

## The International EMF Collaborative's Counter-View of the Interphone Study

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### Results Summary

- Doubled to quadrupled brain tumor risk reported in the heaviest cellphone users.
- Average use was 2 hours per month
- Major design flaws cause all reported results to be underestimated.
- Five and one-half years after completion, only partial results are published.
- Risk by gender ignored.
- Future studies need to be restructured, or abandoned.

### Introduction

First promised for publication in 2005, partial results from the 13-country Telecom-funded Interphone study of brain tumors from 2000-2004 are finally available. The study finds no general increase in risk of brain tumors, but does find that people who have used phones heavily for a decade have a doubled to quadrupled risk of two types of brain tumors—glioma (brain cancer) and meningioma. The average user in the Interphone study used a phone for two hours a month, which is close to the amount of use by many people in a single day. . Six years after completion of data collection, results for tumors of the acoustic nerve (acoustic neuroma), and salivary gland tumors remain unpublished.

The abstract of the study concludes, “Overall, no increase in risk of glioma or meningioma was observed with use of mobile phones. There were suggestions of an increased risk of glioma at the highest exposure levels, but *biases and error prevent a causal interpretation*. The possible effects of long-term heavy use of mobile phones require further investigation.” [Emphasis added] This far too brief “Conclusions” obscures and understates the doubled to quadrupled risk of brain cancer and meningioma found in the heaviest users.

Last August, in an attempt to provide information to be use for balanced reporting, the International EMF Collaborative published, *Cellphones and Brain Tumors: 15 Reasons for Concern* (<http://www.radiationresearch.org/pdfs/15reasons.asp>). This Counter-View expands on that work and provides additional information to ensure balanced reports.

In fact the Interphone study compared people who used cellphones an average of two hours a month with brain cancer to those who used cellphone phones less than that. Today there are no unexposed population and many people use cellphone phones as much in a single day as those in the Interphone study used in an entire month.

### “Biases and Error Prevent a Causal Interpretation”

How can we determine if biases exist?

If we want to see if a coin is biased we can flip it a bunch of times and see how many times “heads” or “tails” come up. Experience tells us that head and tails will come up

about the same number of times, a sign the coin is unbiased. But if we flip a coin, say 50 times, and we find that tails comes up 44 times, we know the coin is biased towards tails. The cause of this bias is the coin is much heavier on the tail side compared to the head side.

How can we determine if biases exist in the Interphone Study?

For the sake of this analogy we will say a “tail,” is when the Interphone Study reports cellphone use protects (reduces the risk) the user from a brain tumor. We will say a “head,” is when the Interphone Study reports cellphone use increases the user’s risk of a brain tumor.<sup>1</sup> In this study, the coin was tossed 236 times, and tails came up 207 times, an overwhelming bias towards protection. While this result from the cumulative 236 “coin tosses” are extremely strong statistically, each individual toss resulting in a “tail” (OR less than one) was not necessarily statistically strong. But 50 of these odds ratios (24%) were “statistically significant.” That is, there was less than a 5% probability that the odds ratios were due to chance. Stated another way, with 207 odds ratios less than one, we would expect 5% to be “statistically significant” (about 10), but 24% of them (29) were “statistically significant.” That is, nearly one quarter of the time, cellphone use was found to provide statistically significant *protection* from a brain tumor. Unless you believe placing a cellphone against your head protects you from a brain tumor, *this is prima facie evidence of bias.*

What was the cause of this bias?

We have previously identified 11 causes

(<http://www.radiationresearch.org/pdfs/15reasons.asp>). They are:

- Selection Bias
- Insufficient Latency Time
- Definition of “Regular” Cellphone User
- Exclusion of Young Adults and Children from the Interphone Study
- Brain Tumor Risk from Cellphones Radiating Higher Power in Rural Areas Were Not Investigated
- Exposure to Other Transmitting Sources Are Not Considered
- Exclusion of Brain Tumor Types
- Tumors Outside the Cellphone’s Radiation Plume Are Treated as Exposed
- Exclusion of Brain Tumor Cases Because of Death or Too Ill to Respond
- Recall Accuracy of Cellphone Use
- Funding Bias

By far the two largest causes are *selection bias* (AKA participation bias) and *exposure to other transmitting sources are not considered.*

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<sup>1</sup> The Odds Ratio (OR) in the context of the Interphone Study is the risk that use of a cellphone causes a brain tumors. When an OR, is greater than one, there is a risk of a brain tumor. When an OR is less than one, there is protection (reduced risk) from a brain tumor.

