

# Epidemiology of Cell Phones and Other Wireless Transmitting Devices, an Update

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# Why do we now think that Cell phones probably cause Brain Cancer?

Three important sets of case-control studies:

- Interphone ~2-fold increased risk for 10+ years use
- Hardell in Sweden – several studies showing ~2-5 fold increased risk after prolonged use
- Cerenat France, ~5-fold increased risk for 5+ years use

# Risk of brain tumours in relation to estimated RF dose from mobile phones (Cardis et al, 2011)

<u>Exposure:</u>	<u>OR</u>	<u>95% CI</u>
Hours of use		
Never regular user	1.0	
<13.0	0.81	0.46-1.42
13.0-60.9	1.11	0.71-1.75
61.0-199.9	0.81	0.50-1.33
200-734.9	1.03	0.64-1.67
735+	1.72	1.07-2.77

# Risk of brain tumours in relation to estimated RF dose from mobile phones (Cardis et al, 2011)

<u>Exposure</u>	<u>OR</u>	<u>95% CI</u>
Specific Absorption (SA)		
7+ Years in the past		
Never regular user	1.0	0.46-1.42
<76.7	1.11	0.61-2.02
76.7-	1.53	0.85-2.78
284.1-	1.50	0.81-2.78
978.9-	1.69	0.91-3.13
3123.9+	1.91	1.05-3.47

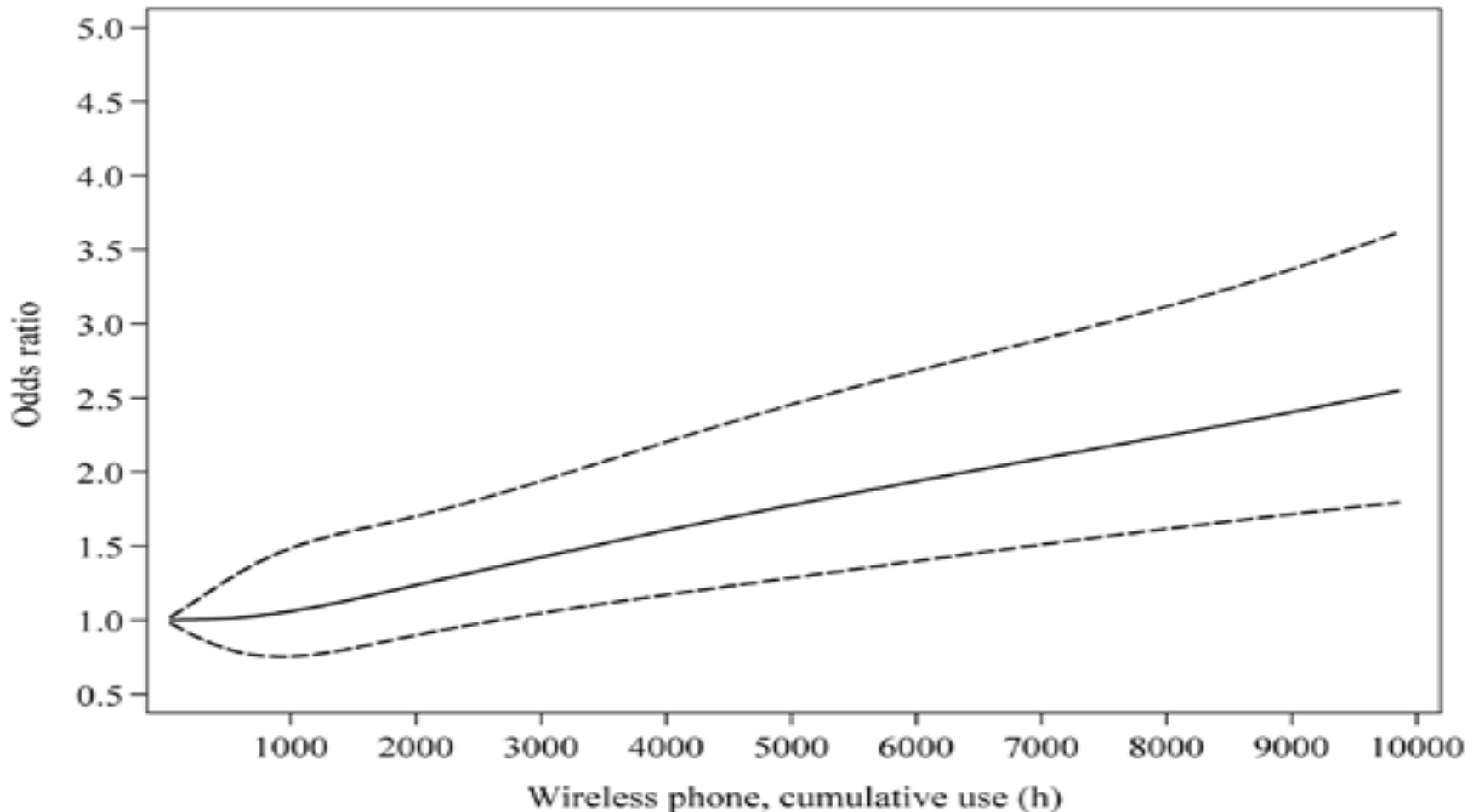
# Mobile Phone Use and Brain Tumors in Children and Adolescents (CEFALO) (Aydin et al, 2011)

