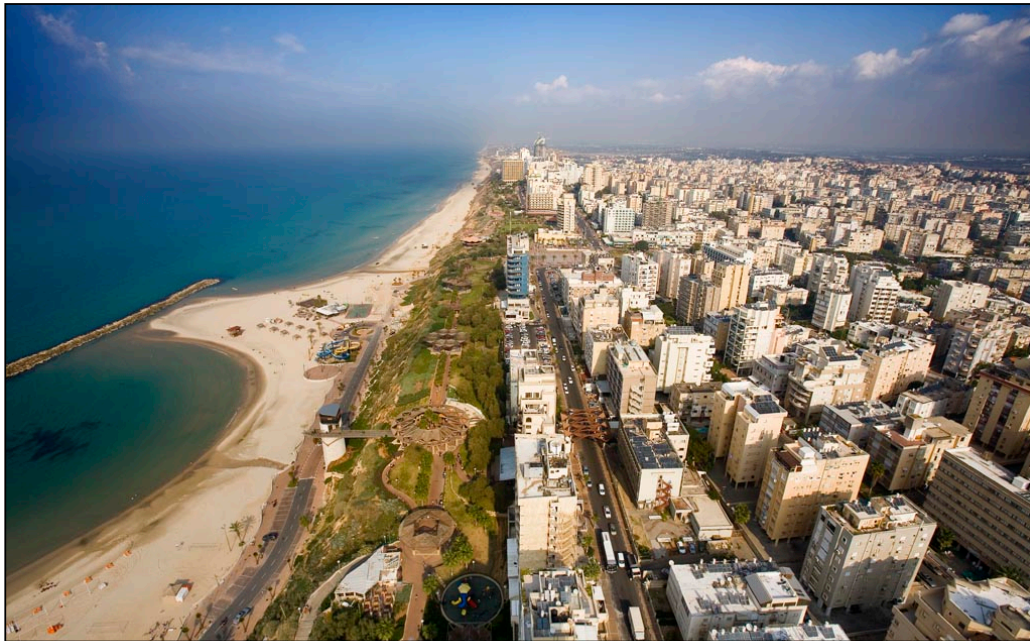


Netanya, Israel (1997-1998)



New cell phone tower set up in city of Netanya, Israel, in July, 1996.

1500 watt, 850 MHz.

Power density in the whole exposed area was **far below 0.53 $\mu\text{W}/\text{cm}^2$** .

This is 1000 times less than the FCC Guidelines of 600 $\mu\text{W}/\text{cm}^2$ for 850 MHz exposure.

Comparison of cancer rates during the second year of exposure, in 677 long-term residents near the tower, compared to 1,222 matched controls living in another area of the city.

Wolf R, Wolf D. Increased Incidence of Cancer Near a Cell-Phone Transmitter Station. *International Journal of Cancer Prevention* (2004); 1(2):1-19.

Netanya, Israel - Relative Cancer Risk



Relative risk of cancer in residents near a new cell phone tower in Netanya, Israel, during the second year of exposure.

Overall risk of cancer in Area A was 4.15 times higher than in the town as a whole.

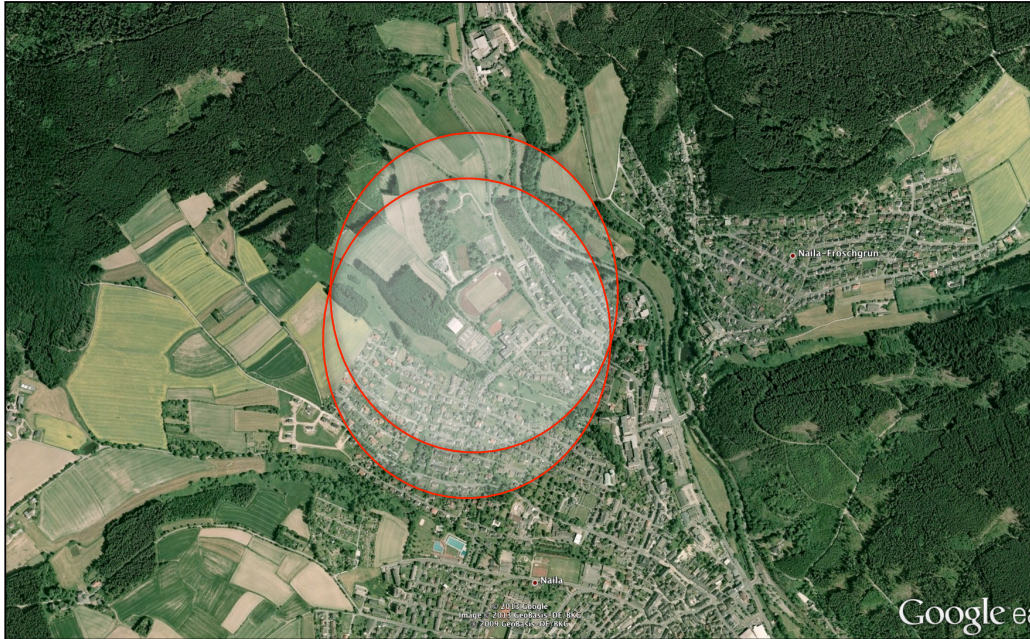
For men in area A, the cancer rate was 1.4 times higher.

For women in area A, the cancer rate was 10.5 times higher (p < 0.0001)

[the probability of this being a random finding is one hundredth of 1%

Wolf R, Wolf D. Increased Incidence of Cancer Near a Cell-Phone Transmitter Station. *International Journal of Cancer Prevention* (2004); 1(2):1-19.

Naila, Germany (1999-2004)



Town of ~ 1100 residents.

Cell tower installed in 1993.

Medical of 1000 residents reviewed for the years 1994-2004.

Comparison of cancer incidents in residents living within 400 meters of the cell phone tower, compared to residents living farther away, and compared to the death rates for the province as a whole.

Eger H, Hagen K, Lucas B, Vogel P, Voit H. The Influence of Being Physically Near to a Cell Phone Transmission Mast on the Incidence of Cancer. *Umwelt-Medizin-Gesellschaft* (2004); 17(4):1-7.

Cancer Incidence in Naila (1999-2004)

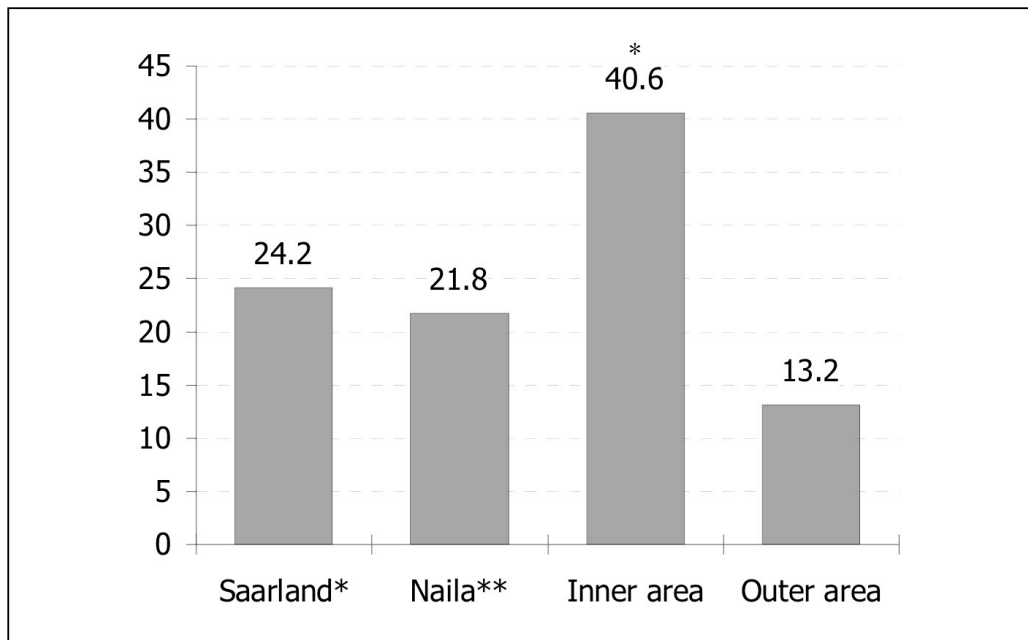


Fig. 3 : Number of new cancer cases 1999 to 2004, adjusted for age and gender, calculated for the 5,000 patient years

Y axis: Cancer incidence 1994 - 2004 (new cases per 5000 patient years).

* Saarland = predicted rate based on the cancer registry for the federal state of Saarland.

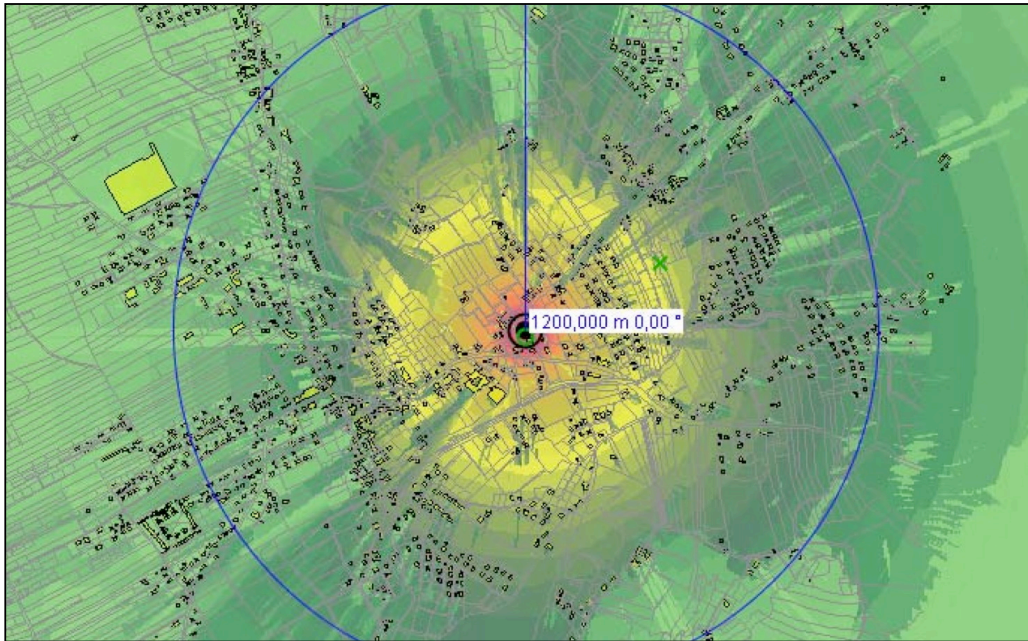
** Naila = incidence for the town as a whole.

Inner area = residence within 400 meters of the tower.

Outer area = remainder of community.

In the inner area, the risk of cancer incidence was three times as high after five or more years of exposure. In addition, the patients that live within 400 metres tend to develop the cancers at a younger age.