What is *selection bias*?

The Interphone Study is a case-control study. Cases are people with brain tumors. Controls are people without brain tumors who are otherwise similar to the cases (same age, gender, live in the same region, etc.). When randomly selected controls are asked if they would like to participate in a “mobile phone” study, they are far more likely to agree if they use mobile phones than if they don’t, and if they do not use a mobile phone they are likely to refuse participation. This study reports that only 54% of controls participated but in fact it was 39%.<sup>2</sup>

The Interphone team accepts that their study has selection bias. Both Bruce Armstrong, the Australian Principal Investigator, and Siegal Sadetzki, the Israeli Principal Investigator, said selection bias caused about a 10% skew towards protection, but both admit that the size of the protective skew is much larger than 10%.

What is, *other transmitting source are not considered*?

We know that cordless phones and other widely used technologies today directly release radiofrequency radiation. These have not been included in the Interphone study, which means that the definition of exposure is incomplete. Though no other transmitting sources were considered, by far the largest source was cordless phone use. Cordless phones use cellphone technology, and their radiation is very similar to cellphone radiation. The “secret” Interphone Protocol<sup>3</sup> required asking everyone in the study if they used a cordless phone. However, cordless phone radiation was not considered an exposure. During the time when data was being collected, the percentage of people who used cordless phones was typically higher than the percentage of people using cellphones. In all likelihood this results in even larger protective effect than selection bias.

### **Risks Were Found**

In spite of this systemic-protective-skew,<sup>4</sup> the Interphone Study found statistically significant risks ( $\geq 95\%$  confidence) for both meningioma and brain cancer, as well as near-statistically significant risks ( $\geq 90\%$  confidence).

#### Statistically Significant Findings of Risk ( $\geq 95\%$ confidence)

- *Quadrupled risk of brain cancer and quintupled risk of meningioma*  
When the total use time of a cellphone was between 1 and 4 years and the cumulative number of hours of use was more than 1,640 hours, there was a 4.8-fold risk of meningioma, and 3.8-fold risk of brain cancer [Table 3];
- *Doubled risk of brain cancer*  
When a brain cancer is on the same side of the head where the cellphone was used (ipsilateral use), with more than 1,640 hours of cumulative use there was a 2-fold risk [Table 5];

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<sup>2</sup> The study uses the number of controls interviewed (7,658), but the published results was based on 5,634 controls.

<sup>3</sup> The official protocol never mentions cordless phones.

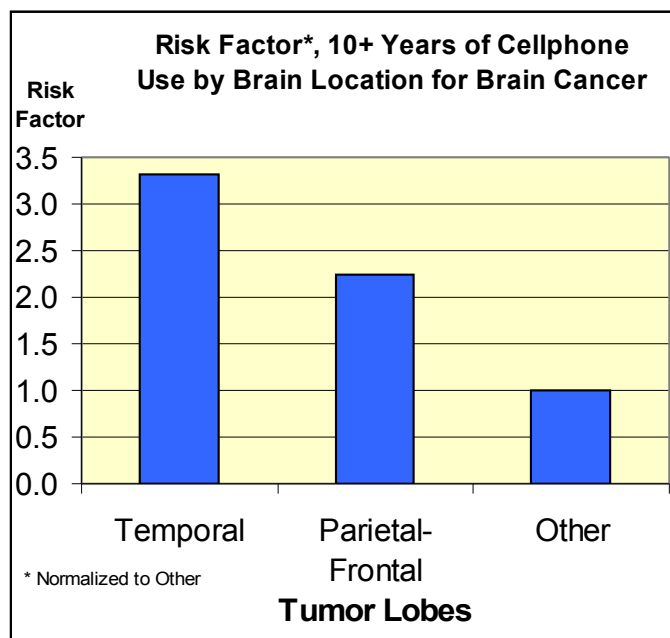
<sup>4</sup> A systemic-protective-skew means *every* odds ratio, whether less than one, or greater than one, is larger than reported.