<u>Exposure</u>	<u>OR</u>	<u>95% CI</u>
Regular use	1.36	0.92-2.02
Time since first use:		
Never regular user	1.0	
Up to 3.3 years	1.35	0.89-2.04
3.3-5.0 years	1.47	0.87-2.49
>5 years	1.26	0.70-2.28

# Mobile Phone Use and Brain Tumors in Children and Adolescents (CEFALO) (Aydin et al, 2011)

Operator recorded use	<u>OR</u>	<u>95% CI</u>
Time since first subscription:		
Never regular user	1.0	
Up to 1.8 years	0.78	0.43-1.40
1.8-2.8 years	1.71	0.85-3.44
>2.8 years	2.15	1.07-4.29

# Cumulative use of Wireless phones and Malignant Brain Tumors (Hardell et al, 2013)



# Risk of Glioma for use of mobile and cordless phones by site of tumour. (Hardell et al, 2013)

<u>Site</u>	<u>OR</u>	<u>95% CI</u>
Ipsilateral		
Mobile phone:	1.7	1.01-2.9
Cordless:	1.9	1.1-3.2
Contralateral		
Mobile phone:	1.4	0.8-2.5
Cordless:	1.6	0.9-2.8



# Mobile phone use and Gliomas in the CERENAT case-control study (Coureau et al, 2014)

<u>Exposure</u>	<u>OR</u>	<u>95% CI</u>
Average calling time/month		
<2	0.91	0.57-1.46
2-4	0.57	0.30-1.10
5-14	1.70	0.97-2.99
15 or more-	4.21	2.00-8.87
Urban use only	8.20	1.37-49.07
Ipsilateral	2.11	0.73-6.08
Contralateral	0.66	0.23-1.89

# Risk of Glioma for use of mobile and cordless phones in different latency groups.

(Hardell et al, 2015)

<u>Latency</u>	<u>OR</u>	<u>95% CI</u>
Never regular user	1.0	
>1-5 years	1.1	0.9-1.4
>5-10 years	1.5	1.2-1.9
>10-15 years	1.4	1.1-1.8
>15-20 years	1.7	1.2-2.3
>20-25 years	1.9	1.3-2.9
>25 years	3.0	1.7-5.2

# The Intracranial Distribution of Gliomas in Relation to Exposure From Mobile Phones (Grell et al, 2016)

Distance From Preferred Ear to Gravity Center of Tumor	<u>OR</u>	<u>95% CI</u>
15-55 mm - Females	1.85	1.41-4.04
>55-75 mm – Females	1.85	1.36-2.96
15-55 mm- Males	3.04	1.63-7.54
>55-75 mm - Males	1.68	1.26-2.33

