ITU Workshop on “Human Exposure to Electromagnetic Fields (EMFs)”
QUITO, ECUADOR, 14 AUGUST 2013

RF and Health: A WHO Perspective

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OUTLINE

- Introduction
- Assessing the health risk
- Managing the potential risk
- Conclusions
When delegates met in San Francisco to form the United Nations in 1945, one of the things they discussed was setting up a global health organization. WHO's Constitution came into force on 7 April 1948—a date we now celebrate every year as World Health Day.

Delegates from 53 of WHO's 55 original member states came to the First World Health Assembly in June 1948. They decided that WHO's top priorities would be to ensure the health of the world's populations, to advance research in all aspects of health and to develop and introduce new medical and public health measures. Since then, WHO has improved the lives of millions of people across the world through the development of vaccines and other medicines, and through disease prevention and health promotion campaigns. In 1948, there were 1.5 million cases of polio; today, there are none. In 1948, 80% of the world's population lacked access to safe drinking water; today, 90% do.

**1948**

- International Classification of Diseases (ICD) published.
- WHO takes over responsibility for the International Classification of Diseases (ICD), which dates back to 1852 and was first known as the International List of Causes of Death.

**1952**

- WHO launches its first global programme: Global Polio Eradication Initiative.

**1954**

- WHO creates the International Agency for Research on Cancer (IARC) to investigate the causes of cancer and the preventable factors to health problems.

**1967**


**1974**

- 1974: Onchocerciasis control programme.

**1979**

- 1979: Eradication of smallpox.

**1980**


**1983**

- WHO launches its first Global Strategy for Men's Health.

**1988**


**1998**


**2003**

- WHO Framework Convention on Tobacco Control.

**2004**

- WHO Framework Convention on Tobacco Control.

**2005**

- 2005: World Health Assembly renews its commitment to the Global Strategy for Women's Health.

**2006**


**2007**


**2008**


**2009**


**2010**

- 2010: WHO Framework Convention on Tobacco Control.

**2011**


**2012**


**2013**

- 2013: WHO Framework Convention on Tobacco Control.

**2014**


**2015**


**2016**

- 2016: WHO Framework Convention on Tobacco Control.

**2017**


**2018**


**2019**


**2020**


**2021**


**2022**


**2023**


**2024**


**2025**


**2026**

- 2026: WHO Framework Convention on Tobacco Control.

**2027**

- 2027: WHO Framework Convention on Tobacco Control.

**2028**


**2029**

- 2029: WHO Framework Convention on Tobacco Control.

**2030**

The Present EMF Context

- Increasing EMF human exposure due to electricity demand, medical technologies and wireless devices
- Increasing concern from the public
Radio Frequency Fields (100 kHz – 300 GHz)

- Telecommunications
- Wi-Fi
- Broadcasting
- Navigation/Radar
- Residential sources
- Commercial
- Security scanners
- Emerging technologies

Emerging technologies
Mobiles ‘boost cancer’ use are still unclear.

The biggest British study, led by Sir William Stewart two years ago, could find no evidence of a risk to health. But Sir William still recommended a precautionary approach, particularly in children.

The World Health Organisation has called for more research and has urged people to limit mobile use.

Now Italian scientists believe they could be closer to the truth.

Cancer develops when control signals in a normal cell go wrong and an abnormal cell results. Instead of destroying itself the normal cell keeps on dividing and forms a lump or tumour.

The results of the Italian study support the belief of some scientists who say radiation can damage DNA and destroy the cell repair system - making tumours more deadly.

Dr Peter de Pommery of the

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Stop Smart Meters!

Fighting for health, privacy, and safety

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Defend Your Analog Meter Sample Letter to Utility SSM Bulletins Press Releases Local Contacts Links Order/Download Flyers
The Present Scientific Knowledge

- Large and increasingly sophisticated database
- Known mechanisms
- Health effects not established below international guidelines
- Scientific uncertainty
WHO International EMF Project

- Established in 1996
- Coordinated by WHO HQ
- A multinational, multidisciplinary effort to create and disseminate information on human health risk from EMF
WHO Partners in Radiation

International Organizations

International Advisory Committee

National Authorities

NGOs

Collaborating Centres
mHealth
an ITU/WHO initiative

ITU and WHO launch mHealth initiative to combat noncommunicable diseases

Plan to save lives and reduce costs agreed at ITU Telecom World 2012

Joint ITU/WHO news release

17 OCTOBER 2012 | DUBAI, UNITED ARAB EMIRATES - The International Telecommunication Union (ITU) and WHO today launched a new partnership called the 'mHealth' Initiative to use mobile technology, in particular text messaging and apps, to help combat noncommunicable diseases (NCDs) such as diabetes, cancer, cardiovascular diseases and chronic respiratory diseases.
Do EMFs pose a health risk?

