Laypeople's Knowledge about Mobile Communication

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1. Introduction

Mobile communication is an expanding and highly valued technology, and the ever-increasing numbers of users and use rates for Switzerland impressively show this (BACOM, 2007). Mobile connections necessitate a network of base stations. In contrast to cell phones, this aspect of the infrastructure arouses suspicion. People are often unwilling to accept base stations in their neighborhoods because they fear serious health consequences.

To prevent health effects, the construction of mobile phone networks is strictly regulated and controlled by the government. Nevertheless, people distrust these measures and call for the banishing of base stations to outside their villages.

Considering the fact that it is the cell phone that predominantly contributes to an individual's exposure, concerns regarding base stations are astonishing. Missing knowledge about mobile communication and its functionality could be named as one explanation. Several questions arise: Why does the risk perception of laypeople differ from that of responsible experts? Is this discrepancy due to different standards of knowledge? What do laypeople normally know about mobile communication?

Different actors provide information about mobile communication to the public, but the usefulness of this information remains unclear. Little research has addressed the question of whether the information provided by authorities is understandable and helpful for laypeople. In effect, not much is known about risk perception of mobile communication (e.g., Ruddat et al., 2005; Siegrist et al., 2003; 2005; 2006; Wiedemann et al., 1994) and how knowledge may influence this perception. To the best of our knowledge, no systematic approach has examined these questions. Therefore, we used the 'Mental Model Approach' to gain insights about laypeople's knowledge about mobile communication and possible health effects.

2. Methodology

The 'Mental Model Approach' by Morgan et al. (2002) is guided by the belief that "effective communication must focus on the things that people need to know but do not already" (Morgan et al., 2002, pp. 19). The aim of this approach consists of providing the information people need to make informed decisions. To this end, not only the views of experts but also the beliefs of the targeted public are systematically analyzed. This approach allows to measure the effectiveness of the realized communication and to improve prospective risk communications. The 'Mental Model Approach' was applied successfully in different risk issues such as radon (e. g., Atman et al., 1994a; 1994b), climate change (e. g., Bostrom et al., 1994; Read et al., 1994), and even for perception of low-frequency electric and magnetic fields (Morgan et al., 1990). The complete 'Mental Model Approach' consists of five steps. This report provides an overview about the first tree steps.

Expert Interviews: Mental Model of Experts

First, a graphical expert model reflecting experts' understanding of mobile communication was created by means of a literature review and open-ended interviews with 16 Swiss experts. The final expert model attempts to provide a comprehensive and collective

representation of all aspects experts consider as relevant for the conceptual understanding and risk perception of mobile communication. This expert model provides a template for characterizing laypersons' appropriateness, specificity, and category of knowledge in later steps of the process (Morgan et al., 1992, pp. 2050).

Lay Interviews: Mental Models of Laypeople

The goal of the second step was to uncover the mental models of laypeople. In a similar fashion as for the expert model, the objective was to collect as many qualitative aspects as possible that were considered relevant by laypeople. At the same time, laypeople's knowledge about mobile communication as well as possible misconceptions or knowledge gaps were assessed. The expert model was used as a guideline for the laypeople interviews. For each field of interest, different questions were posed starting with more general, nondirective questions and leading to very specific ones. In sum, 31 interviews (16 laypeople, 15 base station opponents) were conducted and evaluated.

Mail Survey: Relevance of Found Misconceptions and Knowledge Gaps

The first two steps provided a large set of beliefs about mobile communication, but they do not allow for drawing any conclusion regarding the relevance of the found beliefs and knowledge components. To estimate the prevalence of each belief in a general population, a structured questionnaire was created to be employed in a representative mail survey. This questionnaire attempts to cover, as far as possible, all relevant concepts identified during the expert and lay interviews.

First, respondents were asked to rate mobile communication on different dimensions like personal affect, perceived benefit, and perceived risk and to indicate their trust in the diverse actors involved. Second, a set of 29 knowledge questions including some visual tasks using pictograms was presented. Demographic characteristics were recorded at the end of the questionnaire.

