

*MOBI-Kids - Risk of brain cancer  
from exposure to radiofrequency fields  
in childhood and adolescence*

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# Background for application

- Public and public health interest
  - International recommendations
    - ✓ WHO International EMF Project
    - ✓ EU supported EMF-Net
  - National recommendations
  - National funding programs
    - ✓ France, Netherlands, UK, .....
- Past experience



# The INTERPHONE study

- Design

- Population based case-control studies:
  - ✓ Glioma and meningioma
  - ✓ Acoustic neurinoma
  - ✓ Parotid gland tumours
- Common core protocol – 13 countries
- All persons aged 30-59 years who reside in the study regions (metropolitan areas in most countries)
- Study period: 2000 until late 2004



# Participating countries

- ✓ Australia
- ✓ Canada
- ✓ Denmark
- ✓ Finland
- ✓ France
- ✓ Germany
- ✓ Israël
- ✓ Italy
- ✓ Japan
- ✓ New Zealand
- ✓ Norway
- ✓ Sweden
- ✓ UK

*Cardis E, Richardson L, Deltour I, et al. The INTERPHONE study: design, epidemiological methods, and description of the study population. Eur J Epidemiol. 2007 Jul 18; [Epub]*



# INTERPHONE Study

- *Interviewed and eligible subjects*
  - 2,765 glioma
  - 2,425 meningioma
  - 1,121 acoustic neurinoma
  - 109 malignant parotid gland tumours
  - 7,658 controls
- National analyses published as they are completed
- International publications underway



# Glioma – OR in regular users

Many ORs below 1, some significantly so

Participation rates low, particularly in controls

- **selection bias?**

Country	% ever regular users	Number of cases and controls		OR and 95% CI - ever regular use # cases			
Denmark (Christensen, 2005)	49%	81	155	1.08	(0.6, 2.0)	47	Low grade
		171	330	<b>0.58</b>	<b>(0.4, 0.9)</b>	59	High grade
France (Hours, 2007)	54%	96	96	1.15	(0.7, 2.1)	59	
Germany (Schüz, 2006)	39%	366	1,494	0.98	(0.7, 1.3)	138	
Norway (Klaeboe 2007)	56%	289	358	<b>0.6</b>	<b>(0.4, 0.9)</b>	161	
Sweden (Lönn, 2005)	59%	371	674	<b>0.8</b>	<b>(0.6, 1.0)</b>	214	
UK (Hepworth, 2006)	52%	966	1,716	0.94	(0.8, 1.1)	508	
Nordic combined (Lahkola, 2007)	57%	1,522	3,301	<b>0.78</b>	<b>(0.7, 0.9)</b>	867	



# Glioma – OR in long-term users

Studies with largest numbers of long-term users tend to show an increased risk of tumours related to use 10 years or more on the side of the head where the phone is held

– causal association or recall bias?

Country	OR and 95% CI Start of use 10 years or more in the past # cases		OR and 95% CI Ipsilateral use, start of use 10+ years in past # cases		OR and 95% CI Contralateral use, start of use 10+ years in past # cases	
Denmark	1.64 (0.44, 6.12)	6 High-grade	NA		NA	
	0.48 (0.19, 1.26)	8 Low grade	NA		NA	
France	1.96 (0.74, 5.20)	21 46 months+	NA		NA	
Germany	2.20 (0.94, 5.11)	12	NA		NA	
Norway	0.8 (0.5, 1.2)	70 6+ years	1.3 (0.8, 2.1)	39	0.8 (0.5, 1.4)	32
Sweden	0.9 (0.5, 1.5)	25	1.6 (0.8, 3.4)	15	0.7 (0.3, 1.5)	11
UK	0.90 (0.63, 1.28)	66	NA		NA	
Nordic	0.95 (0.74, 1.23)	143	1.39 (1.01, 1.92)	77	0.98 (0.71, 1.37)	67



# Use of mobile phones during childhood ?

- If there is an effect, likely to be greater
  - Developing brain may be more sensitive to effects of RF radiation
  - Children who start using phones will have much more exposure
    - ✓ Many more years of use
    - ✓ Greater quantity of use as much cheaper than before
- Urgent that this is studied



# Environment call 2008

- **ENV.2008.1.2.1.1. Health impacts of exposure to radiofrequency fields in childhood and adolescence**
- The aim is to investigate whether prolonged exposure to radiofrequency fields (RF EMF) and pulsed low frequency magnetic fields via mobile phone use increases the risk of potential adverse effects in the central nervous system (e.g. brain cancer) in childhood and adolescence. The project should also address the need for improved exposure assessment in these populations. International collaboration is encouraged. **(Policy relevant topic)**
- **Funding scheme: collaborative projects (small or medium-scale focused research projects)**
- ***Expected impact:*** *The project will improve risk assessment of potential adverse health effects of exposure to EMF in children to support developing Community public health measures and policies.*