- Forty to sixty percentage increase of brain cancer*  
 Using a different technique for calculating ipsilateral use (the Inskip method), when the cellphone had been used from 5 to 9 years, and cumulative number of hours of use was more than 1,640 hours, the risk for brain cancer on the right side of the head increased 1.4-fold, and 1.6-fold when used for more than 10 years [Appendix Table 2];
- Doubled risk of brain cancer and meningioma*  
 For exclusive use of an analogue cellphone there was a 2-fold risk of brain cancer, and, for exclusive use of a digital cellphone, a 1.8-fold risk of meningioma with more than 1,640 cumulative hours of use [Appendix Table 3], and;
- Quadrupled risk of meningioma*  
 When both analogue and digital cellphone use are combined along with “unknown” type of cellphone, there was a 4.4-fold risk of meningioma [Appendix Table 3].

Near-Statistically Significant Findings of Risk ( $\geq 90\%$  confidence)

- Doubled risk of meningioma*  
 When a cellphone has been used for 10 years and for more than 1,640 cumulative hours of use, there was a 1.8-fold risk of meningioma [Appendix Table 2];
- Fifty percent increased risk of brain cancer*  
 When only a digital cellphone has been used for more than 1,640 cumulative hours of use, there was a 1.5-fold risk of brain cancer [Appendix Table 3], and;
- Fifty percent increased risk of brain cancer*  
 When both analogue and digital cellphones were used along with “unknown” type of cellphone there was a 1.5-fold risk of brain cancer [Appendix Table 3].

The cellphone’s radiation plume deposits the greatest portion of the absorbed energy into the ipsilateral temporal lobe (50% to 60% of all energy absorbed). The graph illustrates what would be expected for brain cancer. The risk is highest in the temporal lobe and less so for other locations.



### **What Was Not Even Considered**

Every brain tumor epidemiologist knows that both meningioma and glioma have statistically significant incidence rate differences between genders. Meningiomas are far more prevalent in women than in men (female/male ratio=2.2). More males are diagnosed with brain cancer (glioma) than females (male/female ratio=1.4). With this well known knowledge of incidence rates difference by gender it is hard to understand why risk by gender was not reported.

In the Interphone Study, the female/male ratio of meningioma was 3.2, when 2.2 was expected. This suggests that women are at greater risk for meningioma when cellphones are used. The male/female ratio for brain cancer in this study was 1.5, when 1.4 was expected. This difference may be statistically insignificant, but with the large number of male brain cancer cases in this study (1,624), it suggests that men may have a significant increased risk of brain cancer. Because the Interphone researchers chose not to report risk by gender, we cannot know the answer.

### **Lack of Credibility**

The long delay in publishing only partial results, combined with industry funding, has deeply damaged the credibility of the Interphone Study. Millions of dollars/euros have been spent (the greater proportion being public money), and years have been wasted, years when cellphone use exploded. The following actions can go along way towards partially restoring the Interphone Study's credibility.

#### Release Full Dataset

All Interphone Study data collection was finished in 2004. 5 ½ years later much remains to be published, and as noted above, some results have not even been considered for publication. It is far past the time to release the full Interphone dataset to independent scientists who can publish what the Interphone Study Group has failed to publish. All governments who contributed funds should demand the release of the dataset.

#### Restructure the Mobi-Kids Study

We know that children are at higher risk from exposures to carcinogens than adults. At this point a large case-control study is being planned in Europe (but not in the U.S.) to see whether they develop brain tumors. In fact, one could also conduct case control studies on young adults with brain tumors in order to answer this question.

- We know that the risk increases inversely with age (the younger the child, the higher the risk).
- We know that an enormous proportion of children are now using cellphones.
- We know that a large proportion of early teenagers and pre-teens sleep with the cellphones beneath their pillows every night.
- We know the Interphone Study excluded children from the study.

