

## **Workshop on Developing and Implementing Protective Measures for ELF EMF**

**20-21 June 2007, Geneva, Switzerland**

### **WHO International EMF Project Rapporteur's Report**

#### **Summary**

The World Health Organization (WHO) held a workshop on "Developing and Implementing Protective Measures for Extremely Low Frequency Electric and Magnetic Fields" (ELF EMF) on June 20-21, 2007, in Geneva, Switzerland. The workshop's overall purpose was to discuss the policy recommendations contained in the WHO Task Group's 2007 Environmental Health Criteria (EHC) monograph on ELF EMF,<sup>1</sup> such as the call for open communication, and the suggestion for precaution in the following statement: "When constructing new facilities and designing new equipment, including appliances, low-cost ways of reducing exposures may be explored. Appropriate exposure-reduction measures will vary from one country to another."

The workshop was chaired by two members of the WHO Task Group—Christopher Portier of the US National Institute of Environmental Health Sciences (NIEHS) on the first day and Leeka Kheifets of the UCLA School of Public Health, California on the second. The assortment of topics discussed over the two days revealed the intricacies of the considerations involved in EMF policy development. As participants explored how to approach the development of protective measures, their discussions tended to divide into two categories: (1) quantifiable factors—numerical guidance, public exposure, and analytical techniques for assessing risks and benefits, and (2) non-quantifiable factors—public concern and the implications of economic, cultural, and philosophical differences on implementing precautionary measures.

Participants grappled with defining "low-cost" and identifying a new set of practical measures to reduce public exposure to EMF, tasks that were difficult to complete during the course of the meeting. By the workshop's end, however, general agreement appeared to emerge among most, but not all, participants that the EHC conclusions are reasonable based on current scientific evidence and that its precautionary recommendations are flexible enough to accommodate individual nation's interests.

#### **Background**

Emilie van Deventer, head of the WHO International EMF Project, clarified the role of different WHO ELF EMF documents. She explained that that WHO has taken note of the EHC monograph, which was prepared by the WHO Task Group on ELF EMF, and that the WHO has used its guidance to formulate its own position, which is contained in the recently released Fact Sheet.<sup>2</sup> She addressed a question from Chiyoji Ohkubo of the Meiji Pharmaceutical University in Japan regarding what he perceived as a difference in the "strength of advice" between the EHC document and the WHO's response in the Fact Sheet. van Deventer explained that the recommendations were "fundamentally the same;" the ten EHC recommendations were condensed into four for the Fact Sheet. "Remember," she said, "the WHO recommendations

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<sup>1</sup> Extremely Low Frequency Fields Environmental Health Criteria Monograph No. 238. 2007 Jun. Available at: [http://www.who.int/peh-emf/publications/elf\\_ehc/en/index.html](http://www.who.int/peh-emf/publications/elf_ehc/en/index.html).

<sup>2</sup> Electromagnetic Fields and Public Health. Fact Sheet No. 322. 2007 Jun. Available at: <http://www.who.int/mediacentre/factsheets/fs322/en/index.html>.

target the whole world,” and there are many countries in which simply complying with international guidelines should be the first priority.

Portier framed the scope of the workshop by saying that participants must limit their contributions strictly to implementation issues and that the workshop would not revisit the scientific findings of the EHC monograph. van Deventer encouraged active participation and noted that WHO is interested in hearing participants’ views on a variety of issues, especially on the meaning of low-cost measures.

## **I Quantitative Aspects of Risk Management**

Throughout the workshop, participants paid close attention to the quantitative aspects of the EHC recommendations, including the need for accurate risk assessment, the contribution of various sources to public ELF EMF exposure, and the use of cost-benefit analyses to determine potential mitigation strategies.

### **Childhood Leukemia**

Anders Ahlbom of the Karolinska Institute, Sweden, and Kheifets, both epidemiologists and members of the WHO Task Group, provided overviews of the scientific evidence regarding an association between health risks and ELF EMF exposure and the related uncertainties that pose a challenge to policy development. Ahlbom said that although he believes more epidemiologic studies or more accurate exposure assessments are not likely to change the EHC conclusions, he believes that resolving the gap between epidemiology and biology should be a high priority for future research. Calling the situation “intriguing,” Ahlbom characterized the evidence for an ELF EMF and childhood leukemia risk link as “quite consistent,” noting that in his opinion it is stronger than health risks from passive smoking despite the lack of a known mechanism.