# Interested participants

- EU funding

- Austria
- France
- Germany
- Greece
- Israel
- Italy
- The Netherlands
- Spain

- Separate funding

- Australia
- Canada
- New Zealand
- *China??*
- *Korea*

... *and exposure  
assessment experts*



# Objectives

- Overall objective
  - To assess the potential carcinogenic effects of childhood and adolescent exposure to radio frequency (RF) from mobile telephones on the central nervous system.  
*... This is precisely the topic of call ENV.2008.1.2.1.1. "Health impacts of exposure to radiofrequency fields in childhood and adolescence".*
- To achieve this, we have operational objectives:
  - To conduct a multinational epidemiological case-control study of brain tumours diagnosed in young people in relation to EMF exposure from mobile telephones and other sources of RF
  - To develop and validate improved indices of RF and extremely low frequency (ELF) exposure, and assess related uncertainties, for all of the subjects in the study
  - To analyse the relation between risk of brain tumours and exposures to RF and ELF from mobile phones and other relevant and important sources of exposure in the general environment



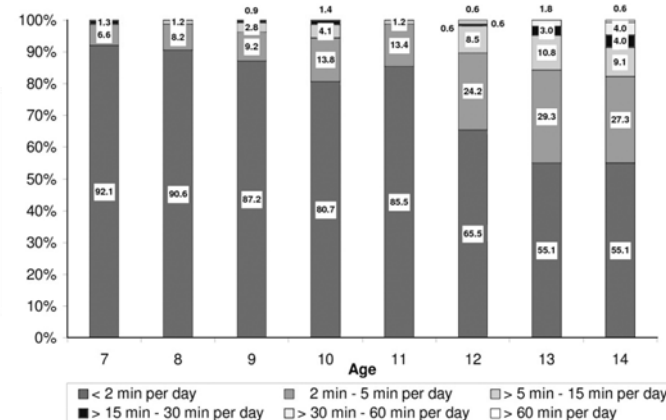
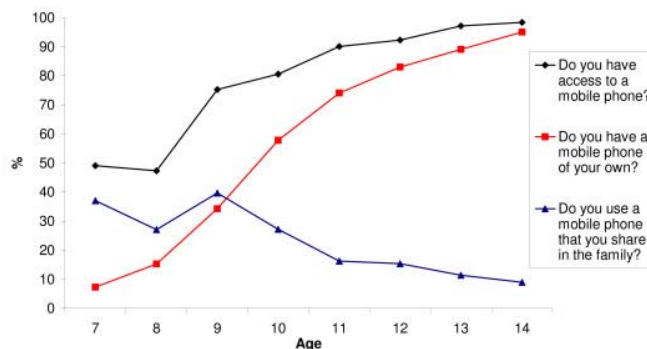
# The consortium

<b>Beneficiary Number.</b>	<b>Beneficiary Name</b>	<b>Country</b>
1 (Coordinator)	Fundació Centre de Recerca en Epidemiologia Ambiental (CREAL)	Spain
2	Fundació IMIM (FIMIM)	Spain
3	Universiteit Utrecht (UU)	Netherlands
4	France Telecom SA (FT)	France
5	Health Protection Agency (HPA)	UK
6	Ludwig-Maximilians-Universitaet Muenchen (LMU)	Germany
7	Medizinische Universitaet Wien (MUVI)	Austria
8	Università degli Studi di Torino (UNITO)	Italy
9	Centre National de la Recherche Scientifique (CNRS)	France
10	National and Kapodistrian University of Athens (UOA-SARG)	Greece
11	Gertner Institute for Epidemiology & Health Policy Research	Israel
12	University of Ottawa	Canada
13	Monash University	Australia
14	The University of Auckland	New Zealand



# Use of mobile phones

- Growing rapidly in adolescents and, more recently, children.
  - Use has been very prevalent among adolescents at least for the last five years.
  - “Heavy” mobile phone use appeared to be rare five years ago among children below the age of 10.





# Issues in study design

- Essential to ensure that the prevalence of use in the past is sufficient for the study to have adequate statistical power.
  - Many known carcinogens have long latency periods (10-15 years or more)
  - Most likely mechanism, if any, by which RF exposure may increase the risk of cancer is through a tumour promotion or progression effect (*later stages of carcinogenicity*)
  - ➔ **assume latency period of 7 to 8 years**
- Choice of age range
  - Because of low use of mobile phones in children below the age of 12 years in the past and the high use among teenagers:
    - ➔ **a study of brain tumours in subjects aged 15-24 has most power**
  - But latency could be shorter among younger children ... given the increasing use in 8-10 year old children since 2005-2006 and the growing prevalence of other sources of RF in the home
    - ➔ **it is also of interest to study tumours in children aged 10-14.**
  - *There appears to be little cost-benefit in including younger subjects in such a study.*



## Expected number of brain tumour cases in the age range (10-24)

Country	Expected number of cases	
	Per year	Study period
Austria	35	86
France	94	235
Germany	125	313
Greece	25	63
Israel	40	120
Italy	68	169
Netherlands	63	158
Spain	125	313
<b>Total – with EU funding</b>	<b>574</b>	<b>1,455</b>
<i>Australia</i>	71	178
<i>Canada (Ontario + Québec)</i>	94	234
<i>New Zealand</i>	25	63
<b>Total</b>	<b>764</b>	<b>1,929</b>