Hausmannstätten & Vasoldsberg, Austria (1984-1997)

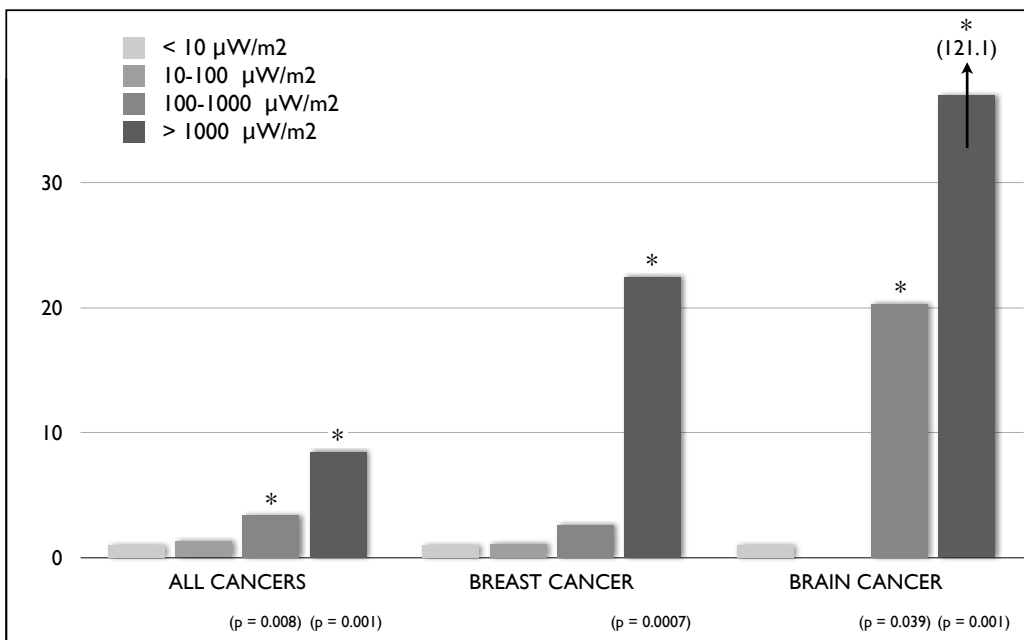


NMT 450 cell tower, operational from 1984–1997.

Case/control study of cancer patients living within 1200 meter radius of the tower.

Oberfeld G. *Environmental Epidemiological Study of Cancer Incidence in the Municipalities of Hausmannstätten & Vasoldsberg (Austria)*. Provincial Government of Styria, Department 8B, Provincial Public Health Office, Graz, Austria (2008):1-10. <http://www.emf-health.com/PDFreports/Austrianstudy.pdf>

Hausmannstätten & Vasoldsberg, Austria (1984-1997)



Odds ratio of cancer incidence — stratified by exposure levels (exterior to dwelling) in $\mu\text{W}/\text{m}^2$.

Note: FCC thermal safety guidelines $\sim 6,000,000 \mu\text{W}/\text{m}^2$

In the highest exposure category:

Breast cancer risk was 23 times higher,

Brain cancer risk was 121 times higher.

Oberfeld G. *Environmental Epidemiological Study of Cancer Incidence in the Municipalities of Hausmannstätten & Vasoldsberg (Austria)*. Provincial Government of Styria, Department 8B, Provincial Public Health Office, Graz, Austria (2008):1-10. <http://www.emf-health.com/PDFreports/Austrianstudy.pdf>

Belo Horizonte, Brazil (2011)

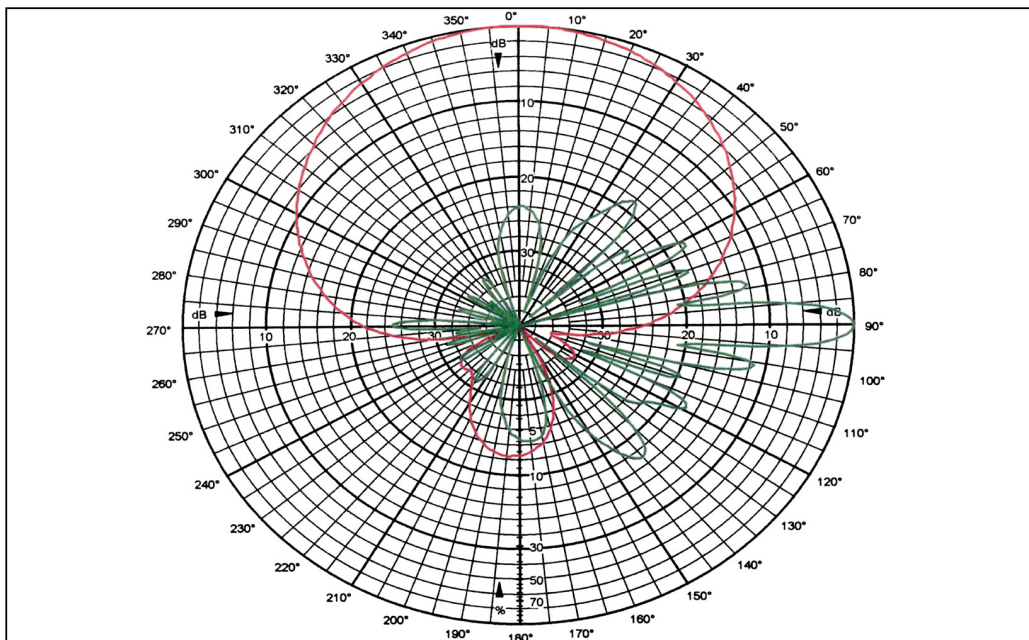


Belo Horizonte is the capital of Minas Gerais state in Brazil, population 2,258,096 in 2010.

Rated by the U.N. in 2007 as having the best quality of life in Latin America.

By 2006, 856 cell phone towers had been installed in the city.

Dode AC, Leao MM, Tejo Fde A et al. Mortality by neoplasia and cellular telephone base stations in the Belo Horizonte municipality, Minas Gerais state, Brazil. *Sci Total Environ* (2011); 409(19):3649-3665.



Environmental monitoring of RF power densities in the city was performed.

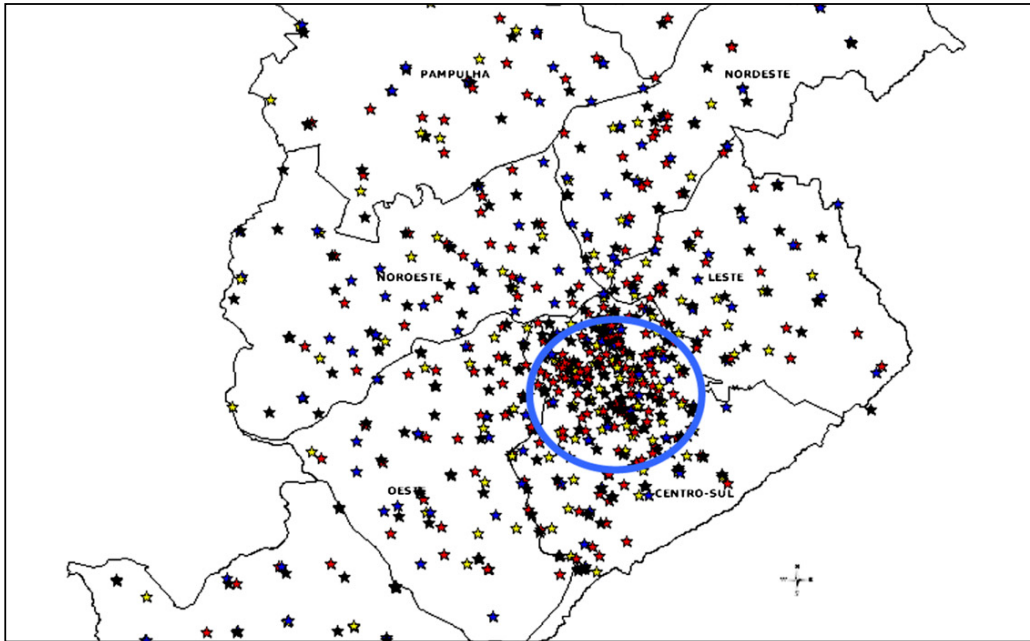
In 2003, the highest recorded power density in the city was $3.06 \mu\text{W}/\text{cm}^2$.

In 2008, the largest recorded power density was $40.78 \mu\text{W}/\text{cm}^2$, 13 times higher than in 2003.

$40 \mu\text{W}/\text{cm}^2$ is 15 times less than the FCC Exposure Guidelines.

Fig. 3. Horizontal and vertical radiation patterns per sector of BS site BH 20

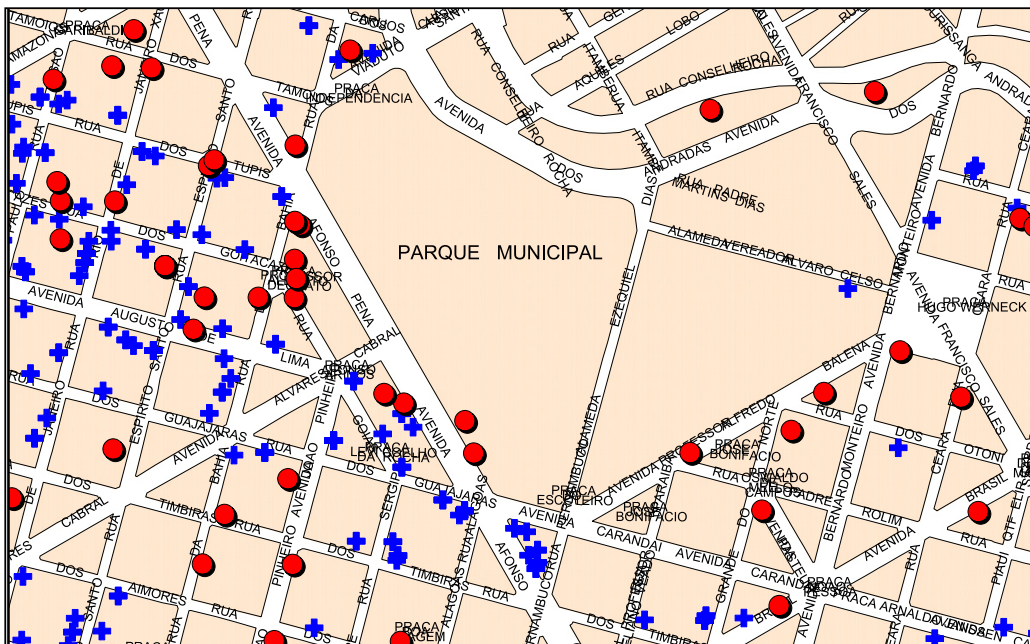
From: Dode AC, Leao MM, Tejo Fde A et al. Mortality by neoplasia and cellular telephone base stations in the Belo Horizonte municipality, Minas Gerais state, Brazil. *Sci Total Environ* (2011); 409(19):3649-3665.



The authors used the Telecommunications National Agency database to map the locations of the 856 cell phone towers that existed in the city as of December 2006.

Fig. 8. Installed BSs in the Belo Horizonte municipality until 2006. Total amount = 856.

Dode AC, Leao MM, Tejo Fde A et al. Mortality by neoplasia and cellular telephone base stations in the Belo Horizonte municipality, Minas Gerais state, Brazil. *Sci Total Environ* (2011); 409(19):3649-3665.



They then cross-referenced health department records of death by neoplasia with census and demographic city population data to locate the residence of all individuals who had died of cancer in the city between 1996 and 2006.

Fig. 10. Sample of geocoded deaths and BS locations in downtown Belo Horizonte City located in Central-Southern region.

From: Dode AC, Leao MM, Tejo Fde A et al. Mortality by neoplasia and cellular telephone base stations in the Belo Horizonte municipality, Minas Gerais state, Brazil. *Sci Total Environ* (2011); 409(19):3649-3665.