Kheifets addressed the uncertainties in childhood leukemia risk assessment, reinforcing the EHC conclusion that the fraction attributable to EMF is small (i.e., assuming causality, 0.2 to 5% of total annual cases globally). She emphasized that there is considerable uncertainty in this estimate, particularly with respect to exposure distributions on a global scale. Although the impact of ELF EMF exposure is likely to be limited, the EHC could not exclude the possibility of no impact or even a larger impact, she said.

### **Risk Assessment**

After the introductory speakers set the scene, the first day’s discussion, which Portier had encouraged, began. Participants’ attention focused on implementation of the EHC’s conclusion that precautionary actions were warranted only at no- or low-cost levels. Jim Metcalfe of the UK’s Biological Research Trust and a member of the WHO Task Force asked whether the outcome of any of these precautionary measures, that is, the projected decrease in the number of childhood leukemia cases, would even be measurable within the noise of normal incidence. For example, he said, 2 leukemia cases out of 500 per year in the UK might be attributed to ELF EMF. He questioned the wisdom of conducting expensive research when, it appears, the outcome will be undetectable.

Dan Chisholm, a WHO health economist, addressed the question when he presented an overview of how economists conduct cost-benefit analyses of preventive measures. His talk built on a presentation by Marie Neira, head of the WHO’s environmental health program, who described her department’s shift toward viewing environmental protection as a key to disease prevention. Although Chisholm noted that such economic analyses are often thought of as “dry” (or in the words of one participant, “cold-hearted”), their aim is to optimize the efficiency of resources, he

said. With respect to ELF EMF, Chisholm noted, the major uncertainty in prioritizing actions is in the magnitude of the benefit or, said another way, the risks that could be prevented.

The UK National Grid's John Swanson, an observer of the WHO Task Group, summarized the EHC recommendations as "very low-cost" precautionary actions based on a combination of factors: epidemiologic evidence of an association with childhood leukemia, the level of uncertainty in this association, and the low prevalence of both high ELF EMF exposures and childhood leukemia.

Swanson advocated for a cost/benefit analysis approach because it is clearly understood, easy to use in comparisons, and, because a net monetary measure is value-neutral, it holds the promise of achieving neutrality. Noting that ethics and public concern are also important factors in decision making, he acknowledged that people are unlikely to agree on any one approach due to philosophical differences, an issue discussed at length later on in the workshop. Essentially, Swanson pointed out that small modifications in the assumptions underlying the calculations will not change the results significantly due to the magnitude of the differences, for example when preventative measures—such as installing corridors and setbacks—are estimated to cost billions but estimated benefits—decreased human ELF EMF exposure and possible disease prevention—are valued in the millions. Swanson pointed out, "We're now beginning to get a sense of what low-cost means." In the absence of a precise definition, precautionary actions based on the EHC recommendations, according to Swanson, can be ranked from "sensible to do anyway" to "unlikely to ever be sensible."

Offering an economist's perspective, Chisholm said it is standard practice to identify a net figure instead of a cost-per-individual sum in order to establish "societal perspective." Portier remarked that different risk communication techniques may invoke different public responses and that there are ways to communicate cost-benefit analyses rather than simply using large monetary values.

### **Guidance for Precaution**

Several participants expressed their desire for a specific numerical value with which to guide precautionary action with respect to exposure and childhood leukemia risk. A proponent of precautionary measures, Cindy Sage, a consultant and citizen activist from California, said that without a number from the WHO, there is no real guidance available for countries to use when evaluating their resource allocation. Another commenter added that, without a number from the WHO, interest groups may resort to time-consuming, costly legal proceedings in order to establish the guidance that is needed. Sage argued that the threshold should be lower than 0.3 or 0.4 microT (3 or 4 mG) because the Task Group had not taken into account recent studies<sup>3</sup> that indicate impacts of exposure on not only the disease incidence, but also long-term survival of childhood leukemia patients.