Risk Assessment
The Evidence

Risk Perception
The Public Concern

Risk Management
The Policies
OUTLINE

- Introduction
- Assessing the health risk
What do we know?

100 kHz  300 MHz  10 GHz

≠
What do we know?
Mechanisms of interaction

- Induced currents
- Induced currents and heating
- Surface heating

Frequency:
- 100 kHz
- 300 MHz
- 10 GHz

Non-thermal effects??
What type of research is needed?
RF Research Agenda

- To promote research areas that have relevance to public health, and can
  - reduce scientific uncertainties: health effects research
  - respond to public concern through better risk communication: social science research
- Useful to researchers and funding agencies
- Uptake of the latest agenda in several countries
Research
Balance of studies needed

Laboratory Studies

- Cellular studies
  - Genotoxicity
  - Gene expression

- Animal studies
  - Cancer
  - Behaviour
  - BBB
  - Skin

- Human studies
  - Sleep
  - EEG
  - Hormones
  - EHS
To date, research **does not suggest any consistent evidence** of adverse health effects from exposure to RF fields at levels below those that cause tissue heating.

Research has not been able to provide support for a causal relationship between exposure to EMF and self-reported symptoms, or “electromagnetic hypersensitivity”.

**Short-term effects**

(WHO fact sheet 193, June 2011)
Epidemiological studies
Studies on mobile phones

- Tumours in head and neck
  - Glioma, meningioma, acoustic neuroma, parotid gland

- Over 20 studies on the use of mobile phones
  - Published: USA, Nordic countries, INTERPHONE, CEFALO
  - Ongoing: MOBI-Kids, COSMOS
Brain tumour risk in relation to mobile telephone use: results of the INTERPHONE international case–control study

The INTERPHONE Study Group*

Corresponding author. Elisabeth Cardis; CREAL, Doctor Aiguader 88
*List of members of this study group is available in the Appendix.

Accepted 8 March 2010

Cases:
- 2,765 gliomas
- 2,425 meningiomas
- 1,121 acoustic neuroma
- 109 malignant parotid gland

Controls:
- 7,658
**Long-term effects**
(WHO fact sheet 193, June 2011)

- No increased risk of glioma, meningioma or acoustic neuroma with mobile phone use of more than 10 years
- Indications of increased risk of glioma for heavy users
  - Biases and errors prevent a causal interpretation
- No available data for long-term use (15-20 years)
- Studies on children ongoing
  - No causal relationship seen in CEFALO study (July 2011)
Centro de prensa

Campos electromagnéticos y salud pública: teléfonos móviles

Nota descriptiva N°193
Junio de 2011

Datos y cifras

- El uso de teléfonos móviles se ha universalizado: en el mundo hay unos 4600 millones de contratos de telefonía móvil.
- El Centro Internacional de Investigaciones sobre el Cáncer ha clasificado los campos electromagnéticos producidos por los teléfonos móviles como posiblemente carcinógenos para los seres humanos.
- Hay estudios en curso para analizar más a fondo los posibles efectos a largo plazo del uso de los teléfonos móviles.
- En 2012, la OMS realizará una evaluación formal de los riesgos a partir de todos los resultados de salud estudiados en relación con campos de radiofrecuencias.

http://www.who.int/mediacentre/factsheets/fs193/es/index.html
Epidemiological studies
Base stations and wireless networks

- Some studies have been performed
  - Well-being and performance
  - Cancer
- Difficulty of personal exposure assessment