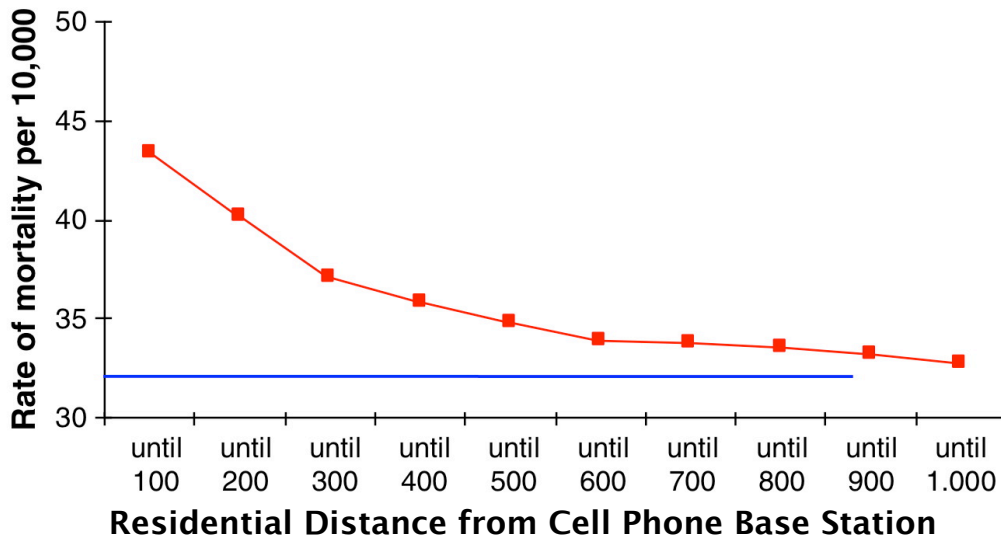
Belo Horizonte, Brazil (2011)



This allowed them to calculate the distance between the deceased individuals' residences and the closest cell phone tower, in meters.

Dode AC, Leao MM, Tejo Fde A et al. Mortality by neoplasia and cellular telephone base stations in the Belo Horizonte municipality, Minas Gerais state, Brazil. *Sci Total Environ* (2011); 409(19):3649-3665.

Belo Horizonte, Brazil (2011)

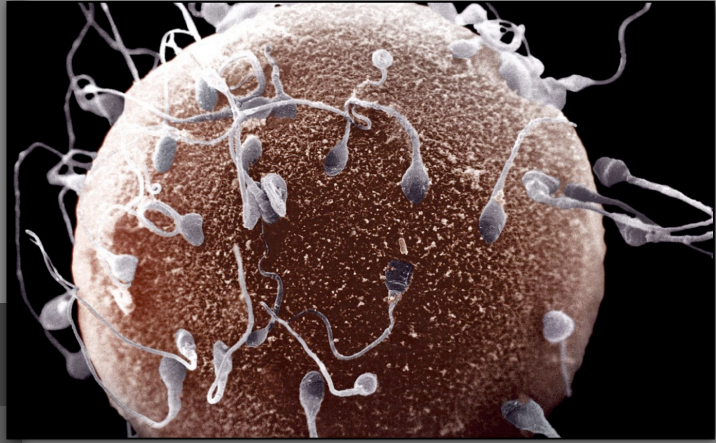


Analysis of this data showed that the cancer death rate was significantly elevated at proximities closer than 500 meters to cell phone towers.

Fig. 15. Rate of mortality by neoplasia, according to the distance from the BS in Belo Horizonte municipality, from 1996 to 2006, and the null hypothesis (blue line).

Dode AC, Leao MM, Tejo Fde A et al. Mortality by neoplasia and cellular telephone base stations in the Belo Horizonte municipality, Minas Gerais state, Brazil. *Sci Total Environ* (2011); 409(19):3649-3665.

Effects of Microwave RF Exposure on Fertility



Impaired Fertility in Fruit Flies



Insects are remarkably resistant to ionizing radiation and radioactivity.

They appear to be much more sensitive to the effects of microwave radio frequency exposures.

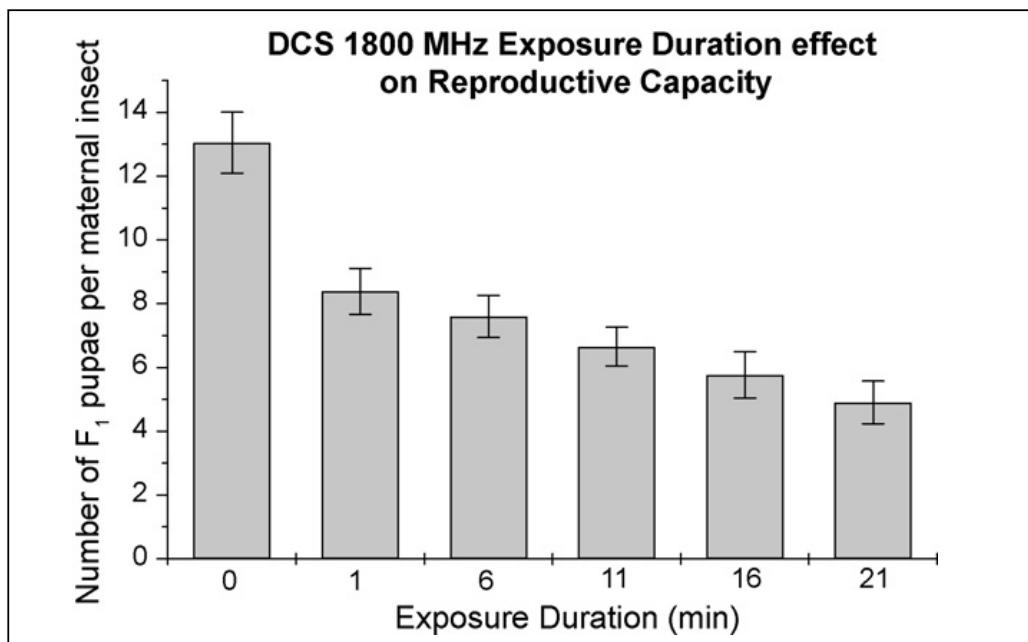
In a recent study, **fruit flies were exposed to 10 $\mu\text{W}/\text{cm}^2$ of GSM 900 MHz or 1800 MHz digital RF.**

This exposure level is 100 times lower than the FCC Guidelines of 1000 $\mu\text{W}/\text{cm}^2$

Exposures were for one single exposure intervals per day for five days, ranging from 1 to 21 minutes per day.

Panagopoulos DJ, Margaritis LH. The effect of exposure duration on the biological activity of mobile telephony radiation. *Mutat Res* (2010); 699(1-2):17-22.

Impaired Fertility in Fruit Flies



0 = control group, with no exposure.

Even at one minute of exposure per day, a significant decrease in fertility is seen.

Fig. 2. Reproductive capacity (mean number of F1 pupae per maternal fly) of groups exposed to DCS 1800MHz radiation for different daily exposure durations (1, 6, 11, 16, and 21min) for five consecutive days, and of sham-exposed groups (no exposure).

Panagopoulos DJ, Margaritis LH. The effect of exposure duration on the biological activity of mobile telephony radiation. *Mutat Res* (2010); 699(1-2):17-22.

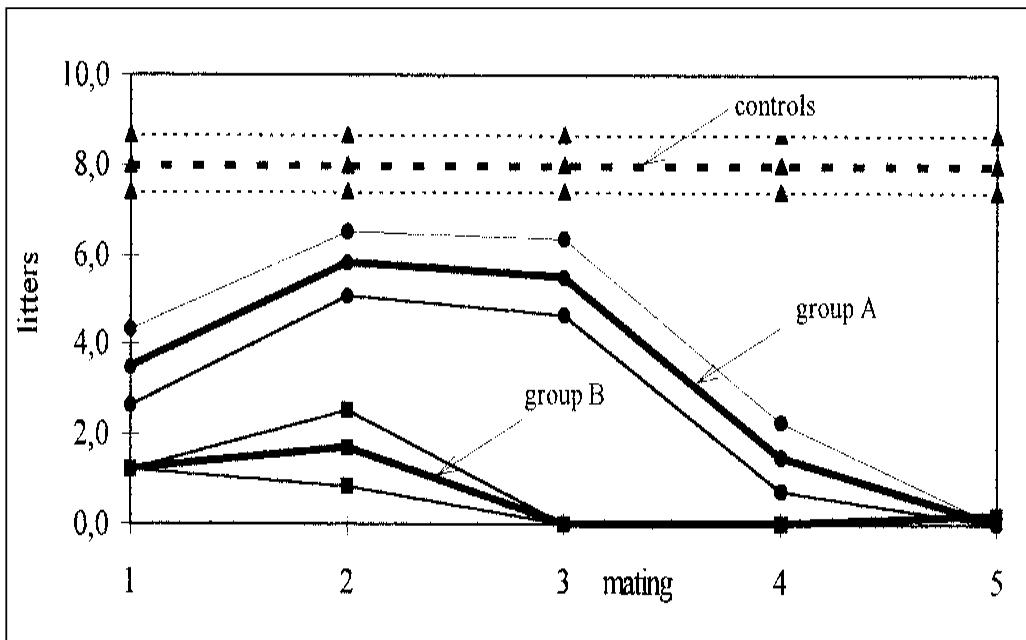
Impaired Fertility in Mammals



This is a Wistar rat.

A great deal of research has been done on the effects of microwave RF on laboratory animals.

Impaired Fertility in Female Mice



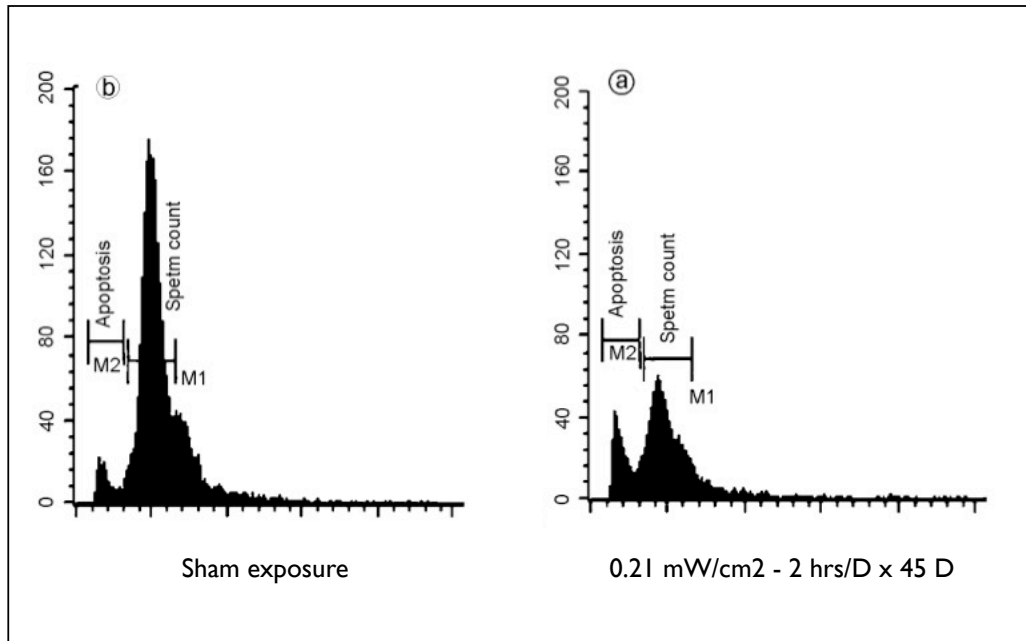
In one study, mice were kept in cages in a VHF/UHF antenna park in Thessaloniki, Greece. Power densities ranged between 0.168 to $1.053 \mu\text{W}/\text{cm}^2$ [reported as 168 – 1053 nanowatts/ cm^2]

This is about 1000 times lower than the FCC Guidelines of $600\text{--}1000 \mu\text{W}/\text{cm}^2$

With repeated matings, litter size decreased, until by the 5th mating, all the dams were infertile.

This infertility was irreversible.

Impaired Fertility in Male Rats



Reduced sperm production in male Wistar rats exposed to 10 GHz microwave RF.

