



1st Digital Africa Week



Electromagnetic Fields (EMFs) and Public Health: Shaping Research Agenda in the Wake of 5G Tech.

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Introduction



" I envision a world in which everyone can live healthy, productive lives, regardless of who they are or where they live. I believe the global commitment to sustainable development - enshrined in the Sustainable Development Goals offers a unique opportunity to address the social, economic and political determinants of health and improve the health and wellbeing of people everywhere".



Dr Tedros Adhanom Ghebreyesus Director-General , World Health Organization.

Public Health and Environment Context



- Radiation of all forms constitutes one of the environmental determinants of health.
- In Nigeria, 29% of national disease burden is linked to risks factors from the environment.
- Exposure to man-made electromagnetic fields (EMF) is on the increase due to electricity demand, ever-advancing technologies and changes in social behaviors.
- Everyone is exposed to a complex mix of weak electric and magnetic fields, including sources such as mobile phones, home appliances and telecommunications and broadcasting installations.
- Globally, an estimated over 3.7 billion uses of mobile phones and the number keeps growing. (Forbes, 2018)



29% of National Disease Burden

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12.6 million

Deaths each year are attributable to unhealthy environments - nearly 1 in 4 of total global deaths.

What are EMFs, what are they NOT?

- Electromagnetic fields (EMFs) are oscillating waves generated when an electric current flow through an electric field.
- These fields are used to transmit information over long distances and form the basis of telecommunications and broadcasting all over the world.
- Mobile telephones, television and radio transmitters and radar produce EMF fields.
- EMF from these equipment are non-ionizing, but can generate heat.
- Radio Frequencies from phones and telecomm equipment are NOT the same as Xrays and Gamma Rays which are ionizing and can break chemical bonds.
- Frequency Vs Wavelength: Fields of different frequencies interact with the body in different ways.









Radiation - Electromagnetic Spectrum



Forms of EMFs



EMF exists in various forms:

- Static magnetic fields (30-50 Hz) e.g medical imaging devices
- Extremely Low Fields (ELF) (up to 300 Hz) e.g high-voltage overhead power cables, Household appliances.
- Intermediate fields (300 Hz to 10 MHz) e.g anti-theft devices operated at the exits of shops, induction hotplates, VDU.
- Radio Frequency (RF) radiation (10 MHz to 300 GHz) e.g telecommunications antennae and mobile phones, WLAN.



869-890 MHz (CDMA) 935-960 MHz (GSM 900) 1805-1880 MHz (GSM 1800) 2110-2170 MHz (3G) 2190-2310 MHz (4G)

5G : Healthy Opportunities or Threats?



- 5G stands for "fifth generation" mobile network technology that is expected to roll out by 2020. It will be 40–60 times faster than current mobile technology.
- A 10% increase in high-speed Internet connections, economic growth increases by 1.3%" and leads to "democratization of innovation" – World Bank (2019)
- The increase in overall exposure to radio waves when 5G is added to an existing network is a concern to the public



Exposures to EMF



Personal exposure	Monitor, Oven, Wifi Mobile Phones HF dialectic heaters Portable radios	
Occupational exposure	Base stations levels of exposures correlated with proximity to antennae	
Environmental exposure	Broadcasting sources PVC Welding machines Induction Heaters	

EMFs and Epidemiologic Relationship



- The Health effect of a substance on the human body is a function of the interaction between the agent (substance), environmental context and susceptible host (man)
- Epidemiologic Triad model explains the development of disease as a combination of events:
 - A harmful agent
 - A susceptible host
 - An appropriate environment

Agent:

Radiation –exposure (wavelength, frequency), pathogenicity, virulence,....



Health Effects of Exposure to Radio Frequency



- Tiny electrical currents exist in the human body due to the chemical reactions that occur as part of the normal bodily functions, even in the absence of external electric fields.
- Low-frequency magnetic fields induce circulating currents within the human body.
- The strength of these currents depends on the **intensity** of the outside magnetic field.
- If sufficiently large, these currents could cause stimulation of nerves and muscles or affect other biological processes.
- Biological effects are measurable responses to a stimulus or to a change in the environment.
- These changes are not necessarily harmful to your health.
- Changes that are irreversible and stress the system for long periods of time may constitute a health hazard.



EMF: Public Health Concerns



- There are instances where the public have attributed a diffuse collection of symptoms (headaches, anxiety, suicide and depression, nausea, fatigue and loss of libido) to low levels of exposure to electromagnetic fields at home.
- To date, scientific evidence does not support a link between these symptoms and exposure to electromagnetic fields.
- At least some of these health problems may be caused by noise or other factors in the environment by anxiety related to the presence of new technologies.

Radio Frequency and Cancer



- Despite many studies, the evidence for any effect remains highly controversial.
- However, it is clear that if electromagnetic fields do have an effect on cancer, then any increase in risk will be extremely small.
- The results to date contain many inconsistencies, but no large increases in risk have been found for any cancer in children or adults.
- A number of epidemiological studies suggest small increases in risk of childhood leukemia with exposure to low frequency magnetic fields in the home.
- However, scientists have not generally concluded that these results indicate a cause-effect relation between exposure to the fields and disease (as opposed to artifacts in the study or effects unrelated to field exposure).



5G and Health Concerns



- 5G devices and networks are yet to be implemented, the increase in overall exposure to radio waves when it is added to an existing network riase additional concerns.
- International Commission on Non-Ionizing Radiation Protection (ICNIRP) is currently revising its radio frequency guidelines
- 5G devices and networks are yet to be implemented, the increase in overall exposure to radio waves when it is added to an existing network
- The critical effect of high-frequency exposure relevant to human health and safety is heating of exposed tissue.
- "High-frequency fields can penetrate into the body (the higher the frequency, the lower the penetration depth) ... this results in friction and thus heat."
- ICNIRP said the acute and long-term effects of high-frequency exposure below the thermal threshold have been studied extensively without showing any conclusive evidence of adverse health effects.
- WHO do not perform research into the technology but will "review scientific evidence of 5G when the technology is deployed and rele^e published health data are available".



