

Overview: Radiofrequencies and cancer

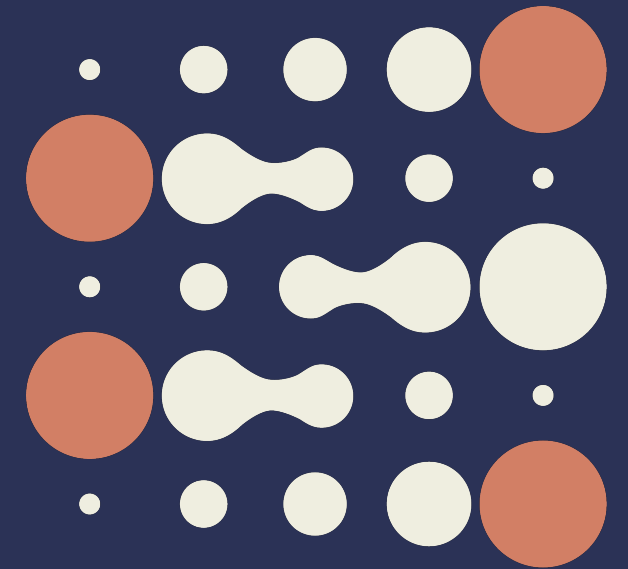
Joachim Schüz

Head, Environment and Lifestyle Epidemiology Branch
International Agency for Research on Cancer, Lyon, France

ANSES-IARC Symposium 23 Nov 2022:

Radiofrequencies and Health:
Research in a fast-moving environment

International Agency
for Research on Cancer



Monograph Meeting - Volume 102



24/05/2011 -

Dr Christopher Wild, Director, IARC, opens Monograph meeting on *Non-ionizing Radiation, Part II: Radiofrequency Electromagnetic Fields [includes mobile telephones]*

[Listen to Podcast](#) , [Read Introduction to the IARC Monographs Volume 102](#)