0.21 mW/cm² = **one fifth** of the FCC Guidelines of 1 mW/cm²

OTHER EFFECTS: Increases in reactive oxygen species, increased free radical formation, decreased activity of glutathione peroxidase and superoxide dismutase, DNA strand breakage, increased apoptosis (cell death) in sperm cells, distortion of sperm structure, reduced testosterone levels, shrinkage of seminiferous tubules and testicular size, decreased number and weight of progeny.

Kesari KK, Kumar S, Behari J. Effects of radiofrequency electromagnetic wave exposure from cellular phones on the reproductive pattern in male Wistar rats.

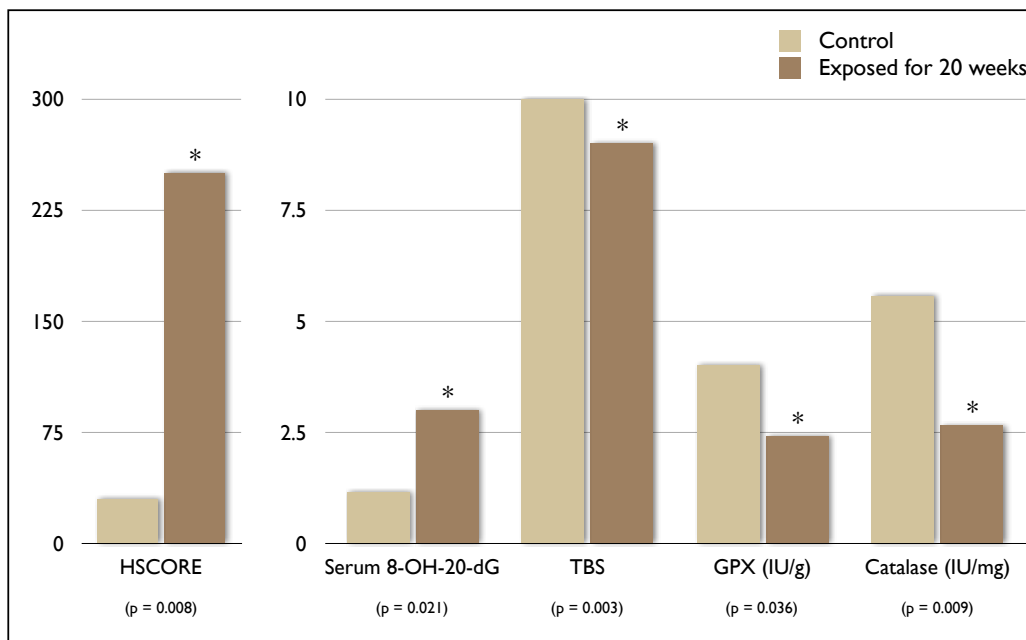
Appl Biochem Biotechnol (2011); 164(4):546-559.

Kesari KK, Kumar S, Behari J. Pathophysiology of microwave radiation: effect on rat brain. *Appl Biochem Biotechnol* (2012); 166(2):379-388.

Kumar S, Kesari KK, Behari J. Influence of microwave exposure on fertility of male rats. *Fertil Steril* (2011); 95(4):1500-1502.

Kumar S, Behari J, Sisodia R. Influence of electromagnetic fields on reproductive system of male rats. *Int J Radiat Biol* (2012); epub Nov 13:1-8

WiFi Exposure Damages Sperm With Oxidant Stress.



The rats were exposed to a Standard WiFi gateway, 24 hours a day for 20 days.

HSCORE = histological staining in testes for 8-OH-20-dG [8-hydroxy-20-deoxyguanosine, **byproduct of DNA damage**]

Serum 8-OH-20-dG (ng/ml) [byproduct of DNA damage]

TBS = testicular biopsy score

9 = Much spermatogenesis, but germinal epithelium disorganized with marked sloughing or obliteration of lumen

GPX = glutathione peroxidase, an antioxidant (consumed by oxidative stress in exposed rats).

Atasoy HI, Gunal MY, Atasoy P, Elgun S, Bugdayci G. Immunohistopathologic demonstration of deleterious effects on growing rat testes of radiofrequency waves emitted from conventional Wi-Fi devices. *J Pediatr Urol* (2012); March 30.

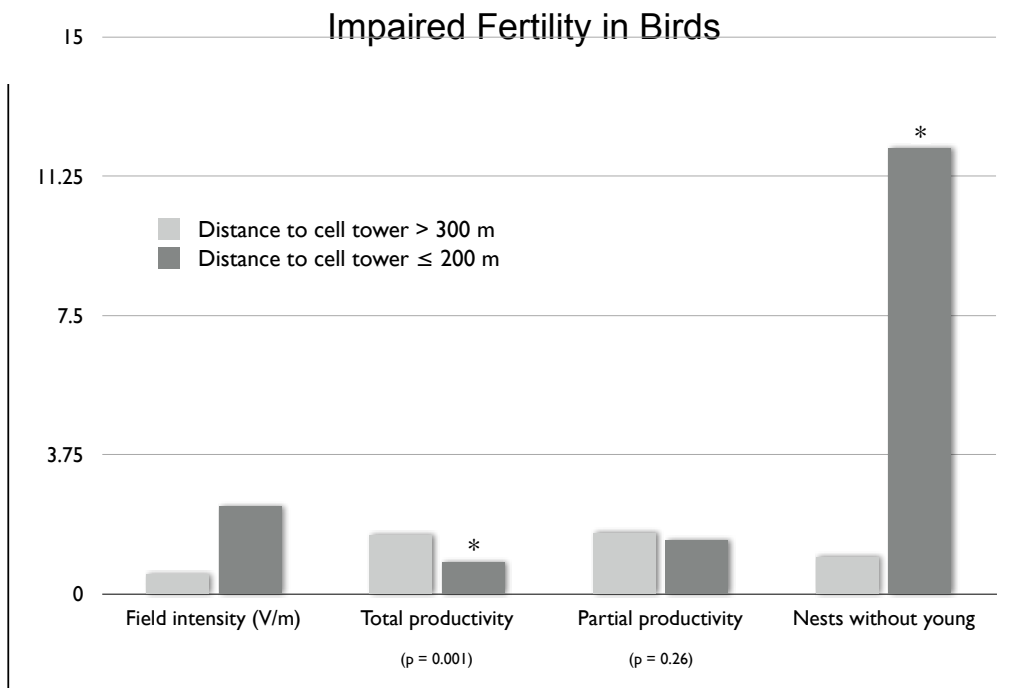
Impaired Fertility in Birds



In Valladolid, Spain, a study compared the productivity of storks nesting closer and farther from a cell phone tower site.

30 nests within 200 meters of the antennae, were compared with 30 nests greater than 300 meters from the antennae

Balmori A. Possible Effects of Electromagnetic Fields from Phone Masts on a Population of White Stork. *Electromagn Biol Med* (2005); 24(2):109-119.



Productivity was significantly reduced in birds in the high exposure group.

Average electric field intensity on nests within 200m = 2.36 ± 0.82 V/m (~ $1.48 \mu\text{W}/\text{cm}^2$)

This is more than 400 times less than the FCC Guidelines of $600\text{--}1000 \mu\text{W}/\text{cm}^2$

Average electric field intensity on nests further than 300m = 0.53 ± 0.82 V/m (~ $0.07 \mu\text{W}/\text{cm}^2$).

Balmori A. Possible Effects of Electromagnetic Fields from Phone Masts on a Population of White Stork. *Electromagn Biol Med* (2005); 24(2):109-119.

Impaired Fertility in Amphibians



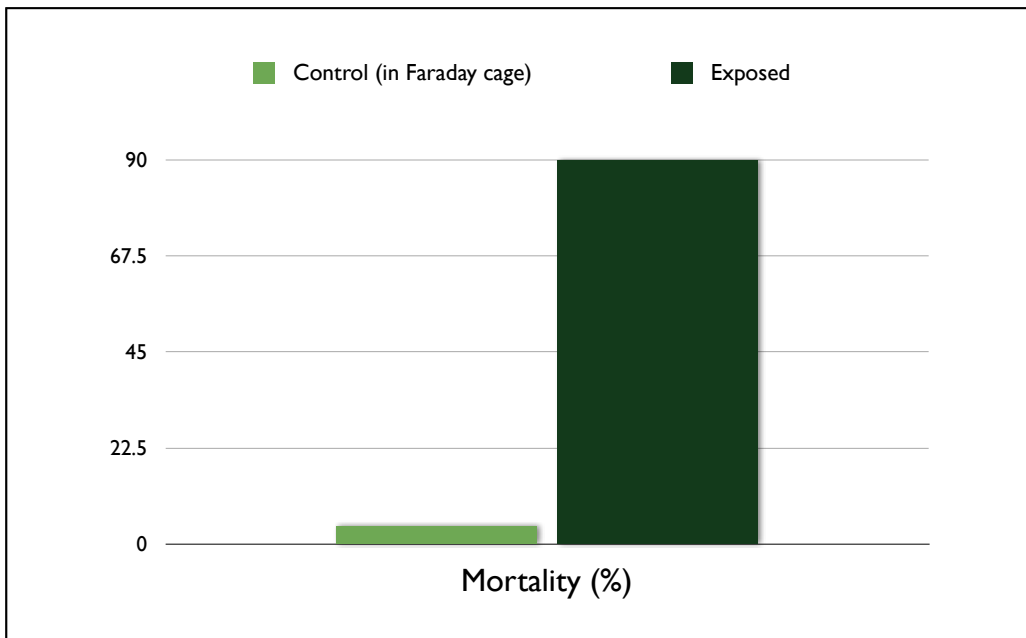
Eggs and tadpoles of the European common frog (*Rana temporaria*) were exposed to RF/EFM from several cell towers located at a distance of 140 meters.

Duration of exposure was 2 months (from egg phase to advanced tadpole stage).

Control groups were placed in same conditions, but contained in a faraday cage that shielded the eggs from RF exposure.

Balmori A. Mobile phone mast effects on common frog (*Rana temporaria*) tadpoles: the city turned into a laboratory. *Electromagn Biol Med* (2010a); 29(1-2):31-35.

Impaired Fertility in Amphibians



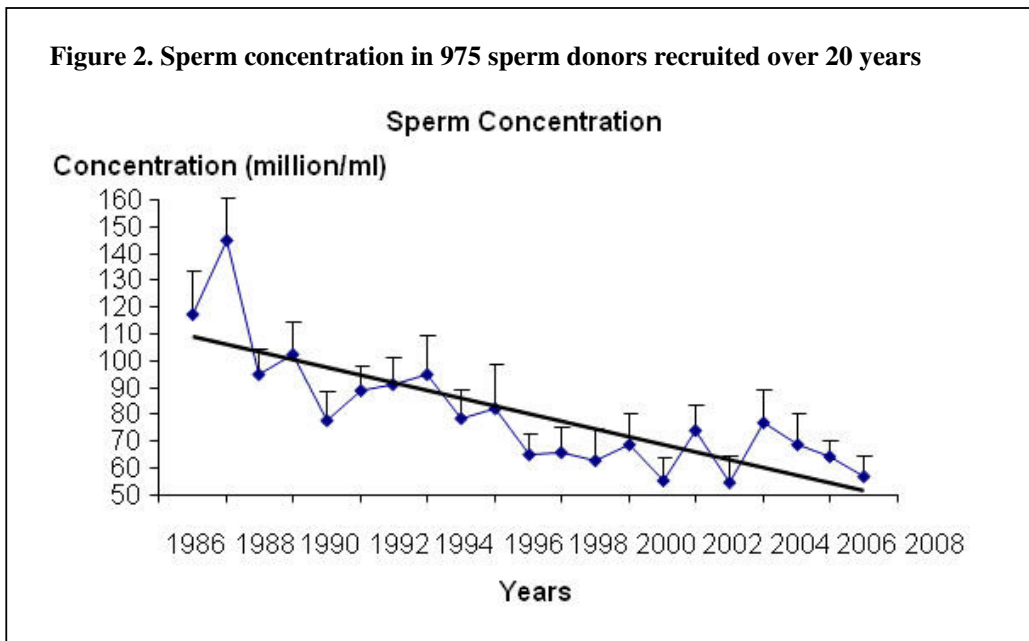
Exposure intensity 1.8 to 3.5 V/m (~ 0.8–3.2 $\mu\text{W}/\text{cm}^2$).