In response, Portier stressed that the WHO Task Group did not see any "bright line" below the existing 100-microT (1000-mG) ICNIRP basic restriction for the public that would have made them comfortable with a new recommendation. It is simply not justified by the data, he added. Swanson and Jack Sahl, representing Southern California Edison Co. in the US, also opposed the use of a specific number, saying that it would lead to an inefficient use of prevention resources.

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<sup>3</sup> SSI's Independent Expert Group on Electromagnetic Fields. Recent research on EMF and health risks: Fifth annual report from SSI's Independent Expert Group on Electromagnetic Fields, 2007. 2008 Mar. and Svendsen AL, Weihkopf T, Kaatsch P, Schuz J. Exposure to magnetic fields and survival after diagnosis of childhood leukemia: a German cohort study. *Cancer Epidemiol Biomarkers Prev.* 2007 Jun;16(6):1167-71.

Others continued to advocate for a specific value based on childhood leukemia risk because, as one attendee pointed out, the EHC report would be “unsatisfying” to the public without it.

The conversation moved on to the relationship between dose and response. Sage pointed out that if increased risk occurs at a specific level, then spending billions of dollars to reduce exposure to any level above that is “wasted.” Because many more children are exposed to low levels of EMF than to high levels, Sage concluded that, if effects do occur at low levels, significantly more health protection can be achieved by limiting exposures further. Portier reminded the group that the epidemiologic studies being referenced cannot supply a threshold value for peak-exposure risk because they are based on time-weighted averages.

Kheifets and Portier noted that, nevertheless, there are not enough data to determine whether the dose-response relationship is that of a threshold, a rapidly rising risk beginning at low exposures, or a risk that rises but plateaus above a few microT. Implementing expensive measures without knowing if there is any risk at these very low levels is a poor use of resources, they said. Once again, however, they emphasized the uncertainty inherent in any risk estimate at these levels.

### **Exposure and Low-Cost Measures**

Throughout the workshop, panelists and participants shared their thoughts on possible ways to reduce public exposures. Several sessions revealed the extent to which nations’ approaches to policy development vary; however, they have produced what appeared to be a less-divergent list of practical measures to reduce public exposure.

In an overview of common ELF EMF sources and exposures, Rüdiger Matthes of Germany’s Federal Office for Radiation Protection concluded among other things that ELF fields from natural sources are generally low, EMF from electricity use is “ubiquitous,” and high field strengths in every day life are rare. In a presentation on the UK Health Protection Agency’s Residential Sources Study, Myron Maslanyj noted that most ELF EMF exposure does not come from high-voltage power lines but rather from low-voltage sources such as home electrical appliances and distribution systems. In fact, he said, improving indoor wiring could reduce indoor exposure by 55%, making it by far the most cost-effective control measure. This was also the conclusion reached by the UK’s SAGE (government Stakeholder Advisory Group on ELF EMF) report and the EHC.

As session chair, Portier consulted the audience for suggestions on practical low-cost precautionary measures. The suggestions he received were already well-recognized to most, such as setback requirements and electrical practices—most notably, the need for rigorous enforcement of current code requirements.

More than once Portier emphasized the need for greater attention to wiring. He offered concrete examples of some of the “many things you can do” to reduce exposure. In the US, for example, he noted a policy that he advocates: requiring wire code inspection and enforcement in the course of routine home inspections during real estate sales. “That’s a very simple solution that’s going to catch a lot of what’s going on,” he said. Similarly, schools can be inspected by electricians during other routine work. Those are “low-cost, simple, easy” methods for the US, Portier asserted.

Sahl was a participant on a panel discussion of “different perspectives” along with Jody Ellant and Susan Birke-Fiedler, citizen activists who opposed the upgrade of a transmission line in Connecticut, USA, based on the risk of leukemia to children, and Neutra, one of 3 scientists who conducted California’s ELF EMF risk assessment. The panel further highlighted the issues that

arise in a relatively wealthy country, for example: Should all new lines be placed underground or have a mandatory 300-foot setback? Again alluding to the open question of what is considered a “minor cost,” they explained that the consequence of these actions in California would be 24 million US dollars, only a 0.03% increase in utility bills.