# Risk of Meningiomas in relation to estimated RF dose from mobile phones (Cardis et al, 2011)

<u>Exposure</u>	<u>OR</u>	<u>95% CI</u>
Specific Absorption (SA)		
7+ Years in the past		
Never regular user	1.0	
<76.7	1.07	0.64-1.78
76.7-	0.74	0.33-1.67
284.1-	0.88	0.47-1.64
978.9-	1.00	0.52-1.92
3123.9+	2.01	1.03-3.93

# Mobile phone use and Meningiomas in the CERENAT case-control study (Coureau et al, 2014)

<u>Exposure</u>	<u>OR</u>	<u>95% CI</u>
Average calling time/month		
<2	1.05	0.60-1.81
2-4	0.45	0.22-0.91
5-14	0.78	0.36-1.68
15 or more-	2.02	0.81-5.04
Urban use only	2.72	0.36-20.78
Ipsilateral	2.29	0.58-8.97
Contralateral	1.18	0.34-4.12

# Risk of Acoustic Neuroma for use of mobile and cordless phones in different latency groups. (Hardell et al, 2013)

<u>Latency</u>	<u>OR</u>	<u>95% CI</u>
Never regular user	1.0	
>1-5 years	1.2	0.8-1.6
>5-10 years	1.8	1.3-2.7
>10-15 years	2.0	1.3-3.2
>15-20 years	1.7	0.9-3.3
>20 years	4.4	2.2-9.0

# Nation-wide CC study of Vestibular Schwannoma diagnosed in Sweden between 2002-2007 (Pettersson et al, 2014)

<u>Exposure</u>	<u>OR</u>	<u>95% CI</u>
Ever used regularly	1.18	0.88 to 1.59
5-9 years since first use	1.40	0.98-2.00
10 or more years from first use	1.11	0.76-1.61
Ipsilateral use	0.98	0.68-1.43
≥680 hours use	1.46	0.98-2.17

# Update of Danish Cohort Study – All brain tumors

(Frei et al, 2011)

<u>Exposure</u>	<u>IRR</u>	<u>95% CI</u>
≥13 years of subscription		
Men	1.03	0.83-1.27
Women	0.91	0.41-2.04



# Million Women Cohort Study, UK

(Benson et al, 2013)

<u>Exposure and tumor</u>	<u>RR</u>	<u>95% CI</u>
Ever use mobile phone		
Glioma	0.91	0.76-1.06
Meningioma	1.05	0.81-1.38
Acoustic Neuroma	1.44	0.91-2.28

# Million Women Cohort Study, UK

(Benson et al, 2013)

<u>Exposure and tumor</u>	<u>RR</u>	<u>95% CI</u>
Duration of use 10+ years		
Glioma	0.78	0.55-1.10
Meningioma	1.10	0.66-1.84
Acoustic Neuroma	2.46	1.07-5.64

# Trends in cancer incidence

- Expectation: Any change will be slow, and small
- Potential confounding: Trends in diagnosis
- Latent period: Could be prolonged
- Examples: US, UK, Australia, Israel (parotid gland tumors)

# Incidence trends of temporal lobe GBM in the US: 1992-2006.

(Zada et al, 2014)

<u>Registry</u>	<u>APC</u>	<u>p</u>
Los Angeles	2.3	0.010
California	2.3	0.026
SEER 12	1.3	0.027

# Incidence trends of frontal lobe GBM in the US: 1992-2006. (Zada et al, 2014)

<u>Registry</u>	<u>APC</u>	<u>p</u>
Los Angeles	3.0	0.001
California	2.4	<0.001
SEER 12	2.5	0.025

# Case Series

- 7 (+) unusual case reports of breast cancer
- Two Cancer Clusters in Israel

# Summary of 7 Breast Cancer cases

- Negative for genetic risk factors
- No family history or other risk factors
- Unusual location of multi-focal tumors where phones were kept
- No significant histology away from the areas of cellular phone use
- Two with metastases (spread to other parts of body)

# Overall conclusions

- ✓ Radiofrequency fields are a Probable Human Carcinogen (IARC Category 2A)
- ✓ Radiofrequency fields are now ubiquitous
- ✓ Even if the risk per individual is low, it is widely distributed and could become a major public health problem
- ✓ The Precautionary Principle must be applied now.