**Campos electromagnéticos (CEM)**

**Los campos electromagnéticos y la salud pública**

Estaciones de base y tecnologías inalámbricas

Nota descriptiva N°304
Mayo 2006

**Conclusiones**

Teniendo en cuenta los muy bajos niveles de exposición y los resultados de investigaciones reunidos hasta el momento, no hay ninguna prueba científica convincente de que las débiles señales de RF procedentes de las estaciones de base y de las redes inalámbricas tengan efectos adversos en la salud.
.... subject to proper siting
How do we evaluate the health risk from EMF?
EMF Health Risk Assessment

- **Problem Formulation**

  - **Exposure Assessment**
    - Determine the amount, duration and pattern of exposure to the agent

  - **Hazard Identification**
    - Review key research to identify any potential health problems that an agent can cause

  - **Exposure-Response Assessment**
    - Estimate how much of the agent it would take to cause varying degrees of health effects that could lead to illnesses

- **Risk Characterization**
  - Assess the risk for the agent to cause cancer or other illnesses in the general population

Cancer
Overview of the evaluation process

Cancer in humans
- Sufficient evidence
- Limited evidence
- Inadequate evidence
- Evidence suggesting lack of carcinogenicity

Cancer in experimental animals
- Sufficient evidence
- Limited evidence
- Inadequate evidence
- Evidence suggesting lack of carcinogenicity

Mechanistic and other relevant data
- Mechanistic data “weak,” “moderate,” or “strong”?  
- Mechanism likely to be operative in humans?

Overall evaluation
- Group 1: Carcinogenic to humans
- Group 2A: Probably carcinogenic to humans
- Group 2B: Possibly carcinogenic to humans
- Group 3: Not classifiable as to its carcinogenicity to humans
- Group 4: Probably not carcinogenic to humans

RF fields classified as "possibly carcinogenic to humans (Group 2B)" based on

- **limited** evidence in humans. Positive association observed between exposure to RF-EMF from wireless phones and glioma and acoustic neuroma (epidemiologic studies).
- **limited** animal data

Evidence for other exposures (e.g. base stations, wifi, ...) and outcomes (other cancers) considered insufficient for any conclusion
<table>
<thead>
<tr>
<th>IARC Classification</th>
<th>Examples of Agents</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Carcinogenic to humans (107)</strong></td>
<td>Asbestos</td>
</tr>
<tr>
<td></td>
<td>Alcoholic beverages</td>
</tr>
<tr>
<td></td>
<td>Benzene</td>
</tr>
<tr>
<td></td>
<td>Mustard gas</td>
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<tr>
<td></td>
<td>Radon gas</td>
</tr>
<tr>
<td></td>
<td>Solar radiation</td>
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<tr>
<td></td>
<td>Tobacco (smoked and smokeless)</td>
</tr>
<tr>
<td></td>
<td>X-rays and Gamma</td>
</tr>
<tr>
<td><strong>Probably carcinogenic to humans (59)</strong></td>
<td>Creosotes</td>
</tr>
<tr>
<td></td>
<td>Diesel engine exhaust</td>
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<tr>
<td></td>
<td>Formaldehyde</td>
</tr>
<tr>
<td></td>
<td>Polychlorinated biphenyls (PCBs)</td>
</tr>
<tr>
<td><strong>Possibly carcinogenic to humans (267)</strong></td>
<td>RF fields</td>
</tr>
<tr>
<td></td>
<td>Coffee</td>
</tr>
<tr>
<td></td>
<td>Gasoline engine exhaust</td>
</tr>
<tr>
<td></td>
<td>Pickled vegetables</td>
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<tr>
<td></td>
<td>ELF magnetic fields</td>
</tr>
<tr>
<td></td>
<td>Styrene</td>
</tr>
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</table>
Health Risk Assessment

Problem Formulation

Hazard Identification
Review key research to identify any potential health problems that an agent can cause

Exposure Assessment
Determine the amount, duration and pattern of exposure to the agent

Exposure-Response Assessment
Estimate how much of the agent it would take to cause varying degrees of health effects that could lead to illnesses

Risk Characterization
Assess the risk for the agent to cause cancer or other illnesses in the general population

All studied outcomes
Scope

Frequency range:
- 100 kHz - 300 GHz
- Include UWB, pulses, mm-waves

Sources:
- RFID, EAS, mobile telephony, radar, smart meters, ...