This is 200 times less than the FCC Guidelines of 600–1000 $\mu\text{W}/\text{cm}^2$

[In the exposed group (n = 70), low coordination of movements and asynchronous growth was observed in living specimens, resulting in both big and small tadpoles. In the control group (n = 70), growth was normal.]

Balmori A. Mobile phone mast effects on common frog (*Rana temporaria*) tadpoles: the city turned into a laboratory. *Electromagn Biol Med* (2010a); 29(1-2):31-35.

Impaired Fertility in Humans



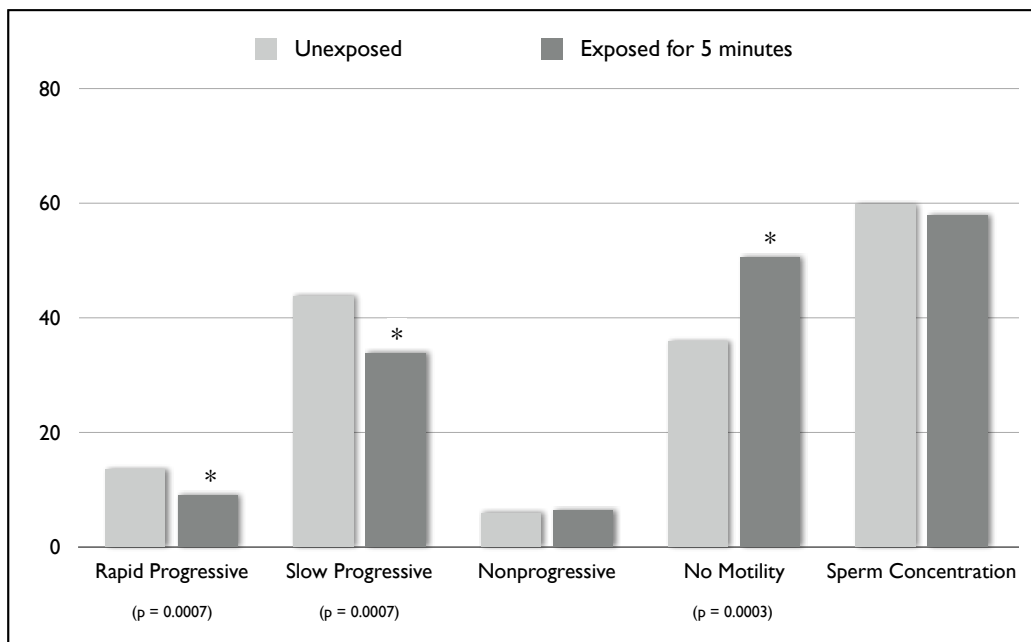
Sperm counts have been dropping worldwide for the last several decades.
 (e.g. In New Zealand, 2.5% per year for the last 20 years).

Pesticides have been implicated.

Some evidence suggests that microwave RF exposure may also play a role.

Shine R, Peek J, Birdsall M. Declining sperm quality in New Zealand over 20 years. *N Z Med J* (2008); 121(1287):50-56.

Cell Phone Transmissions Decrease Sperm Motility in Vitro



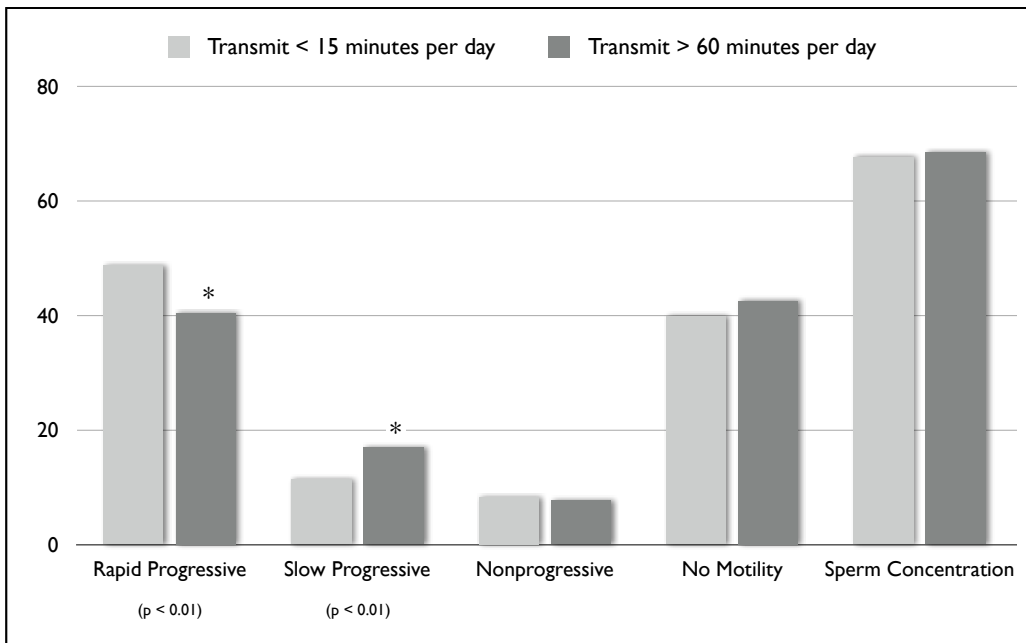
Samples of human sperm received 5 minutes exposure, 10 cm from a transmitting GSM 900 MHz cell phone.
 Average power density of exposure: 20 $\mu\text{W}/\text{cm}^2$

This is 30 times less than the FCC Exposure Guideline of 600 $\mu\text{W}/\text{cm}^2$

(Y axis = values in %)

Erogul O, Oztas E, Yildirim I et al. Effects of electromagnetic radiation from a cellular phone on human sperm motility: an in vitro study. *Arch Med Res* (2006); 37(7):840-843.

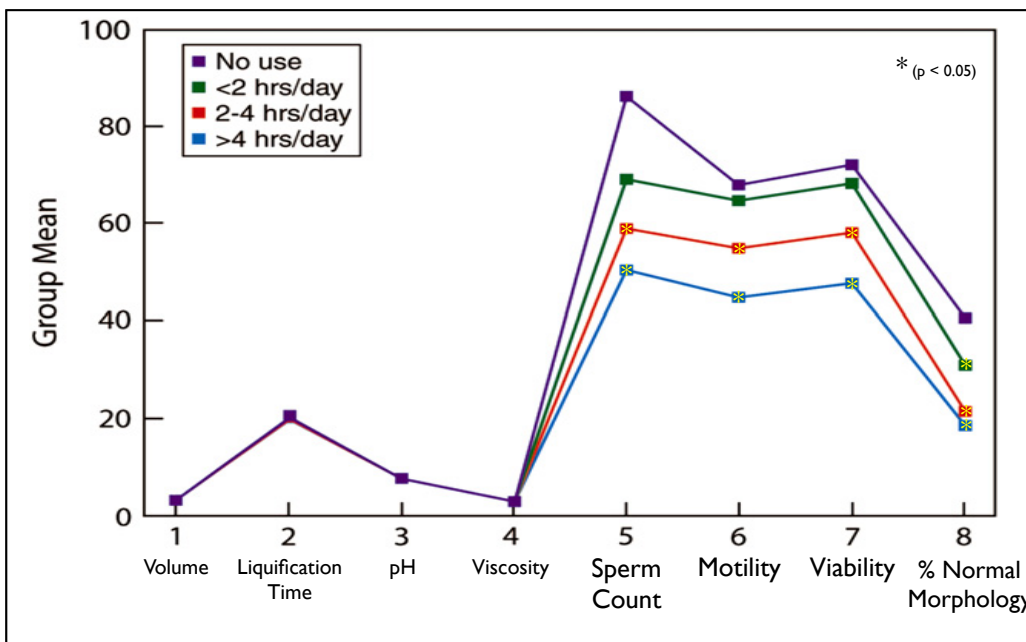
Cell Phone Use Decreases Sperm Motility in Vivo



Semen analysis performed on 371 men at a university clinic.
Health questionnaire included query of cell phone use habits.
(Y axis = values in %)

Fejes I, Zavaczki Z, Szollosi J et al. Is there a relationship between cell phone use and semen quality? *Arch Androl* (2005); 51(5):385-393.

Cell Phone Use Degrades Sperm Quality in Vivo



Three hundred sixty-one men undergoing infertility evaluation were divided into four groups according to their active cell phone use:

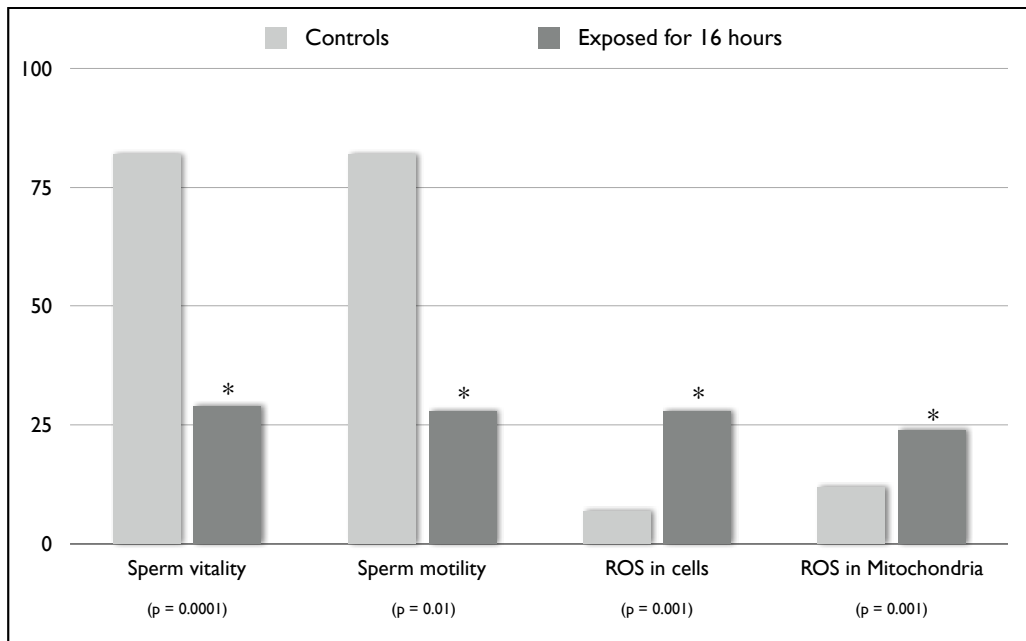
group A: no use; group B: < 2 h/day; group C: 2-4 h/day; and group D: > 4 h/day.

With greater than two hours a day of reported talk time, significant reduction in **sperm count, motility, viability, and % normal morphology** were observed.

[One can assume that with texting rather than talking, the data might be even worse . . . as the phone antenna will be closer to the testes.]

Agarwal A, Deepinder F, Sharma RK, Ranga G, Li J. Effect of cell phone usage on semen analysis in men attending infertility clinic: an observational study. *Fertil Steril* (2008); 89(1):124-128.