The questionnaire was mailed to a representative sample selected from the Swiss phone directory. 765 questionnaires were ultimately included in the data analysis (response rate: 41%). Forty-two percent (N = 311) of the respondents were women, and fifty-eight percent (N = 435) were men. Reported age ranged between 19 and 105 years, with a mean age of 51.62 (SD = 16.60). Respondents were better educated than the general Swiss population.

3. Results

The results of these three steps can be summarized as follows: The final expert model depicts a broad variety of aspects and influence factors in regard to risk perception of mobile communication. The model reflects the beliefs of a group of Swiss experts. It can be stated that experts overwhelmingly agree on technical as well as on social and individual aspects. Yet, beliefs about scientific uncertainties and probabilities of possible health effects differ to some degree. The lack of causal models explaining bodily changes, missing long-term studies, and the difficulties in appropriately measuring radiation results in uncertainty and offers space for personal opinions and speculations. The expert model allows important insights into the structure of the complex problem field.

The evaluation of the lay interviews generates a broad set of beliefs. For this report, we focus only on the insights about the technical aspects. The comparison between laypeople and base station opponents shows a lot of similarities but also some differences. Various levels of knowledge concerning the technical aspects of mobile communication were found in both groups. Most opponents, however, knew more than average laypeople. They were better informed about laws, exposure standards, and network construction processes than

laypeople. The most striking discrepancy between experts and laypeople was the degree of certainty about health effects of radiation. All opponents and all but two laypeople were certain that high-frequency electromagnetic fields could harm human beings.

Lay interviews and survey results indicate that the general public is familiar with diverse aspects of mobile communication but shows specific knowledge gaps and misconceptions. In other words, people's objective knowledge depended on the topic. Correct answers to the knowledge questions ranged between 10.6 % and 74.1% (answer possibilities: correct, wrong, don't know). Respondents had reasonable knowledge about cell phones (mean of 49% correct answers based on 9 items) and even base stations (mean of 33.8% correct answers based on 5 items), but most of them ignored the interaction patterns between cell phones and base stations (mean of 21.2% correct answers based on 6 items). Knowledge about radiation in general (mean of 19.3% correct answers based on 2 items) and about regulation was also low (mean of 21.7% correct answers based on 2 items). Only 26% of the respondents reported that they had actively searched for information about mobile communication. Self-reported knowledge (6-point-scale: 1=no knowledge, 6=good knowledge) fluctuated across various knowledge topics. Respondents reported knowing more about risk (M = 3.42, SD = 1.3) than technical aspects (M = 3.03, SD = 1.32) or legal aspects (M= 2.27, SD = 1.24).

4. Discussion

Results suggest that laypeople's objective knowledge varies considerably across the different topics. Knowledge about cell phones and base stations is widespread, but 'knowledge about interaction patterns', 'regulation', and 'radiation in general' is lacking. The knowledge about interaction pattern is considered particularly and highly relevant for the full understanding of EMF exposure. Qualitative and quantitative results stress that people misperceive the exposure contributions of cell phones and base stations. They underestimate the contribution of cell phones and are not aware that the amount of radiation emitted depends on factors like distance to the base station or shielding by walls. In fact, most people ignore that their cell phone is also an antenna and has the same functionality as a base station. They perceive distance to the base station as a protecting factor, yet all the while the fact that they themselves hold an antenna close to their heads goes unheeded.

Risk communication addressed to laypeople should consider the unveiled misconceptions or knowledge gaps. Worried cell phone users can be shown simple and effective ways of how to reduce their daily exposure dose. The knowledge about interaction patterns between base stations and cell phones is also useful in regard to base station placement. Base station opponents often wish to remove base stations from residential areas in order to reduce their daily radiation exposure. Again, the 'homemade' radiation by their own cell phone and its dependence on factors like distance to base station and shielding are ignored. Perhaps knowledge about these interaction patterns could help people to accept the necessary proximity of base stations. However, even adequate knowledge about technical aspects is probably worthless if there is a lack of trust in the involved actors. Therefore, it is important to invest in accurately timed and open communication.

As long as it cannot be satisfactorily documented that EMFs of mobile communications are innocuous, people have to deal with uncertainty. Information about technical aspects cannot compensate the uncertainty and the health concerns, but they can help people, establish accurate beliefs about exposure and give them helpful behavioral guidelines. This can help to qualify their fears and anticipated health consequences.

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