International Agency for Research on Cancer



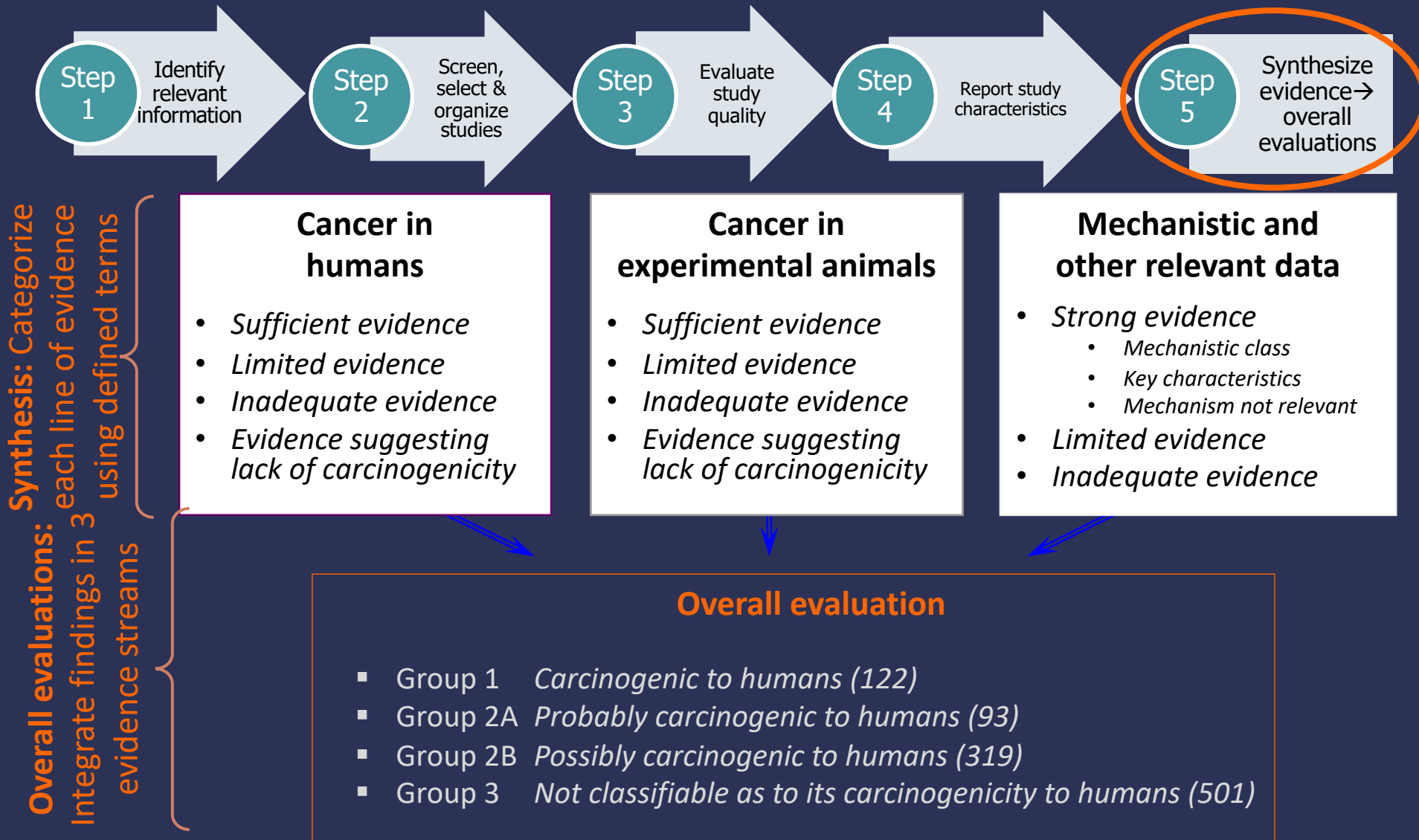
PRESS RELEASE
N° 208

31 May 2011

IARC CLASSIFIES RADIOFREQUENCY ELECTROMAGNETIC FIELDS AS POSSIBLY CARCINOGENIC TO HUMANS

Lyon, France, May 31, 2011 -- The WHO/International Agency for Research on Cancer (IARC) has classified radiofrequency electromagnetic fields as [possibly carcinogenic to humans \(Group 2B\)](#), based on an increased risk for [glioma](#), a malignant type of brain cancer¹, associated with wireless phone use.

IARC Monographs Programme approach



Hazard and Risk

From Understanding ...