Isothermal Exposure to 1.8 GHz RF Damages Sperm



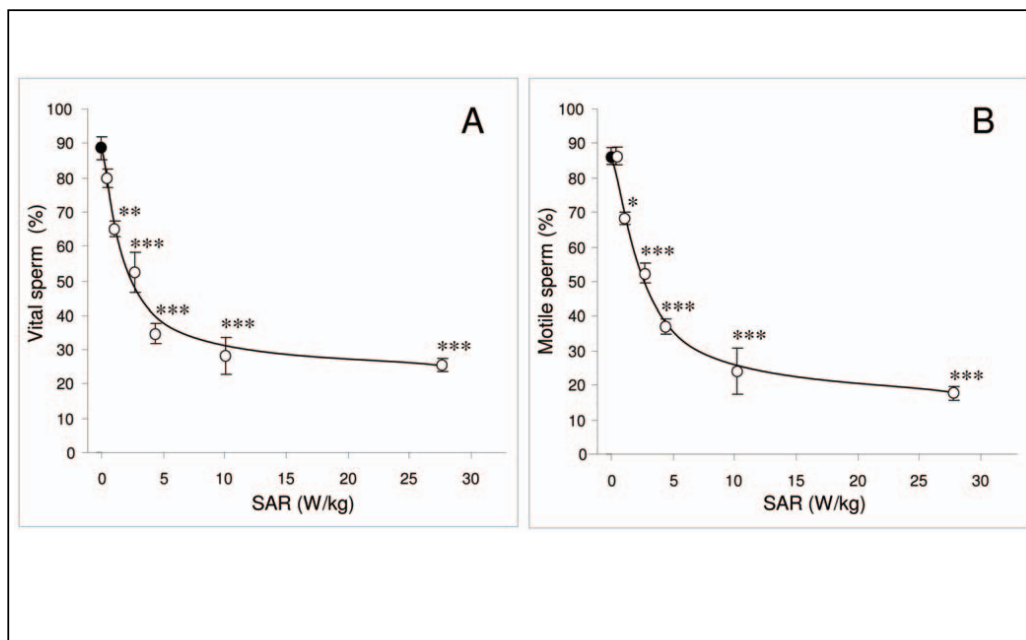
Sperm exposed for 16 hours in vitro to 1.8 GHz (SAR = 27.5 W/kg) @ 21°C (isothermal conditions).

Sperm damage correlates with increased free radical (ROS) production.

Values in %.

De Iuliis GN, Newey RJ, King BV, Aitken RJ. Mobile phone radiation induces reactive oxygen species production and DNA damage in human spermatozoa in vitro. *PLoS One* (2009); 4(7):e6446 (1-9).

1.8 GHz RF Degrades Sperm Quality In Vitro



1.8 GHz RF at various intensities for 16 hours @ 21°C

This is an isothermal exposure

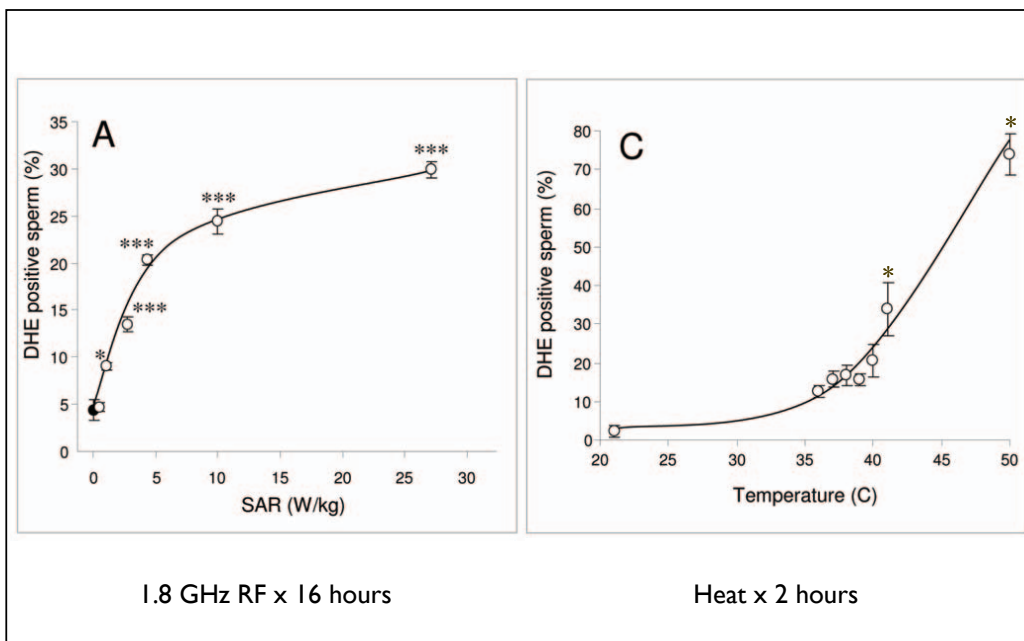
Sperm vitality and motility are significantly detruded at SAR = 1 W/kg and above

Figure 2. RF-EMR exposure reduces motility and vitality of human spermatozoa, in an SAR dependent manner. Percoll-purified spermatozoa (5×10^6 cells) were suspended in 1 ml BWB in a 35 mm Petri dish and placed within the waveguide while control cells (closed circles) were placed outside the waveguide. Cells in the waveguide were exposed to 1.8 GHz RF-EMR at SAR levels of 0.4, 1.0 2.8 4.3 10.1 and 27.5 W/kg (open circles) for 16 h at 21°C. Both vitality and motility were reduced in a dose dependent manner.

A, Vitality was significantly reduced at a SAR of 1.0 W/kg from $89\% \pm 3\%$ to $65\% \pm 1\%$ (**p.0.01).

B, Motility was also significantly reduced at a SAR of 1.0 W/kg from $86\% \pm 2\%$ to $68\% \pm 2\%$ (*p.0.05). All results are based on 4 independent samples.

ROS Production – RF versus Thermal



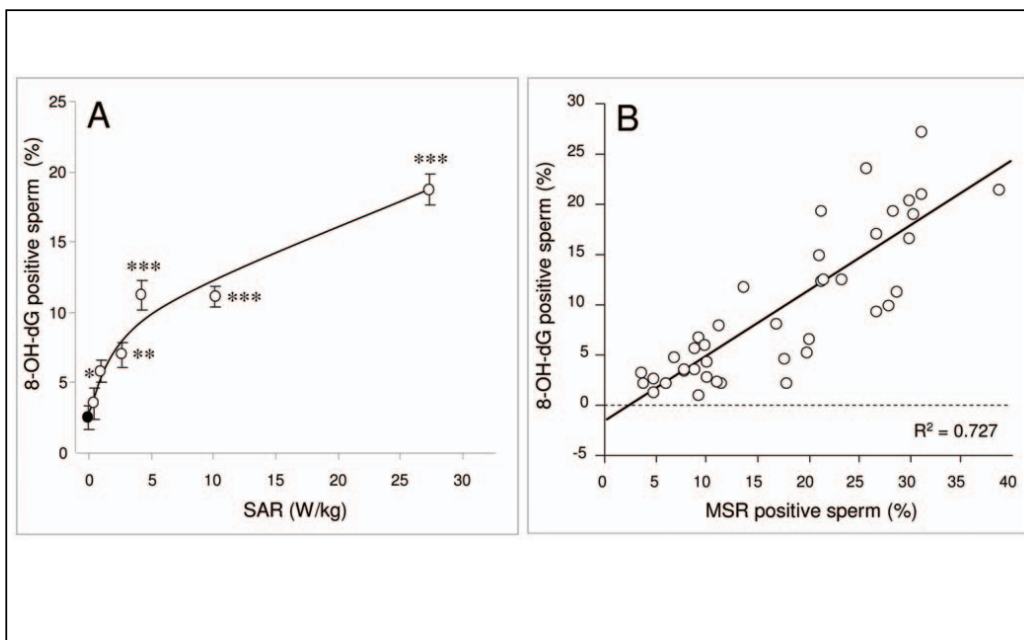
A. ROS generation (DHE response) was significantly increased from control levels after exposure to 1.0 W/kg (*p, 0.05) and above (***p, 0.001).

C. In order to control for thermal effects, the impact of temperature of cellular ROS generation was monitored; a significant increase in ROS generation was observed as temperatures rose above 40°C (p, 0.001).

Figure 3. RF-EMR induces ROS generation in human spermatozoa, in an SAR-dependent manner unrelated to thermal effects.

De Iuliis GN, Newey RJ, King BV, Aitken RJ. Mobile phone radiation induces reactive oxygen species production and DNA damage in human spermatozoa in vitro. *PLoS One* (2009); 4(7):e6446 (1-9).

Oxidative Damage To Sperm DNA From 1.8 GHz RF Exposure



1.8 GHz RF x 16 hours @ 21°C isothermal.

A) As the power levels were increased, the amount of oxidative DNA damage expressed also increased.

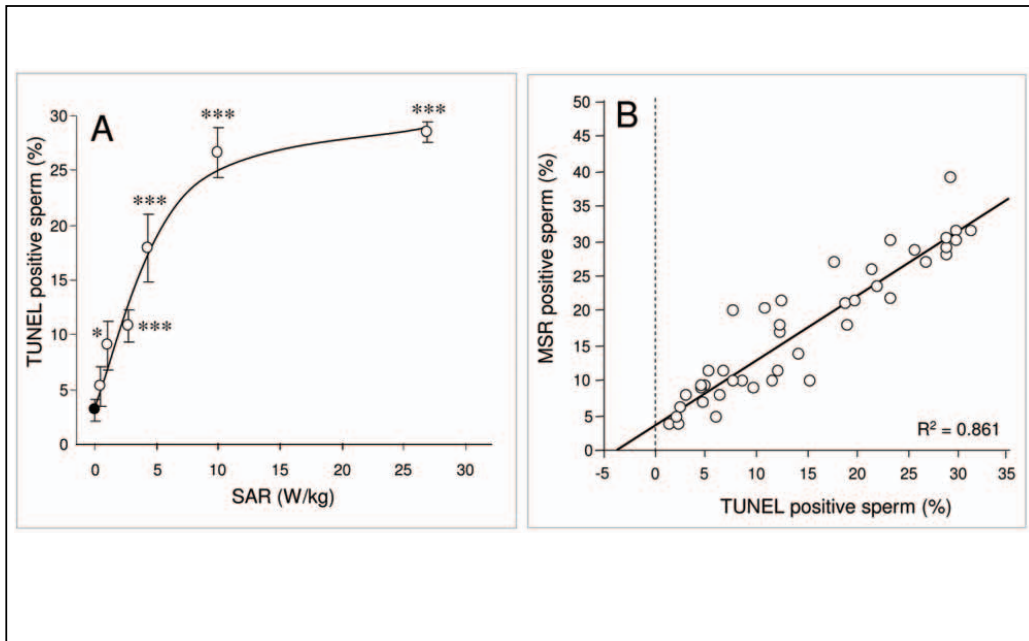
A significant amount of oxidative DNA damage was observed in cells exposed to 2.8 W/kg (*p, 0.05) RF-EMR and above (**p, 0.01; ***p, 0.001).

B) The levels of 8-OH-dG expression were positively correlated with the levels of ROS generation by the mitochondria ($R^2 = 0.727$).

Figure 4. RF-EMR induces oxidative DNA damage in human spermatozoa.

De Iuliis GN, Newey RJ, King BV, Aitken RJ. Mobile phone radiation induces reactive oxygen species production and DNA damage in human spermatozoa in vitro. *PLoS One* (2009); 4(7):e6446 (1-9).

RF Damages Sperm by Increasing Oxidative Stress



A) Significant levels of DNA fragmentation was observed in exposed spermatozoa at 2.8 W/kg (*p,0.05) and above (***p,0.001).

