible health risks of mobile phones likely to be for future generations	(1) none at all to (4) a great deal	$\alpha = .85$	3.33 (.86)

Figure 1: Percentage agreement with emotional responses to precautionary advice



**Figure 2**



\*The t-value (=critical ratio) provides an indication of the significance of the path coefficient:  $t = 1.96$  corresponds to  $p < 0.05$ ,  $t = 2.58$  to  $p < 0.01$  and  $t = 3.29$ ,  $p < 0.001$ .

Table 2: Correlation matrix

	1	2	3	4	5	6	7	8	9	10
1. Desired Public Efficacy	1.00									
2. Precaution as Good Governance	-.26*	1.00								
3. Value of Precaution	.26*	.21*	1.00							
4. Emotional reaction to precautionary advice	.01	.06	-.07	1.00						
5. Specific Trust	-.34*	.66*	-.11	-.01	1.00					
6. Worry	.42*	-.22*	.43*	-.14	-.60*	1.00				
7. General Trust	-.38*	.46*	-.11	.10	.62*	-.32*	1.00			
8. Intended Behaviour Change	.45*	-.08	.27*	-.08	-.54*	.72*	-.17	1.00		
9. Perceived Risks	.42*	-.17	.45*	-.06	-.54*	.87*	-.39*	.66*	1.00	
10. Government Uncertainty	.31*	-.33*	.11	.00	-.21*	.08	-.22*	.00	.08	1.00

\* =  $p < .05$   
 RMSEA = 0.037 (90% confidence interval for RMSEA = 0.025; 0.047)  
 Goodness of fit (Chi Sq/df) = 1.23