



Science and Public Health Implications the INTERPHONE Study

Cell Phones and Glioma Risk: What's the Public Supposed to Believe Now?

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Introduction

- **Cindy Sage, MA, Owner, Sage Associates**
- **Translating complex science for decision-makers**
- **Co-Editor, BioInitiative Report**
- **Research Fellow, Orebro University Hospital, Dept of Oncology, Sweden (2008-2010)**
- **38 years environmental science consulting**
- **Expert witness on EMF (since 1982 ~ 40 legal cases and over 1000 projects involving health and technical work on power line EMF)**
- **10+ years UC Santa Barbara Environmental Studies Program developing and teaching classes**

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Contributors to this Analysis

- **David Carpenter, MD, Director, Center for Health and Environment, University at Albany, New York.**
- **Cindy Sage, MA, Sage Associates**
- **Prof. Michael Kundi, PhD, Institute of Environmental Health, Medical University of Vienna**
- **Lennart Hardell, MD, Oncologist and Researcher University of Orebro, Department of Oncology, Orebro, Sweden**
- **David Gee, Senior Adviser, Science, Policy, Emerging Issues, Integrated Environmental Assessment, European Environment Agency, Copenhagen, Denmark**

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What is the *INTERPHONE*?

- A 13-country study by WHO and IARC.
- About 13,000 participants.
- About 20 researchers contributing.
- Ten years in the making...
- Six years studying, four years arguing over the highly controversial results.
- Bitter disagreement among authors.

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Who Participated?

Countries and Teams:

Australia, New Zealand, Norway
Sweden, Finland, Denmark
France, United Kingdom, Germany
Italy, Japan, Canada, Israel
(The US wouldn't put up the money to participate)

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What is a glioma?

- A malignant brain tumor.
- Average survival time is 403 days from diagnosis.
- The “Ted Kennedy” tumor.
- Very low survival rate.

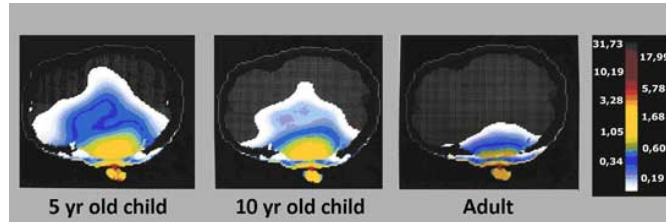
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What does cell phone radiation look like in the brain? (from Gandhi et al, 1996)



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Important Highlights

- *INTERPHONE Study* confirms previous reports showing what many experts have warned – that regular use of a cell phone by adults can significantly increase the risk of glioma by 40%.

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Important Highlights

- The risk of glioma increases to 96% considering ipsilateral use, when the cell is used predominantly on one side of the head.
- Only 1640 hours or more total use
- Over ten years or more use

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Important Highlights

- *INTERPHONE Study* confirms tumors were more likely to occur on the side of the head most used for calling.

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Why Underestimation of Risk is Likely

- Regular user defined as one call per week over six months.
- Very low use counted as exposed.
- Cordless phone use ignored in controls.
- Highest risk groups excluded (<29, >59 years).
- Several factors could cause underestimation of risk.
- Recall bias (if any) was due to people guessing high about their cell phone use.

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Meta-Analyses for Glioma (≥ 10 Years) Corroborating Evidence for Risk

- INTERPHONE (40%) 1.4 OR (1.03-1.89)
 - Ipsilateral (96%) 1.96 OR (CI=1.22 -3.96)
- Hardell et al, 2008. Int J Oncology
 - All tumors (20%) 1.2 OR (0.8 -1.9)
 - Ipsilateral (200%) 2.0 OR (1.2 -3.4)
- Kan et al, 2006 (25%) 1.25 OR (1.01-1.54)
 - No ipsilateral results
- Myung et al, 2009. J Clin Oncology
 - 7 blinded case-control studies (35%) 1.35 OR(1.14-1.59)
 - 7 blinded + 6 not-blinded studies (18%) 1.18 OR(1.04-1.34)
 - 5 studies with ipsilateral use ((39%) 1.39 OR(1.02-1.72)