Health benefits not included
- Hyperthermia, MRI, medical treatments, diathermy, RF ablation surgery

Systematic review of scientific evidence of health risks
Update on research recommendations
Review of national RF policies
OUTLINE

- Introduction
- Assessing the health risk
- Managing the health risk
  - Developing standards and regulations
  - Communicating the scientific knowledge
Emission standards have specifications that limit the EMF emissions from devices.

Exposure standards have specifications that limit EMF exposure to people.
Relevant Authorities
Non-governmental and international organizations

- **Emission standards**
- **Measurements standards**
- **Exposure standards**
Policy documents ....

http://www.who.int/peh-emf/standards/
<table>
<thead>
<tr>
<th>Bill No.</th>
<th>Long Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>HB. 11.12.181 A</td>
<td>Bill for an Act to Require Statutory Bodies to Prepare and Forward To The National Assembly Through The President Annual Reports of Its Operations and Finances; and For Other Matters Connected Therewith...........</td>
<td>C4897 - 4905</td>
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<tr>
<td>HB. 11.12.182 A</td>
<td>Bill for an Act to Provide For The Protection of Humans From Certain Levels of Exposure to Electromagnetic Fields; and for Other Matters Therewith ..........</td>
<td>C4907 - 4914</td>
</tr>
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</table>
Worldwide EMF standards
Test: Electromagnetic Fields Exposure Standards

Many countries have put in place standards or limits to control exposures to electromagnetic fields (EMFs) over the frequency range from 0 Hz to 300 GHz. WHO is creating a new database of such standards and invites your assistance.

For simplicity, the term "standard" is used throughout this questionnaire and is intended to include any limit, guideline or policy that is used to control exposures to EMFs.

This questionnaire is divided into three broad frequency ranges:

- **static** – static or DC fields
- **low frequencies** – frequencies from 1 Hz to 100kHz, i.e. including power frequencies
- **radio frequencies** – frequencies from 100kHz to 300 GHz, i.e. including broadcast radio and TV, mobile telephony and wireless technologies.

Please fill in as many of these frequency ranges as you are able to, leaving aside any questions that lie outside your knowledge or responsibility - we recognise that the responsibility for different frequency ranges may rest with different organisations or sections of government (e.g. Ministry of Health, Ministry of Environment, Ministry of Telecommunications, Ministry of Labor, Radiation Protection Agency, ...). Feel free to forward this survey to whom it may concern in your country.

Within each frequency range, the questionnaire asks separately about standards applying to the public and to workers. For each of these divisions, the questionnaire asks about the existence of standards, their legal status, and the values at specific frequencies within each range to allow easy comparison of different standards.

The results of this survey will be made publicly available on WHO's website www.who.int/emf. If you have questions, please contact us at: emfproject@who.int

Thank you in advance for completing this survey by May 27 2013.

NOTE: The mention of actions/policies in this survey does not constitute endorsement by WHO that risks exist or that the actions are appropriate. Merely, they represent examples of actions/policies that are in effect or that have been proposed in some countries.

Fields marked with an asterisk (*) are mandatory.

Contact and Organization Details

Country *

Organization name *

Last name *
### Exposure standards for electromagnetic fields (EMF)

<table>
<thead>
<tr>
<th>Location</th>
<th>Year</th>
<th>Standards apply ing to the public: Static fields</th>
<th>Standards apply ing to the public: Low frequencies</th>
<th>Standards apply ing to the public: Radio frequencies</th>
<th>Standards apply ing to workers: Static fields</th>
<th>Standards apply ing to workers: Low frequencies</th>
<th>Standards apply ing to workers: Radio frequencies</th>
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</thead>
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<td>Yes</td>
<td>Yes</td>
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<td>No</td>
<td>No</td>
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<td>Algeria</td>
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<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Subnational</td>
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<td>Andorra</td>
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<td>No data</td>
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<td>No</td>
<td>No</td>
</tr>
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<td>Subnational</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Antigua and Barbuda</td>
<td></td>
<td>No</td>
<td>No</td>
<td>No data</td>
<td>No data</td>
<td>No data</td>
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<tr>
<td>Argentina</td>
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<td>Yes</td>
<td>Subnational</td>
<td>Subnational</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
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<tr>
<td>Armenia</td>
<td></td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Australia</td>
<td></td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
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<tr>
<td>Austria</td>
<td></td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Azerbaijan</td>
<td></td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