At this point, as he did throughout the workshop, Portier reminded the speakers that WHO’s recommendations must be relevant to all countries – poor and developing nations as well as wealthy ones – among which the willingness or ability to pay for precautionary measures varies widely. Even countries with similar economic conditions vary. Representatives from Japan noted that, given their population density, a 300-foot setback requirement would create extreme pressure on utility bills. A representative from Israel Electric Corporation, whose power lines sometimes go through or under buildings, voiced a similar sentiment, and then went on to explain that, in his country, the cost of many EMF mitigation measures would be too high when taken in the context of the need to prevent risks from war and terrorism. Ginevra Delfini of VROM, The Netherlands’ Ministry of the Environment, said succinctly that she believes specific measures should not be recommended by WHO but instead this social, political decision should be the responsibility of each country.

## **II Governance and Philosophical Differences**

Less-quantitative issues also generated active interest and discussion. Participants shared their views on how underlying philosophical differences, such as precautionary guidance and flexibility to accommodate individual and global differences, have implications for risk management.

### **Precaution**

Swanson touched on the source of much of the conflict regarding how to implement the EHC recommendations on precaution. He recognized that some people are opposed to taking any action if the risk is uncertain, whereas others reject the proportionality argument, that is, that the government response should be proportional to the quantitative public health impact. Raymond Neutra, a former California regulator, said he believes that parties’ philosophical perspectives should be understood before serious discussion begins because these differences can play an important role in how one interprets facts and establishes a position.

Olivier Borraz, a sociologist who studies policy development at the Centre de Sociologie des Organisations, Paris, posed the following question: “Why is it necessary to invoke the precautionary principle in order to justify low-cost measures when a possible small risk has been identified (in epidemiologic studies)? I don’t see the role of the precautionary principle.” In his opinion, precaution is not needed when recommendations are based on scientific evidence. It is appropriate to justify precaution based on uncertainty or public concern – “it is the price for social peace,” but, he continued, given the low risk that ELF EMF poses, this practice is not necessary in the case of the ELF EHC.

A commenter from Brazil noted that the WHO’s definition of well-being includes social well-being. If precautionary measures decrease any physical risk but increase perception and concern about risk, he asked whether overall well-being can be expected to improve.

At this point, Portier reminded speakers and participants that the EHC based its conclusions not only on the limited impact of ELF EMF but also on the weakness of the available evidence.

## **Risk Communication**

Juan Pablo Valencia of Sciences PO, Paris, France, offered his views on risk and communication. Valencia warned participants to avoid using a static message, which is typical of the “one size fits all approach.” Instead, he promotes an “inclusive approach to risk communication,” a method that consists of clear, unambiguous information; constant reassessment; and a strategy that is flexible enough to accommodate new information. Responding to an audience member who asked how ambiguity can be avoided if science is uncertain, Valencia added another element to his approach: risk communicators’ messages must clearly convey that uncertainties exist.

Because of differences in basic philosophies regarding risk management, many speakers agreed that how the choices are presented makes a difference. For example, asking “Would it be reasonable to add [a specific cost] onto each utility bill in order to reduce childhood leukemia incidence?” would have a different effect than asking “Would it be reasonable to spend [a specific country-wide total cost] on reducing EMF exposures despite the fact that there is no known link to health effects?”

## **Global Perspective**

The agenda featured a world-wide overview of various policy approaches to managing ELF EMF – and varied they were. Shaiela Kandel of the Soreq Nuclear Research Center, Yavne, Israel, and Task Group member, reported that some nations suggest voluntary compliance with international exposure guidelines but do not enforce any limits, while others have adopted formally these guidelines within legislation. Some, including the USA and Canada as well as many developing countries, have taken a minimal interference policy while other nations, such as Argentina, Japan, China, Poland, and Russia, have gone beyond these guidelines and have adopted stricter limits.

With respect to precaution, there are large variances as well. Some nations’ “precautionary” actions include specific exposure limits, such as in Italy. Other forms include restrictions on planned facilities in terms of distances to residential areas or schools. Of the 38 WHO EMF Project member countries Kandel surveyed, 3 required the use of cost-benefit analyses while 16 did not use them at all.