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What the comparison shows

- **Hardell et al meta-analysis finds a doubling of risk for adults for glioma at ≥ 10 years ipsilateral, at about 2000+ hours use.**
- **INTERPHONE study finds nearly doubling of risk for adults for glioma at ≥ 10 years ipsilateral, at about 1640+ hours use.**
- **Kan et al meta-analysis finds a 25% risk for adults for glioma at ≥ 10 years without including any of the Hardell et al studies, and with no laterality.**
- **Myung et al meta-analysis corroborates both meta-analyses above, finding the Hardell studies most credible and finds 39% risk ipsilateral across the studies.**

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Appendix 2 Table – ORs between mobile phone use and brain tumours (meningioma and glioma separately) by time since start of regular use, cumulative call time and cumulative number of calls, excluding use with hands-free devices; analyses restricted to ever regular-users

	Meningioma					Glioma				
	Cases	Controls	OR	95 % CI		Cases	Controls	OR	95 % CI	
Time since start of regular use (years)										
1-1.9 years	116	112	1.00			93	159	1.00		
2-4	362	367	0.90	0.62	1.31	460	451	1.68	1.16	2.41
5-9	288	308	0.75	0.51	1.10	468	491	1.54	1.06	2.22
10+	76	67	0.86	0.51	1.43	190	150	2.18	1.43	3.31
Cumulative call time with no hands-free devices (hours) ¹										
<5 hours	113	88	1.00			90	114	1.00		
5.0-12.9	83	88	0.79	0.48	1.29	92	124	0.88	0.56	1.39
13-30.9	95	107	0.72	0.45	1.15	127	118	1.37	0.87	2.14
31-60.9	70	87	0.59	0.35	0.99	108	126	1.13	0.72	1.77
61-114.9	74	88	0.58	0.35	0.97	121	135	1.06	0.68	1.67
115-199.9	69	95	0.64	0.39	1.06	129	119	1.13	0.71	1.78
200-359.9	74	81	0.58	0.35	0.96	116	138	1.00	0.63	1.58
360-734.9	83	80	0.85	0.51	1.41	142	139	1.17	0.74	1.84
735-1639.9	85	69	0.81	0.49	1.36	126	125	1.09	0.69	1.72
1640+	96	71	1.10	0.65	1.85	160	113	1.82	1.15	2.89
Cumulative number of calls with no hands-free devices (in hundreds) ¹										
<1.5 x 100 calls	109	81	1.00			92	102	1.00		
1.5-3.4	86	98	0.54	0.32	0.90	91	123	0.95	0.59	1.52
3.5-7.4	92	97	0.76	0.46	1.27	108	148	0.85	0.55	1.32
7.5-13.9	88	91	0.76	0.45	1.26	121	111	1.19	0.74	1.89
14-25.4	75	107	0.56	0.34	0.92	133	134	1.10	0.70	1.73
25.5-41.4	71	72	0.60	0.35	1.02	121	124	1.19	0.75	1.88
41.5-67.9	85	94	0.63	0.38	1.05	126	122	1.02	0.64	1.62
68-127.9	102	89	0.79	0.49	1.29	136	147	1.13	0.73	1.77
128-269.9	79	63	0.76	0.44	1.32	154	120	1.49	0.94	2.36
270+	55	62	0.66	0.37	1.17	129	120	1.31	0.82	2.11

5/. ¹ ORs adjusted for sex, age, study centre, ethnicity in Israel, and education.

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Does Inconclusive Mean No Evidence?

- The INTERPHONE study overall called inconclusive. We didn't expect conclusive.
- This does not equate to 'no evidence'.
- Certainly does not equate to 'no risk'.
- We should not expect to see risks yet.
- Seeing risks at ONLY ≥ 10 years is alarming.
- Brain tumor latency is 15-30 years.
- Cell phones are an effective carcinogen.
- There is not yet proof - just growing evidence

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What are the Stakes?

- With more than four billion cell phone users around the world, the potential for a brain cancer epidemic.
- Children are more at risk than adults from the effects of most toxic exposures in life, including both chemicals and radiofrequency radiation from cell phones.
- Experts are worried about the effects of radiofrequency radiation on the developing brain and nervous system of children.

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Children and Brain Tumors

- Brain cancer rates are increasing in children and adolescents (National Cancer Institute, NIH Pub. No. 06-5767. Bethesda, MD 2006. Chapter 6).
- Cell phone use is increasing rapidly by children and adolescents (US Congressional Testimony of Robert Hoover, National Cancer Institute, September 2008).