Hazard / Carcinogenicity



Artificial UV from sunbed use is carcinogenic to humans



Individual Risk



1.8% increase in melanoma risk with each session of sunbed use per year



Population Risk

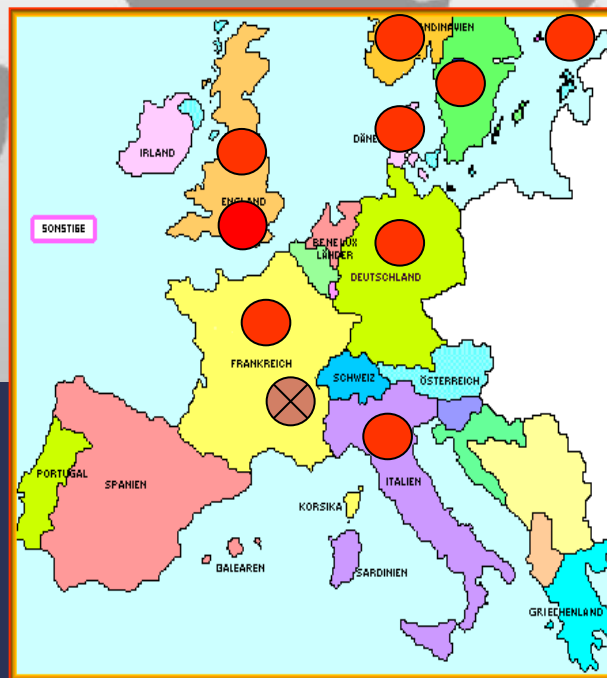
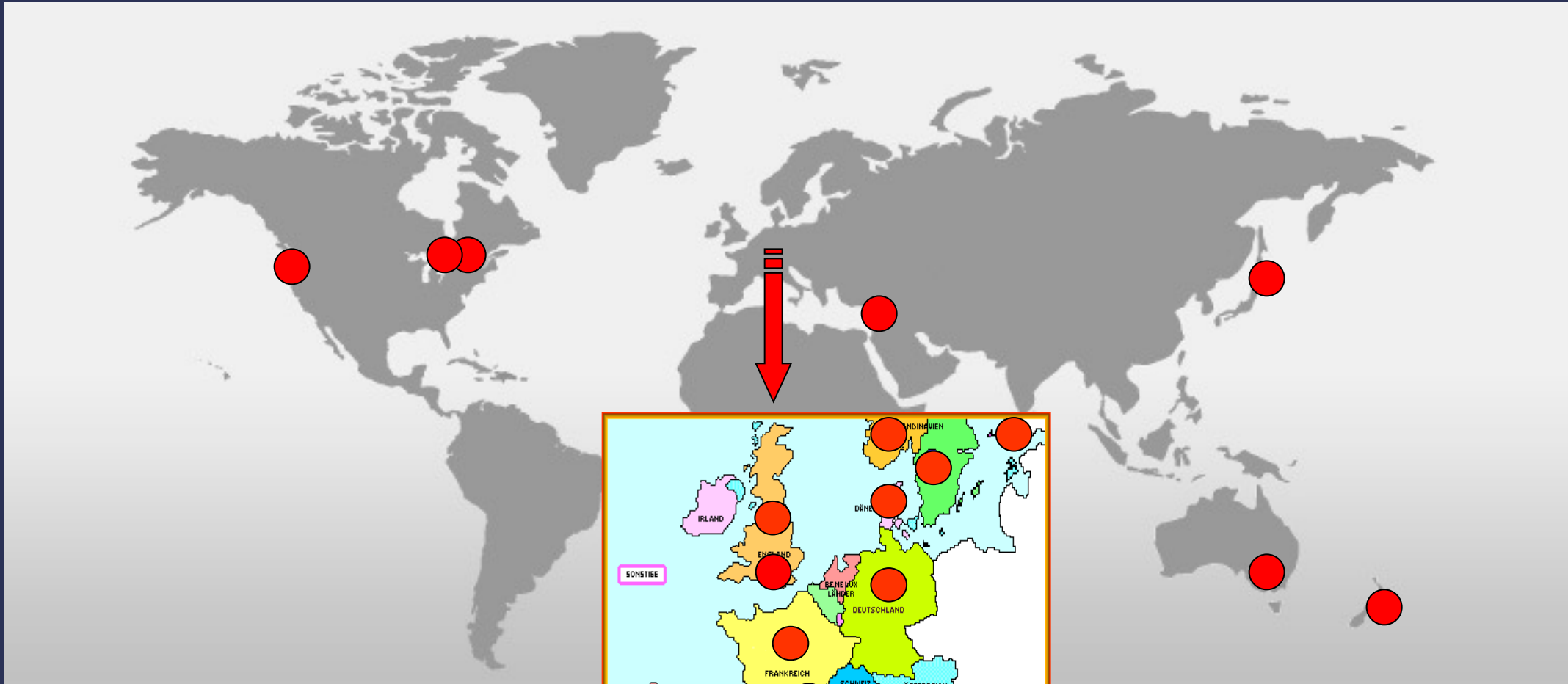


For France in 2015, 382 cases of melanoma were estimated to be attributable to use of sunbeds and could have been prevented