International EMF Project

- The health concerns of EMF exposure led the WHO to establish the International EMF Project in 1996, to assess the scientific evidence of possible health effects of EMF in the Frequency range 0 – 300 GHz.
- The Project has 54 participating countries (including South Africa, Burkina Faso & Tanzania, excluding Nigeria) and 8 International Organizations.

WHO's IARC

- In May 2011, WHO's International Agency for Research on Cancer ,on the strength of accumulated evidence of investigations into EMF exposure & childhood leukemia, classified ELF magnetic fields as "possibly carcinogenic"
- Category 2B some 285 agents. Coffee, known to increase risk of kidney cancer but protective against bowel cancer- was until recently in this classification as "possibly carcinogenic in humans".





Agents Classified by the IARC Monographs, Volumes 1–124

Group 1	Carcinogenic to humans	120 agents
Group 2A	Probably carcinogenic to humans	82 agents
Group 2B	Possibly carcinogenic to humans	311 agents
Group 3	Not classifiable as to its carcinogenicity to humans	500 agents

Special Studies to Note



INTERPHONE (2010)

- An international case-control study of intracranial tumours and tumours of the parotid gland. Started in 2001 and has been conducted in 13 countries.
- Results of some national and international analyses have been published and the full collaborative analysis for gliomas and meningiomas was released.
- The overall analysis showed no increased risk for glioma or meningioma with mobile phone use over 10 years.

CEFALO Study, 2011

- Case-control study was performed in Denmark, Norway, Sweden, Switzerland and the United Kingdom to investigate the risk for brain tumours in children aged 7 to 19 years in relation to mobile phone use during the study period 2004–2008.
- There is no convincing scientific evidence that the weak RF signals from base stations & Wireless Networks cause adverse health effects.



- It is not disputed that electromagnetic fields above certain levels can trigger biological effects.
- Experiments with healthy volunteers indicate that short-term exposure at the levels present in the environment or in the home do not cause any apparent detrimental effects.
- In the area of biological effects and medical applications of nonionizing radiation approximately 25,000 articles have been published over the past 30 years.
- Based on in-depth review of the scientific literature, the WHO concluded that current evidence does not confirm the existence of any health consequences from exposure to low level electromagnetic fields.
- However, some gaps in knowledge about biological effects exist and need further research.

Global Standards of Deployment



- Many international organisations like:
 - WHO/international Agency for Research on Cancer (WHO/IARC),
 - International Commission on Non-Ionizing Radiation Protection (ICNIRP, 1998) and
 - Institute of Electrical and Electronic Engineers (IEEE, 2005)
- Have ALL set up standards and support research on levels of absorption of EMF radiation and associations between EMR and ill health.
- As of date, their considered opinion has not changed as to the danger of EMF radiations occasioned by telecom installations and gadgets to human health within the prescribed limits.
- Almost all the published expert reviews stated that "Overall, currently available information does not provide unequivocal evidence that nonionizing radiation at low and high frequencies is a cause of cancer"









"If an action or policy has a potential risk of causing harm to the public or to the environment, in the absence of scientific consensus, and that the action or policy is harmful, then the burden of proof that it is not harmful, falls on those taking an action and not on the victims of such action "

R. S. Sharma

Setting Research Priority in the Wake of 5G



- 1. Develop a list of research options, by research domain – epidemiology, human studies, animal studies, cell studies, mechanisms of interaction, dosimetry and exposure assessment and social sciences.
- 2. Assemble technical experts and define the context high-priority research needs vs other research needs.
- 3. Set criteria for priority setting
 - relevance to public health (scientific concern, public concern, exposure relevance)
 - potential for filling knowledge gap
 - scientific suitability (study design and method)
 - feasibility (in terms of cost, ethical issues, timescale).



Positioning Africa for Digital Research Reforms

- Connecting the missing links (Academia, Government, Industry).
- Leverage on WHO flagship projects.
- Development of research driven digital Ecosystems and incubation centres to promote digital innovation in health, business, agriculture, environment etc.
- Embrace a multisectoral approach to advance technological innovation to avoid achieving economic growth at the expense of the environment and human health





Benefits in Telecomm and Health



- Common policies, innovations and interventions in Telecom Industry.
- Greater impact in allaying public fears and concerns on EMF.
- Widespread adoption of precautionary measures to prevent impacts of technology on health and environment.
- Increased capacity to fight diseases and provide health services.
- Better health indicators of our populations and progress in achieving SDGs.
- Develop an integrated resilience against health risks from radiation, climate change and other environmental determinants of health.



Global Health Observatory and EMF



- The GHO data repository is WHO's gateway to health-related statistics for its 194 Member States.
- It provides access to over 1000 indicators on priority health issues and health risks such as radiation, sanitation, air pollution and others.
- WHO welcomes the governments of Nigeria and other countries in Africa - national communication commissions to participate in the annual International Advisory Committee Meeting (usually around May/June).



Global Observatory on Health R&D

WHO Priorities









- Following a standard health risk assessment process, there are no substantive health issues related to ELF electric fields at levels generally encountered by members of the public.
- International and National Guidelines should be updated in the wake of 5G high-frequency exposure.
- In preparation for 5G, there is need to promote health, safety and environment based on precautionary guidelines.
- There is need to scale-up integrated research agenda in the telecom industry at country, regional and global levels.
- The need to leverage on Digital Africa to promote health and it's determinants as well create economic opportunities for increasing Africa youth population.





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