A subsequent panel of participants from various countries, each of whom explained his or her country’s approach to managing the ELF EMF issue, served to illustrate the differences and reinforce the influence of public and political factors in determining policy. Session chair Kheifets asked the panel, in essence, how these policies have been received in their countries. Despite their varied approaches, most panelists said that the results were positive. They cited mostly anecdotal evidence of improved procedures for companies proposing new projects; increased public awareness of the issue; more open communications and negotiations; and development of new technologies to reduce exposures. They also noted that, in general, their programs had not posed a significant obstacle for the development of new facilities. Most of the panelists said that they had not evaluated the impact of these policies on public health or public concern.

It appeared that these variations in policy have produced a less-varying slate of practical measures to reduce exposure and did not veer from such customary offerings as using low-field designs for power lines and routing high-voltage lines away from schools.

Kandel shared her observation that many nations are struggling with a similar slate of policy concerns: the role of cost/benefit analyses; the effectiveness of policy implementation; the level of dialogue among stakeholders; equity issues (voluntary vs. involuntary exposures, new vs. existing facilities or homes); relevance for children vs. adults; and finally, the risk of regulatory

competition (a so-called “race to the bottom” to see which nation or region could be the most restrictive). She noted that because the scientific evidence is the same worldwide, one would expect the situation to lead to a convergence of policies. Instead, the opposite is true because, Kandel suggested, EMF policy seems to have formed around a tempest of social factors.

### **III Reaction to the EHC Monograph**

The final session of the workshop served as a synthesis when Kheifets asked panelists to share their overall reaction to the EHC monograph and whether they had any recommendations for further action by WHO.

Borraz began by referring to Kandel’s presentation as an indication of the influence of non-quantitative factors. He said that one does not need to use “precaution” if political, economic, and public issues are acknowledged. He went on to articulate what had become the major theme of the workshop discussions. Health risk, he said, is only one component of policy development. The other is what he termed “institutional risk.” This term encompasses considerations of public concern, economic impacts, politics, and other non-quantifiable factors.

Mirjana Moser, from the Swiss Federal Office of Public Health, and Ellant both urged WHO to go further in specifying exposure limits linked to childhood leukemia and other health endpoints. Moser suggested that WHO “strengthen its argumentation” for precautionary measures. She further recommended defining low-cost as “economically acceptable,” noting that only an analysis of cost (not benefits) would be needed.

Borraz responded that science plus cost/benefit analyses do not add up to a perfect policy decision – if it did, the workshop participants would not be having “this type of discussion.” It is rational, he said, to spend money to reduce this risk and prevent crises. He believes that this realization is implicit in the EHC document but its treatment is too subtle and it should be “center stage.” Though, Borraz asserted that the strength of the EHC is the way it accommodates these issues through acceptable means while still achieving its objectives.

Swanson offered his view that the EHC contains a “clear statement” that precautionary measures are warranted but, he remarked, each country must be able to choose its most efficient, effective means of achieving the EHC recommendations, and thus, no international standards for precaution are appropriate.

On the other hand, Moser recommended that precautionary measures be specified by WHO. Moser noted that precautionary efforts can be taken at all levels—international, national, and individually. But she emphasized her view that, at least on the national level, precautionary measures should be “compulsory” and must be applied not only to transmission lines but to all exposure sources.

The discussion shifted to recommendations to reduce public exposures. Moser referred to the accepted fact that most ELF EMF exposure comes from low-voltage sources and suggested that international policies be adopted to require all EMF-generating devices to comply with emission limits. Portier reiterated the need to focus on internal wiring issues.

George Hooker from the UK’s Department of Health—just emerging from the 2.5-yr SAGE effort—said that he and others will need more time to fully evaluate the EHC document, and that participants’ ability to provide feedback to WHO will improve after they have an opportunity to

reflect upon the document. His reaction thus far, he said, is that the EHC articulated the issues well, which was “extremely helpful,” and it was very much in harmony with the SAGE results.

Swanson lauded the EHC for what he sees as a foundation for open, honest debate on the subject; a sense of proportionality in the response to the issue; acknowledgement of the role of non-quantitative factors such as concerns for children; and advancing the discussion.

Following the panel discussion, Kheifets briefly summarized the proceedings. She concluded that overall there is a sense that low-cost measures are appropriate but that its meaning remains undefined, making the guidance flexible in terms of implementation.