... to Prevention

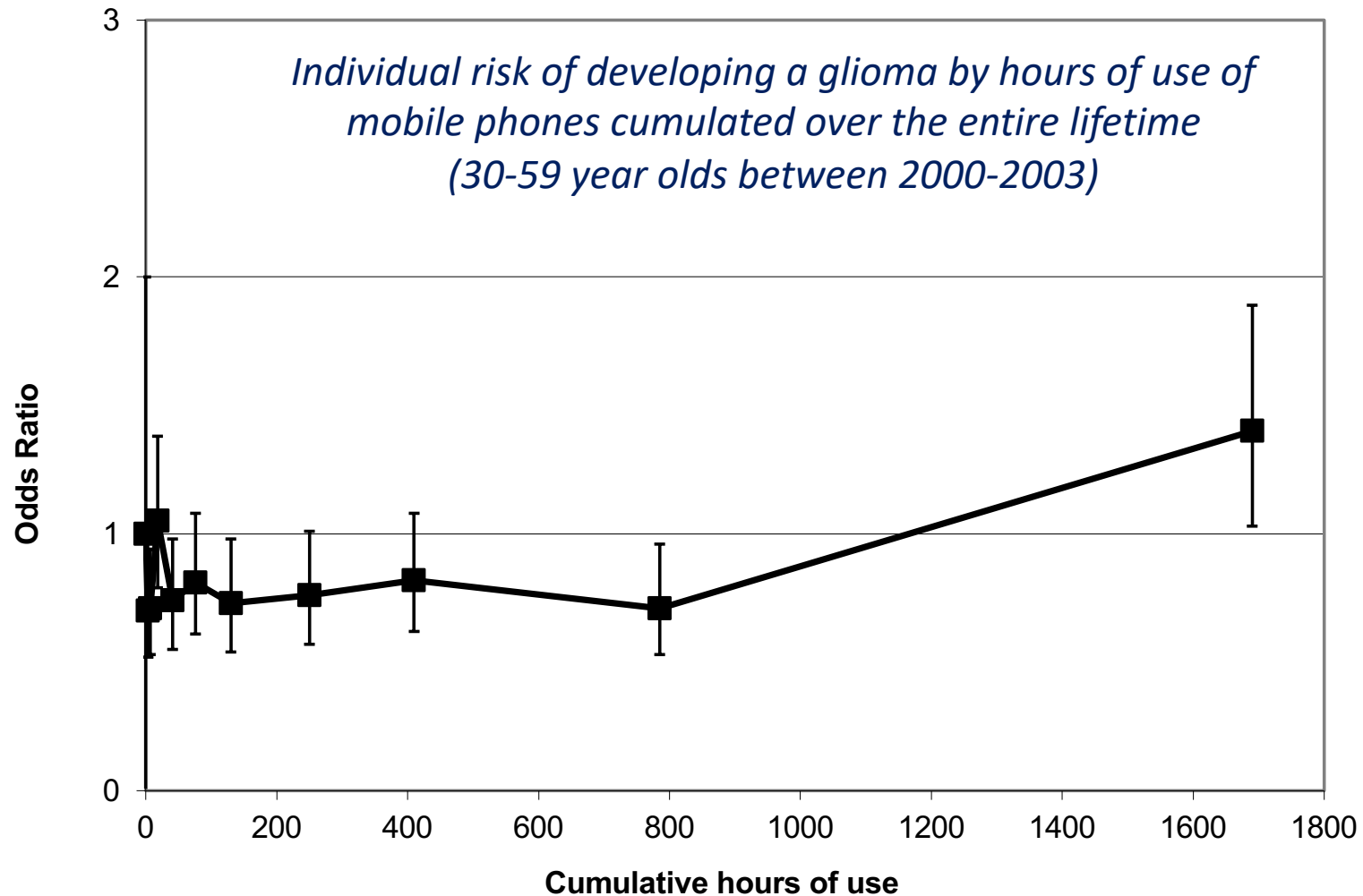
Boniol et al., BMJ, 2012

Arnold et al., J Eur Acad Dermatol Venerol, 2018



16 centres in 13 countries
 Ascertainment: 2000-2003
 Coordinated by IARC/WHO

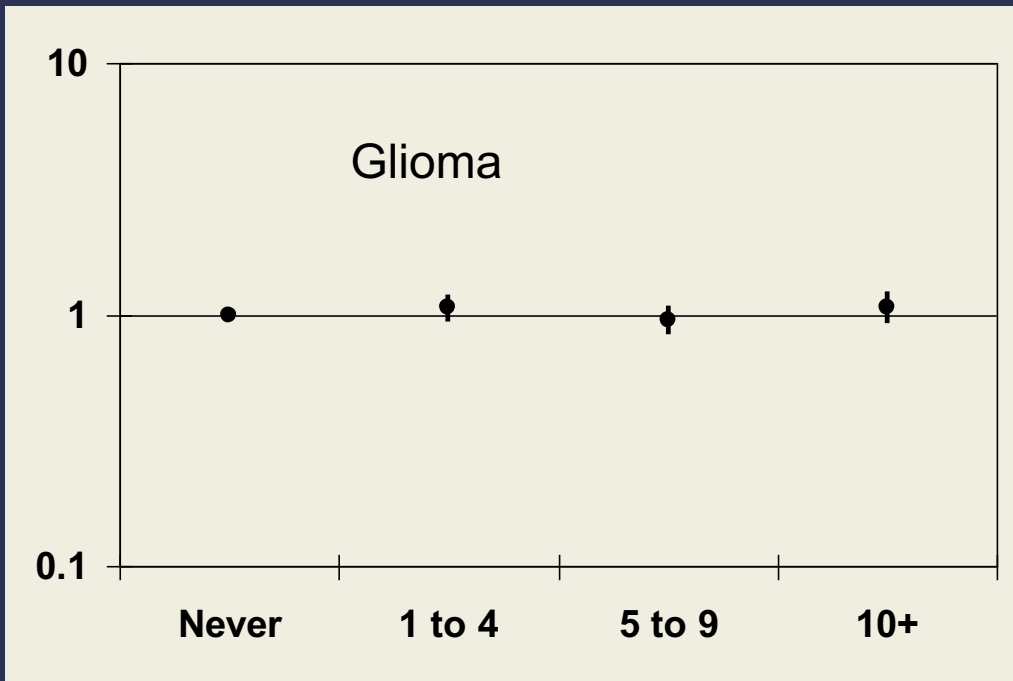
INTERPHONE Study



- Population risk:*
- about half of the population were never regular users of a mobile phone (reference group)
 - almost half of the population had no increased (or slightly decreased) risk
 - about 5% of the heaviest lifetime mobile phone users had moderately increased risk