## Size of the Odds Ratio that can be identified under different scenarios with 80% power

<b>Prevalence of exposure</b> (5-10 years in the past)	<b>Number of Cases</b> (2 controls per case)		<b>OR</b> that could be identified
20%	1,455	European component	1.25
	1,929	Entire study	1.21
10%	1,455	European component	1.33
	1,929	Entire study	1.28
5%	1,455	European component	1.47
	1,929	Entire study	1.40

*... expected statistical power of the study is very good*



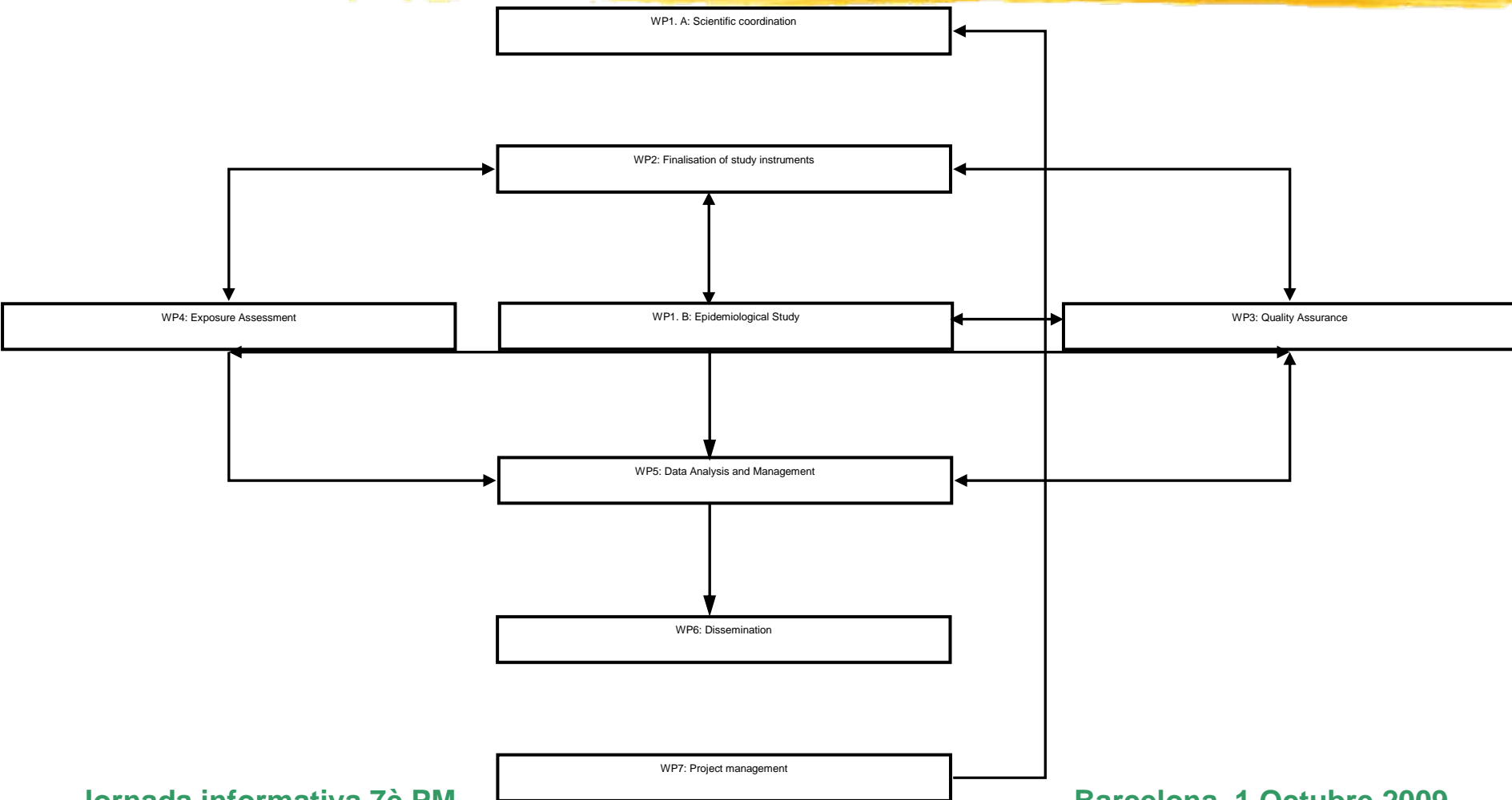
## A lot of attention paid to potential sources of bias or errors

- Latency and statistical power
- Exposure assessment
- Recall errors
- Selection bias
- Quality control

*... in design and analysis of study*



# Graphical presentation of work packages





# Recommendations

- **Project proposal**

- Tailored to the topic of the call
- Very clear
- Address all issues concerning the potential difficulties and pit-falls
- Demonstrate that the project proposed has very high chances of answering the question

- **Consortium**

- Efficient with good working relationships
- Include partners with all essential expertise - multidisciplinary
- Demonstrated capabilities and experience
- Helpful to have partners with demonstrated experience in
  - ✓ Project management
  - ✓ Dissemination

*... Remember: if application is successful, all partners are contractually jointly responsible for the success of the project*