B) DNA fragmentation was positively correlated with ROS production by the mitochondria as monitored by MSR. ($R^2 = 0.861$).

Figure 5. RF-EMR induces DNA fragmentation in human spermatozoa.

De Iuliis GN, Newey RJ, King BV, Aitken RJ. Mobile phone radiation induces reactive oxygen species production and DNA damage in human spermatozoa in vitro. *PLoS One* (2009); 4(7):e6446 (1-9).

Sperm Damage From Laptop WiFi

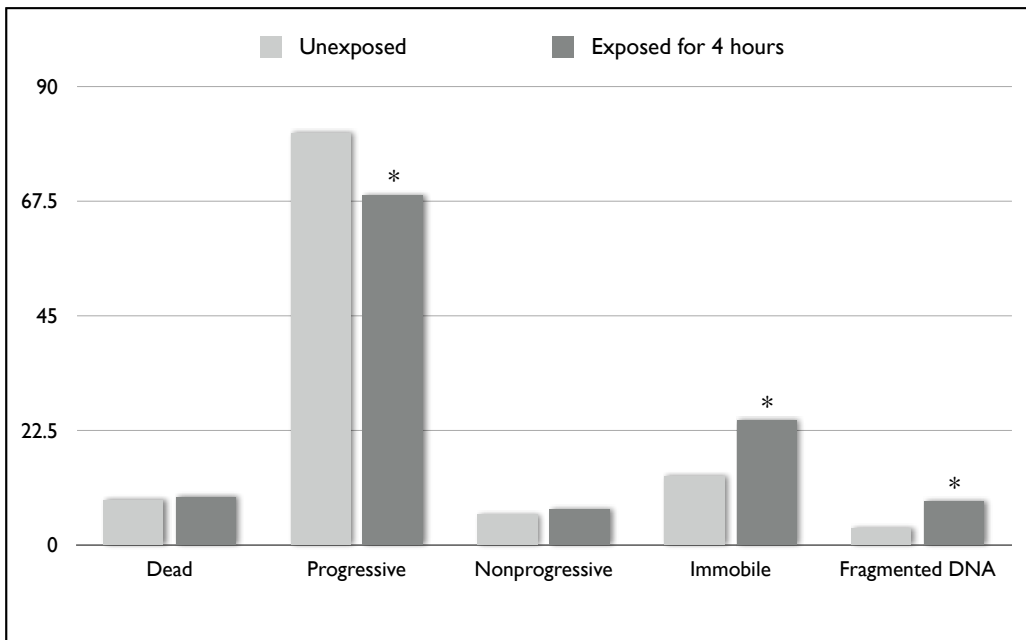


Motile spermatozoa in semen were incubated at room temperature,
3 cm below laptop computer (e.g. lap distance)
4 hours of exposure.

Control incubated in similar conditions, without presence of the computer.

Avendano C, Mata A, Sanchez Sarmiento CA, Doncel GF. Use of laptop computers connected to internet through Wi-Fi decreases human sperm motility and increases sperm DNA fragmentation. *Fertil Steril* (2012); 97(1):39-45.

Sperm Damage From Laptop WiFi



Power density ranged 0.45 to 1.05 $\mu\text{W}/\text{cm}^2$

[This is roughly **1000 times less** than the FCC exposure limit of 1000 $\mu\text{W}/\text{cm}^2$]

Avendano C, Mata A, Sanchez Sarmiento CA, Doncel GF. Use of laptop computers connected to internet through Wi-Fi decreases human sperm motility and increases sperm DNA fragmentation. *Fertil Steril* (2012); 97(1):39-45.

Cell Phones and Risk of Brain Tumor



INTERPHONE Study 2010

Published by Oxford University Press on behalf of the International Epidemiological Association
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International Journal of Epidemiology 2010;39:675–694
doi:10.1093/ije/dyq079

THEME: CANCER

Brain tumour risk in relation to mobile telephone use: results of the INTERPHONE international case–control study

The INTERPHONE Study Group*

Corresponding author. Elisabeth Cardis; CREAL, Doctor Aiguader 88, 08003 Barcelona, Spain. E-mail: ecardis@creal.cat

*List of members of this study group is available in the Appendix.

Accepted 8 March 2010

Background The rapid increase in mobile telephone use has generated concern about possible health risks related to radiofrequency electromagnetic fields from this technology.

Methods An interview-based case–control study with 2708 glioma and 2409 meningioma cases and matched controls was conducted in 13 countries using a common protocol.

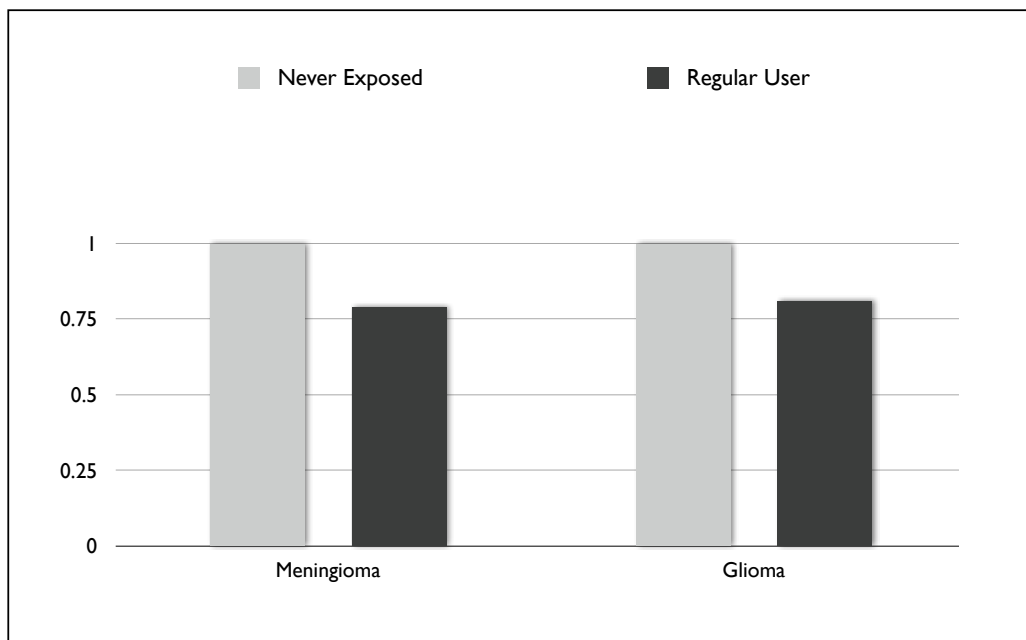
Large case–control study at multiple centers.

Funded in significant part by the telecommunications industry.

Conclusions Overall, no increase in risk of glioma or meningioma was observed with use of mobile phones.

From the authors' published conclusions.

Odds Ratio for Meningioma and Glioma



In the 2010 Interphone Study combined analysis of data for all levels of exposure found that “regular cell phone users” were less likely to have brain tumors than non-users.

This is what was reported in the media about this study.

A reduced odds ratio (OR) related to ever having been a regular mobile phone user was seen for glioma [OR 0.81; 95% confidence interval (CI) 0.70–0.94] and meningioma (OR 0.79; 95% CI 0.68–0.91)

INTERPHONE Study Group. Brain tumour risk in relation to mobile telephone use: results of the INTERPHONE international case-control study. *Int J Epidemiol* (2010); 39(3):675-694.

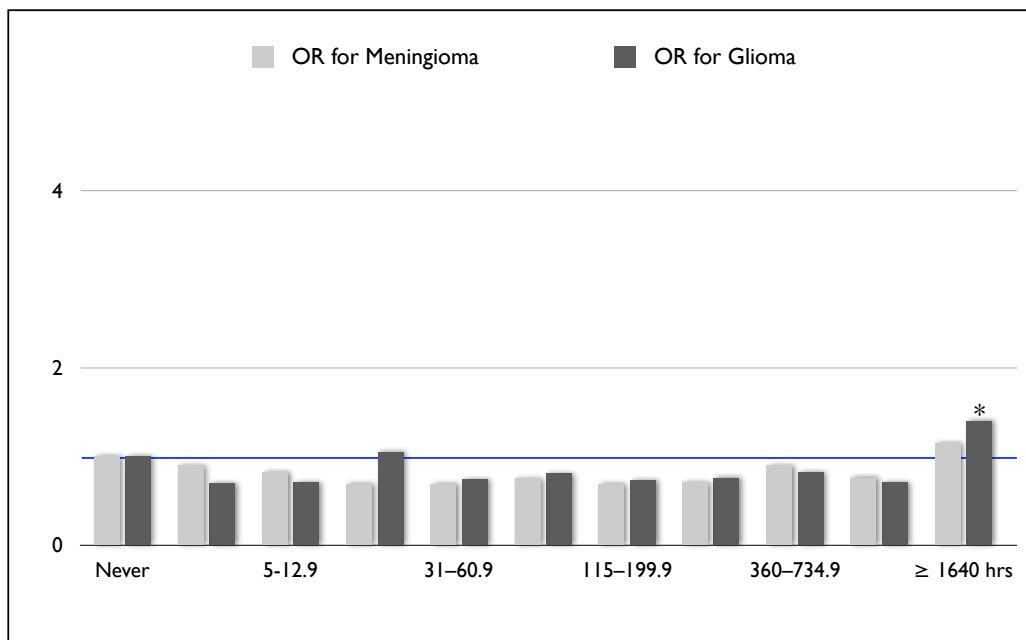
INTERPHONE Study 2010 – Definition of “Risk”

if the subject had ever been a regular user of a mobile phone (had an average of at least one call per week for a period of ≥ 6 months).²⁶

However, “regular use” was defined as a minimum of one call for week for at least 6 months.

In other words, anyone who had made at least 26 cell phone calls in their lifetime was categorized as a “regular user” and placed in the risk group.

Odds Ratio for Meningioma and Glioma with Cell Phone Use



Cumulative call time without hands-free devices, **divided into deciles.**

Blue line is Odds Ratio of 1.0 (equal to control group).

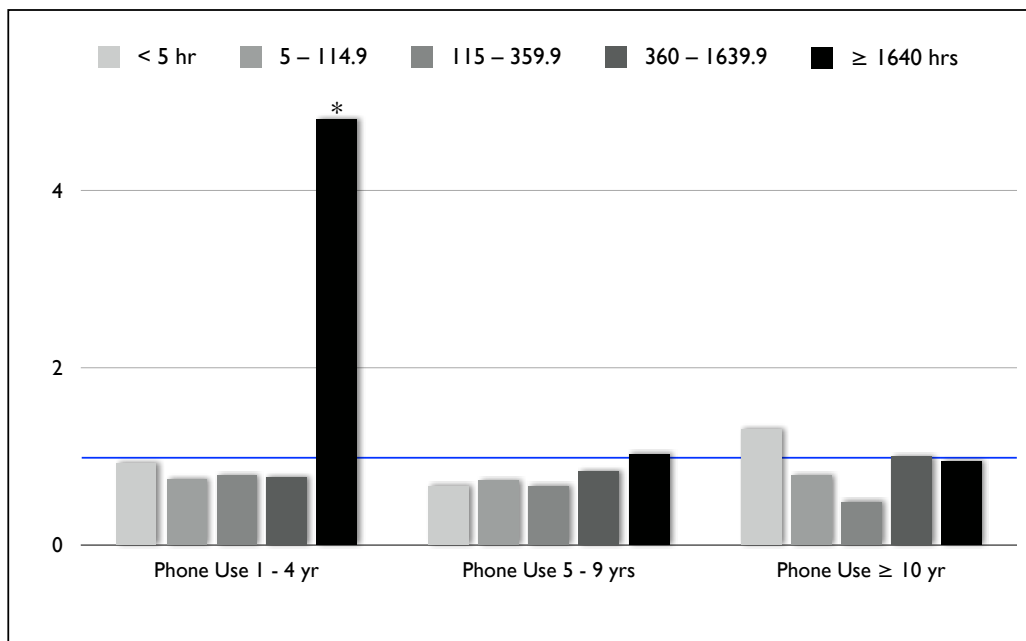
Half of the subjects in the study had less than 115 hours of lifetime exposure.