Cohort Studies (Denmark, UK (Women))

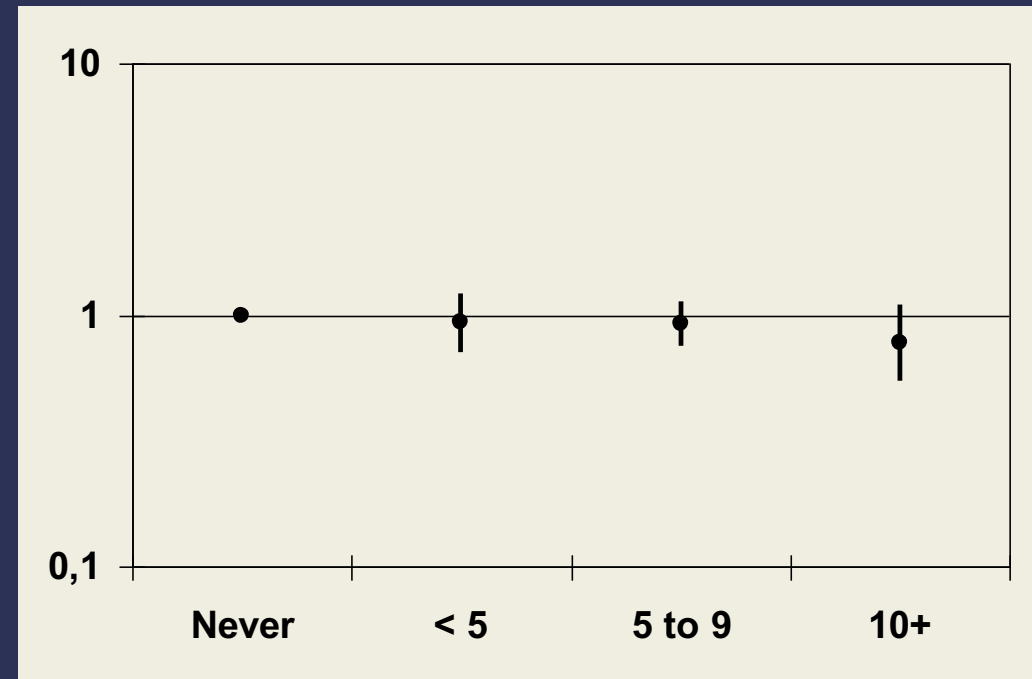
Individual risk from comparing the earliest subscribers for a mobile phone in Denmark (before 1995) with the rest of the Danish adult population



Years of subscription

Frei et al., BMJ, 2011

Individual risk from comparing never mobile phone users with mobile phone users by number of years of use within UK Million Women Study



Years of mobile phone use

Benson et al., Int J Epidemiol, 2013

New studies after 2011 – Animal data?

Carcinogenic hazard in rats (Ramazzini study):