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Children and Brain Tumors

- Children who start using cell phones before the age of 20 have a 500%+ risk of glioma, a malignant brain tumor by 20-29 age.
- Cordless phones are about equally powerful in RF emissions, thus time spent on cordless phones counts for children. Land-lines (corded phones have no RF emissions).

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Science by Press Release? Its Risky

- ***"Landmark study set to show potential dangers of heavy phone use"*** (UK Telegraph)
- ***"International Study Cautions Cell Phone Users"*** (Israel)
- ***"Heavy mobile users risk cancer"*** (UK Times)
- ***"A major international study has found a link between mobile phone use and certain brain tumours."*** (The Scotsman)

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Science by Press Release? Its Not Risky

- ***Study finds no risk of brain tumors with cell phone use."*** (CNN crawler on television)
- ***"Study finds no link in cell phone use, brain tumors"*** (CNN International)
- ***"WHO study finds no increased brain cancer risk with cell phone use"*** RCR Wireless
- ***"No cell phone-cancer link: major study finds"*** (Financial Post)

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Science by Press Release? It is Inconclusive

- "*Cancer from mobile phone use uncertain*" (Associated Press)
- "*Study on cell phone link to cancer inconclusive*" (Frank Jordans, AP Wire)
- "*No proof of mobile phone cancer link*" (UK Mirror)
- "*Massive study can't say*" (Vancouver Sun)

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Science by Press Release? Too much or too young

- "*Study raises worry about cancer risk for heavy cell users*" (Haaretz, Israel)
- "*Mobiles not totally safe for kids*" (Sydney Morning Herald)

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IARC Embargo Breaches Influenced Headlines

- *"Embargo break on cellphone-brain tumor study adds to controversy (LA Times)*
- *"Interphone's data on cell phones and cancer: The spin begins" (Science News)*

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It is not just the RF emissions

- We know that exposure to power line frequency EMFs results in associated with increase in risk of leukemia.
IARC Classification - Group 2B (Possible Carcinogen)
- Kheifets et al, 2006 brain tumor meta-analysis for ELF-EMF found increased risk and ELF emissions from cell phones are excessively high.

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Where Do We Go From Here?

- **The FDA needs to advise consumers on its webpage - now it says “no risk at all”.**
- **INTERPHONE is the world’s longest, largest study. There is nothing else on the horizon.**
- **There are important results = prevention.**
- **Despite dueling interpretations of risk, and varying degrees of belief among researchers, public health message should be strong.**

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What Level of Evidence?

- **The standard for taking action should be precautionary (President’s Cancer Panel, 2010)**
- *“Recommendation 1: A precautionary, prevention-oriented approach should replace current reactionary approaches to environmental contaminants in which human harm must be prove before action is taken to reduce or eliminate exposure.”*

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We already have strong evidence that ELF-EMF and RF are Genotoxic

- There is substantial evidence that RFR may be considered genotoxic (cause DNA damage). Of 28 total studies on radiofrequency radiation (RFR) and DNA damage, 14 studies reported effects (50%) and 14 reported no significant effect (50%). Of 29 total studies on radiofrequency radiation and micronucleation, 16 studies reported effects (55%) and 13 reported no significant effect (45%). Of 21 total studies on chromosome and genome damage from radiofrequency radiation, 13 studies (62%) reported effects and 8 studies (38%) reported no significant effects.
- Extremely-low frequency (ELF-EMF) has also been shown to be genotoxic and cause DNA damage. Of 41 relevant studies of genotoxicity and ELF-EMF exposure, 27 studies (66%) report DNA damage and 14 studies (44%) report no significant effect.
- Radiofrequency radiation exposure can induce genetic damages/changes in cells and organisms at non-thermal exposure levels. This can lead to change in cellular functions, cancer, and cell death.

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Conclusions

- 1) **The INTERPHONE study should be interpreted to be an early and strong warning that cell phone use can cause brain tumors.**
- 2) **That children should not use cell phones at all.**
- 3) **That the FDA should issue warnings to consumers.**
- 4) **That the FCC should adopt new public safety standards for cell phones, because the existing standards are inadequate (or no increased risks would be consistently showing up this early)**

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