This information screams for the need for a study on the risk to children from cellphone use.

Such a study is now underway. It is called Mobi-Kids. However this study is structured around the methodologies of the Interphone study. The leader, Elizabeth Cardis, is the

same leader who headed the Interphone Study. It is designed to study ages from 10 to 24, but we know that a significant proportion of children far younger than 10 years of age are currently using cellphones. However in a presentation given by Elizabeth Cardis she states, "*There appears to be little cost-benefit in including younger subjects in such a study.*" [Emphasis in the original] In contrast to the Interphone Study, Mobi-Kids has a cellphone company in charge of the study in France (France Telecom), creating an even larger financial conflict-of-interest than existed in the Interphone Study.

Though already well underway, without a complete restructuring, there is no reason to expect anything but a repeat of the Interphone Study. Among the restructuring requirements would be the following:

- All researchers would be completely independent of having received industry funding for the previous 5 years;
- All funding sources would be from governmental public health agencies;
- All design flaws within the Interphone Study would be eliminated, or substantially mitigated;
- All cellphone operating companies would be *mandated* to make their cellphone billing records for study subjects available to the study along with general demographic data.
- Interphone researchers would not be allowed to participate.

### **Abandon COSMOS Study**

The COSMOS Study, "COhort Study on MOBILE Phone UserS" is a prospective cohort study of cellphone users over 25-30 years. It is so flawed that Germany decided in 2007 to cease participation in the study. For rare diseases, like brain tumors, only case-controls studies are considered effective. Cohort studies have many problems. Among the problems are::

- Costly for rare diseases<sup>5</sup>
- Costly for diseases with long latency periods<sup>5</sup>
- Mixing of cohorts<sup>5</sup>
- Substantial Telecom industry funding
- Cohort size of 250,000, age 18 and greater

Brain cancer incidence is 7.07 per 100,000 person years (only about 18 brain cancers per year are expected if no increase from cellphone use, or 530 cases over 30 years; by contrast the 13-country Interphone Study had 2,708 brain cancer cases).

The Telecom industry has been touting the COSMOS study as the definitive study that will finally provided answers, 30 years hence, if cellphone use is a risk for brain and other tumors. We believe the purpose of the COSMOS study only to stall protective government actions regarding cellphone.

### **Conclusions**

*The existing study of risk to children from cellphone use must be completely restructured or it will be as flawed as the Interphone Study.*

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<sup>5</sup> Taken from German presentation of COSMOS Study

*The 30-year long cohort study is should be abandoned as it is only an attempt to delay precautionary actions by government for the next 30 years.*

*The full dataset of the Interphone Study must be released to independent scientists so that the complete results can be published.*

*Why are the results from the Swedish team led by Dr. Lennart Hardell so very different than the Interphone Study?*

A Swedish team led by Dr. Lennart Hardell has published results showing substantial risk of brain tumors from cellphone and cordless phone use. These results are internally consistent to what would be expected, if cellphone are a risk of brain tumors. That is:

- The higher the cumulative hours of wireless phone<sup>6</sup> use, the higher the risk;
- The higher the number of years since first wireless phone use, the higher the risk;
- The higher the radiated power from cellphone use, the higher the risk;
- The higher the exposure (use on the same side of head as the brain tumor), the higher the risk, and;
- The younger the user at first use of wireless phones, the higher the risk.

Why does this Swedish team consistently find increased risk from brain tumor from cellphone use when the Interphone study does not find similar risk?

The answer is quite simple, the Swedish team does not have the two largest contributors to the systemic-protective-skew found in the Interphone Study: *selection bias* and *treating cordless phone use as a non-exposure*.

This Swedish team had an 89% participation rates of cases and controls, while the Interphone study had 77% and 63% participation of meningioma and glioma cases respectively, and 39% participation of controls. The Swedish team treated cordless phone use as an exposure, and the Interphone study treated cordless phone use as a non-exposure.

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<sup>6</sup> Wireless phones include cellphones and cordless phones.