~19 hrs of exposure each day with varying levels 0.001-0.1 W/kg

Increase in heart schwannoma in male rats at highest dose

No increase in female rats

Falcioni et al., Environ Res, 2018

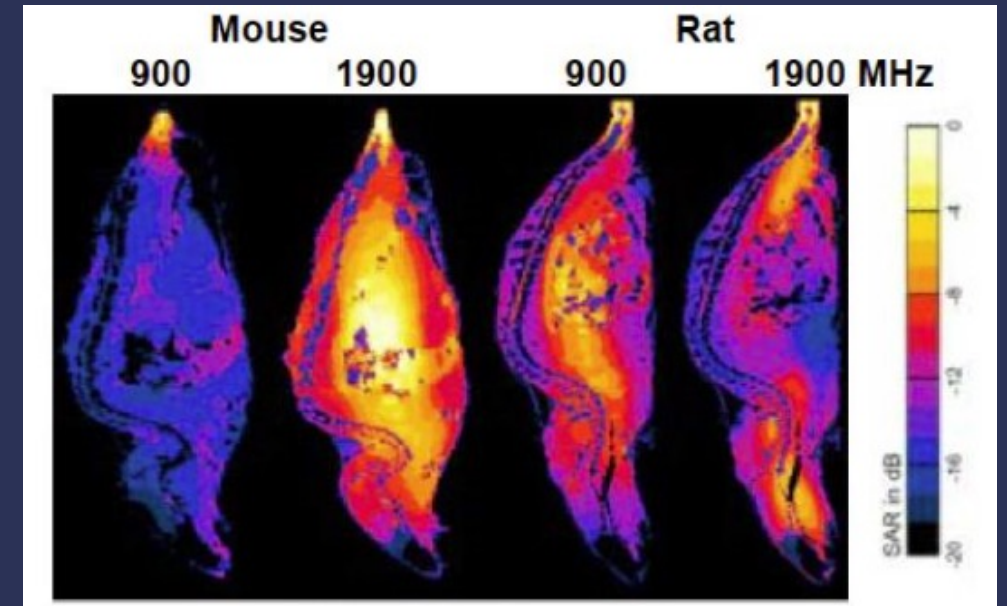
Carcinogenic hazard in rodents (NTP Studies):

~9 hrs of exposure each day with varying levels between 1.5 – 6 W/kg

*Increase in heart schwannoma in male rats at highest dose – no increase in female rats, in male mice or in female mice
Indications of higher occurrences of tumours of brain and adrenal gland*

National Toxicology Program Reports, 2018

Experimental exposure to animals not straightforward to be interpreted in terms of cumulative exposure in humans



What is new – Human data?

Update of individual risk from comparing never mobile phone users with mobile phone users by number of years of use within UK Million Women Study

No association with ever use, daily use, 10+ years of use or specifically with tumours in the most exposed area of the brain (temporal and parietal)

Not „new“ in terms of data

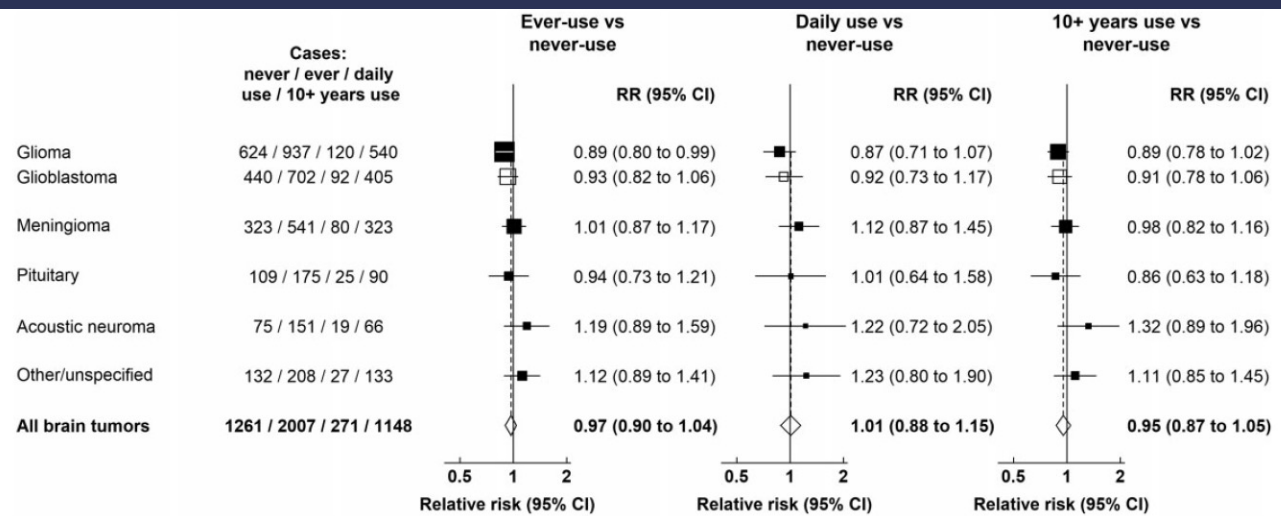
Several reviews & meta-analyses

Wang & Guo, J Cancer Res Therap, 2016
 Bortkiewicz et al., Int J Occup Med Env Health, 2017
 Prasad et al., Neurological Sci, 2017
 Yang et al., PLoS ONE, 2017
 Wang et al., World Neurosurg, 2018
 Rösli et al., Environ Int, 2019
 Choi et al., Int J Env Res Publ Health, 2020