**Notes:**
- Yes indicates that standards apply.
- No indicates that standards do not apply.
- No data indicates that data is not available.
- Subnational indicates that standards apply at the subnational level.
National management approaches

- Relevant authorities
  - National level
National management approaches

Relevant authorities

- National level
- Provincial level
- Local level

- Dispense building and planning permits
- Direct contact with public and operators
- May introduce further conservative measures based on politics rather than science
## Local Authorities

<table>
<thead>
<tr>
<th>Role</th>
<th>Possible responsibilities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Planning authority or regulator</td>
<td>Protect public health</td>
</tr>
<tr>
<td></td>
<td>Authorise siting of transmitters</td>
</tr>
<tr>
<td></td>
<td>Establish planning rules for transmitters</td>
</tr>
<tr>
<td></td>
<td>Approve land use near transmitters</td>
</tr>
<tr>
<td></td>
<td>Coordinate with other stakeholders</td>
</tr>
<tr>
<td>Landowner of transmitter site</td>
<td>Decide whether to lease site</td>
</tr>
<tr>
<td></td>
<td>Act as a good neighbour</td>
</tr>
<tr>
<td></td>
<td>Use position as landowner to encourage or promote local priorities.</td>
</tr>
<tr>
<td>Network operator</td>
<td>Operate radio telemetry network to monitor status of local infrastructure</td>
</tr>
<tr>
<td></td>
<td>Operate mobile radio network to communicate with staff</td>
</tr>
<tr>
<td></td>
<td>Operate WiFi network for public use</td>
</tr>
<tr>
<td></td>
<td>Comply with regulatory requirements</td>
</tr>
<tr>
<td>Employer</td>
<td>Meeting occupational health and safety responsibilities for staff working near wireless network transmitters.</td>
</tr>
<tr>
<td>Source of information</td>
<td>Lead public communications about health issues.</td>
</tr>
<tr>
<td></td>
<td>Respond to questions about wireless networks</td>
</tr>
</tbody>
</table>
Management Options

Reduce concern
Reduce uncertainty
Reduce exposure

- No action
- Communication
- Research
- Planning measures
- Engineering measures
- Exposure limits
- ....
Risk Perception and Communication

WHO Risk Handbook

- For programme managers who need basic information on EMF risk perception, communication and management
- Available in English
- Translated into Spanish, Italian, German, French, Russian, Bulgarian, Dutch, Polish, Portuguese, Hungarian and Japanese
- Available on the web [www.who.int/emf](http://www.who.int/emf)
Elements of Risk Perception

- Extent of health risk
- Probability of occurrence
- Uncertainty
- Ubiquity
- Pattern of exposure
- Delayed effect
- Inequity and injustice
- Voluntary vs. involuntary exposure
Managing EMF Risk Communication
Stakeholders
With whom to communicate?

Scientific Community
Health Community
Associations
General Public
Media
Industry
Law
Government
8 MARCH 2010

MEDIA CAMPAIGNING INFLUENCES PUBLIC POLICY

UNITED KINGDOM
Key words: RF, risk communication, media campaigning, public policy

Madison, Wisconsin---In a recent article in the journal Risk Research, Adam Burgess of the University of Kent in the UK analyzes “media risk campaigning,” which he defines as the conscious and systematic promotion of particular causes and issues. “It is usefully thought of in its most distinct sense as promoting an issue which media make their own, more than lending support to an established one,” he says. In his paper, he uses 3 issues as examples: mobile phones, genetically modified organisms, and sex offenders. This Gateway summary will be restricted to mobile phones and masts.
OUTLINE

- Introduction
- Assessing the health risk
- Managing the potential risk
- Conclusions
Challenges to governments....

- Rapidly evolving RF technologies
- Launched on the market before health evaluation
- Disparities in risk management measures and regulations around the world
- Concern from the public
Conclusions

- Need for clear roles and responsibilities in government on this topic
- Need for adoption and compliance of health-based standards
- Need for a public information program and dialogue with stakeholders
- Need for promoting research to reduce uncertainty

"We are a "global village"