Overall confirmation of previous conclusions by the IARC and SCENIHR, as more or less based on same data

Differences mainly due to how the risk of bias was interpreted

Meta-analyses unlikely to reveal new insights



Schüz et al., J Natl Cancer Inst, 2022

Mobile phone use in children, adolescents and young adults



4 countries, ages 7-19 years
352 cases – 646 controls

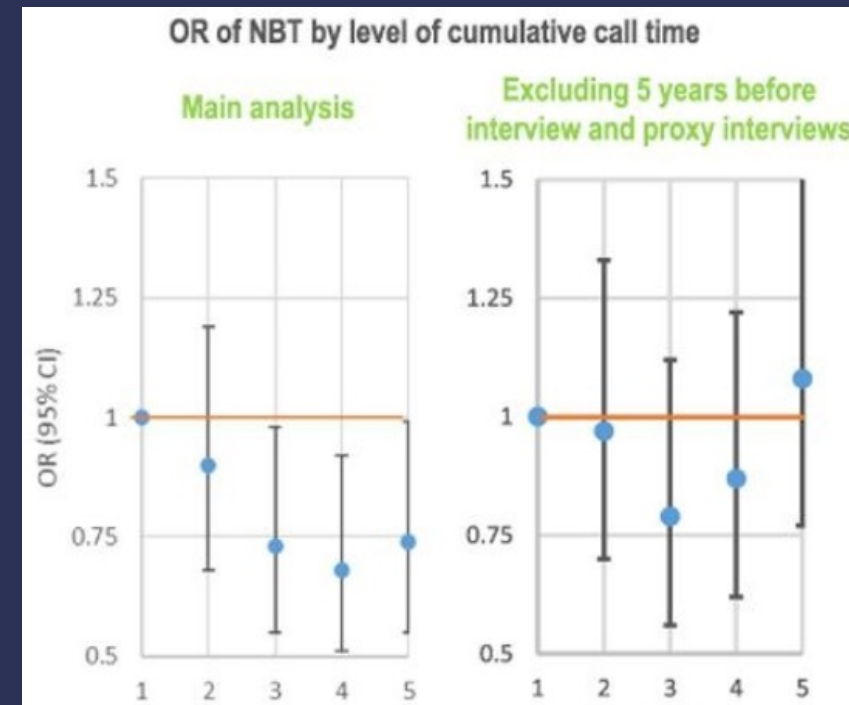
Time since first use, y	
Never regular user	1.0 (referent)
≤3.3	1.35 (0.89 to 2.04)
3.3–5.0	1.47 (0.87 to 2.49)
>5.0	1.26 (0.70 to 2.28)

Cumulative duration of calls, h	
Never regular user	1.0 (referent)
≤35	1.33 (0.89 to 2.01)
36–144	1.44 (0.85 to 2.44)
>144	1.55 (0.86 to 2.82)

Aydin et al., J Natl Cancer Inst, 2011

14 countries, ages 10-24 years
899 cases – 1,910 controls

Mobi-Kids

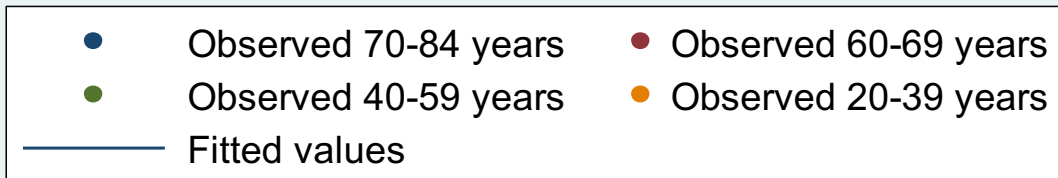
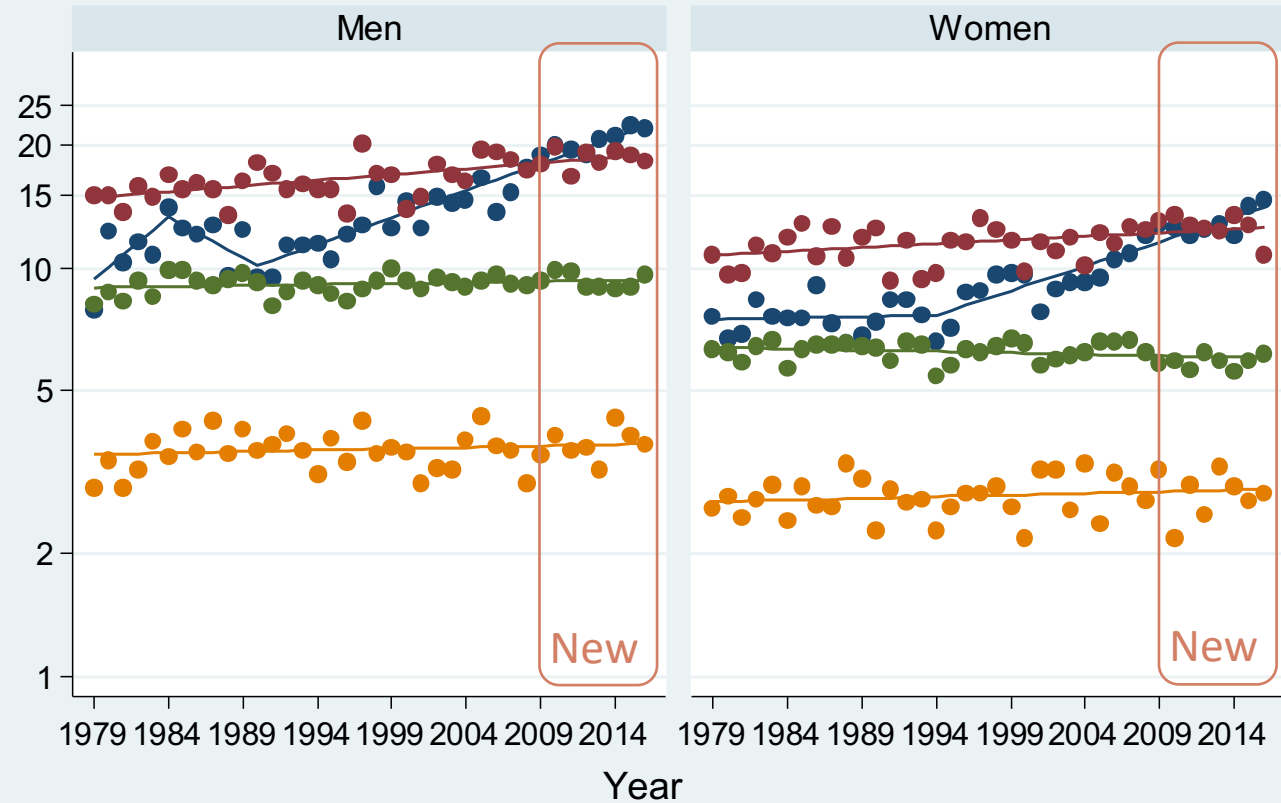


Castano-Vinyals et al., Environ Int, 2022

Glioma Incidence Rate (Nordic Countries)

Population risk:

- Incompatible with suggestions of increased glioma risk in ordinary mobile phone users
- Incompatible with suggestions of increased glioma risk in heavy mobile users other than heavy users of the first two generations
- Hypothetical small risks cannot be ruled out



Priority for re-evaluation of RF-EMF by IARC *Monographs*

- Advisory Group on Priorities (2020-2024) noted*
 - New evidence available for cancer bioassays and carcinogen mechanisms
 - Several likely informative cancer epidemiology studies forthcoming (Million Women Study , Mobi-Kids , **COSMOS**)
- Advisory Group recommended re-evaluation by IARC Monographs during 2023-24
- Any re-evaluation meeting would be announced 1 year in advance, at monographs.iarc.who.int

*<https://monographs.iarc.who.int/advisory-group-to-recommend-priorities-for-the-iarc-monographs-during-2020-2024/>

Conclusions

- Cancer Hazard:
Possibility of carcinogenicity confirmed in large animal experiments
Animal exposure not easy to interpret as cumulative lifetime human exposure
- Human risk from cohort and case-control studies:
Possibility of modest risk for glioma in the <5% of heaviest mobile phone users
Possibly only related to the first two generations of mobile technology
Precaution: Possible risk can be mitigated by not holding the device directly to the head
- Population-level studies:
No evidence of any detectable population risk of any type of brain tumour