Note that a significantly higher risk for glioma was seen with more than 1640 hours of exposure.

OR for glioma = 1.40 [95% CI = (1.03–1.89)]

From Table 2: INTERPHONE Study Group. Brain tumour risk in relation to mobile telephone use: results of the INTERPHONE international case-control study. *Int J Epidemiol* (2010); 39(3):675-694.

Odds Ratio for Meningioma with Cell Phone Use



Charted data from the Interphone study for risk of meningioma.

With ≥ 1640 hrs exposure in 1 - 4 years, OR = 4.80 [95% CI = (1.49-15.4)]

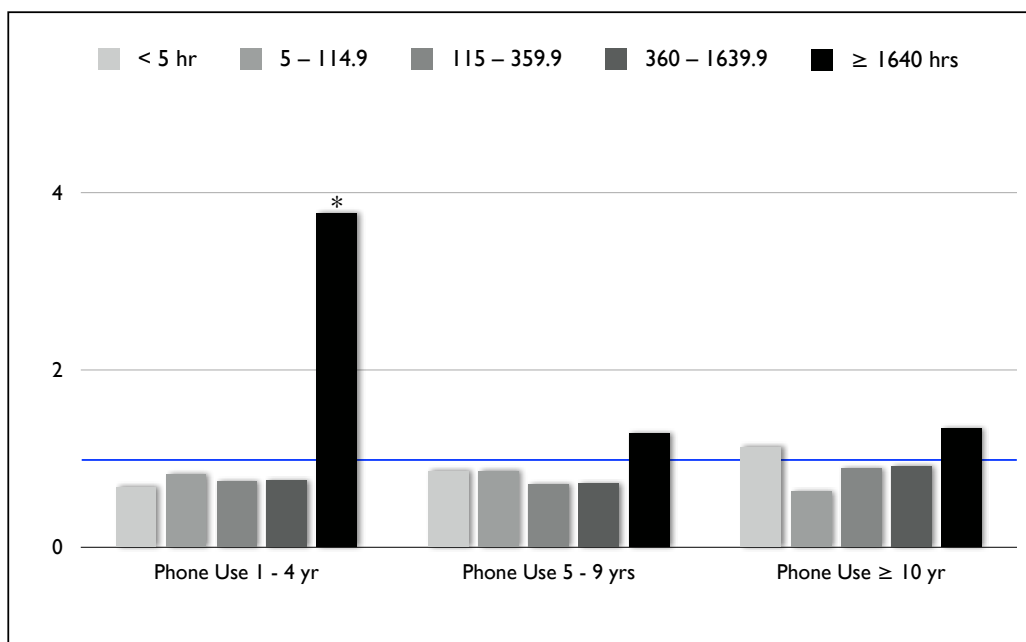
1640 hours in 4 years = 7.9 hrs/wk (range in cohort was 8 - 30 hrs/wk)

1640 hours in 10+ years ~ > 3 hrs/wk

(range in 1-4 years cohort was 8 - 30 hrs/wk, which the authors discounted as "implausible values of use" in their summary of results)

From Table 3: INTERPHONE Study Group. Brain tumour risk in relation to mobile telephone use: results of the INTERPHONE international case-control study. *Int J Epidemiol* (2010); 39(3):675-694.

Odds Ratio for Glioma with Cell Phone Use



Charted data from INTERPHONE study group, glioma risk.

Stratified by cumulative call time (without hands/free devices).

Also stratified by years of use.

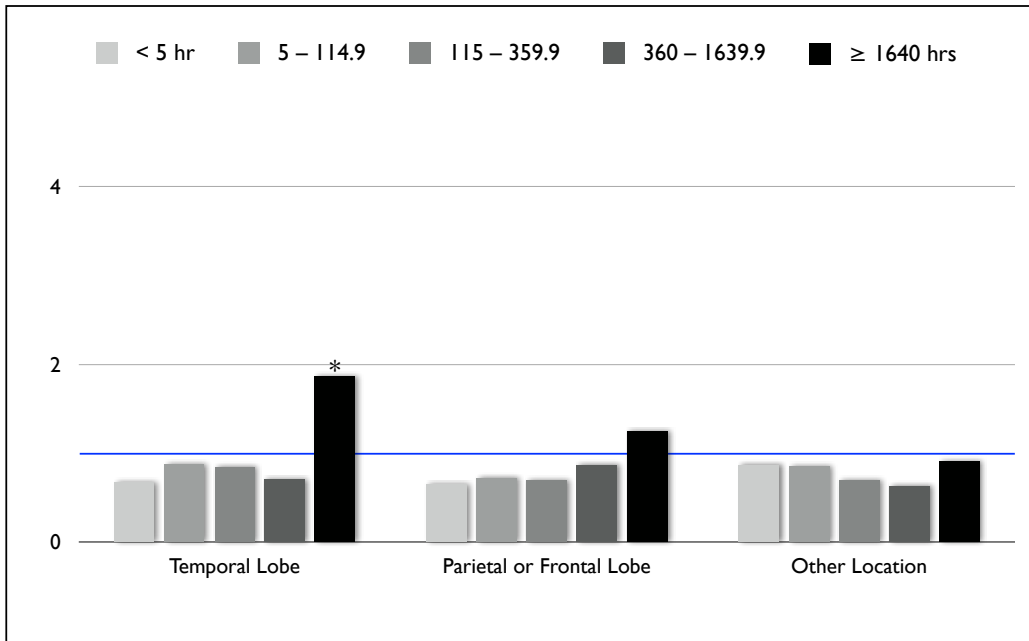
With ≥ 1640 hrs exposure in 1 - 4 years, OR for Glioma = 3.77 [95% CI = (1.25-11.4)]

1640 hours in 4 years = 7.9 hrs/wk (range in cohort was 8 - 30 hrs/wk)

The authors rejected their own findings on glioma, stating that this level of reported cell phone use (8 to 30 hours per week) was "implausible".

From Table 3: INTERPHONE Study Group. Brain tumour risk in relation to mobile telephone use: results of the INTERPHONE international case-control study. *Int J Epidemiol* (2010); 39(3):675-694.

Odds Ratio for Glioma with Cell Phone Use



Glioma risk by **location in the brain.**

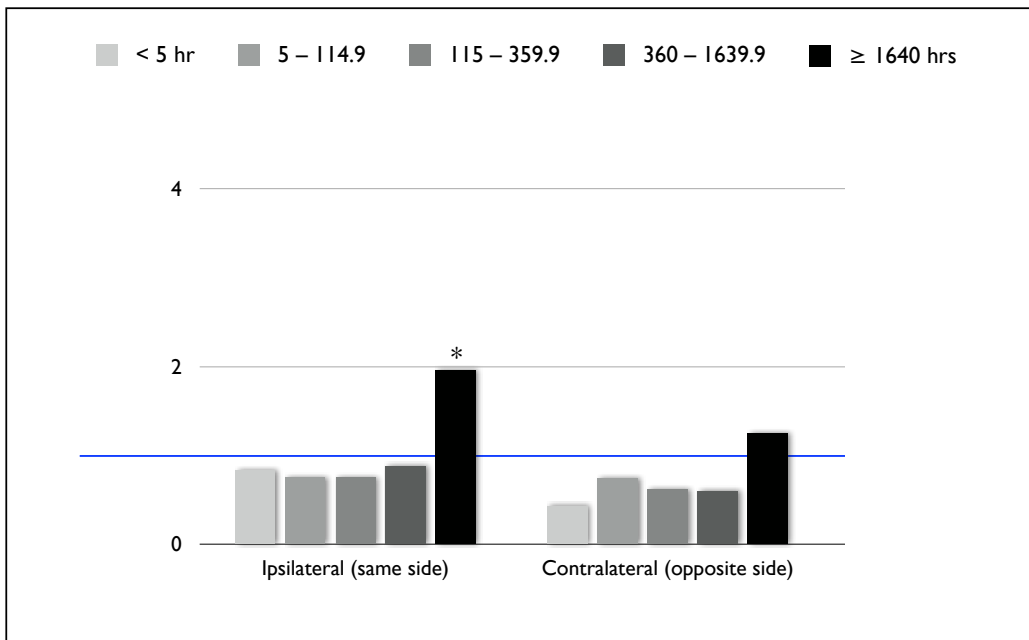
Also stratified by **cumulative call time.**

Temporal lobe (With ≥1640 hrs exposure, OR = 1.87 [95% CI = (1.09–3.22)])

From Table 4: INTERPHONE Study Group. Brain tumour risk in relation to mobile telephone use: results of the INTERPHONE international case-control study. *Int J Epidemiol* (2010); 39(3):675-694.

Interestingly, the study did report its statistics stratified by total time of reported use, and the top decile (greater than 1640 hours use over a ten year interval, averaging out as greater than 3 hours a week) had an increased risk of certain tumors. Individuals who accrued that greater than 1650 hours of use over a 1 to 4 year interval (ranging from 8 to over 30 hours a week) had a markedly higher odds ratio of meningioma (OR 4.80) or glioma (OR 3.27).

Odds Ratio for Glioma with Cell Phone Use



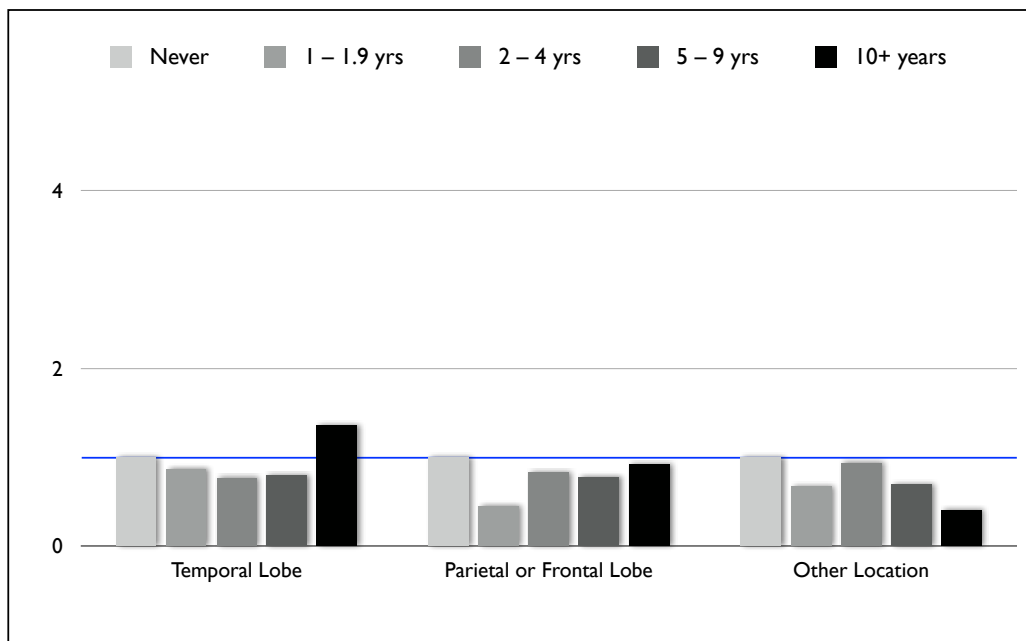
Glioma risk by **side of head they habitually held the phone.**

Also stratified by **cumulative call time.**

(With ≥1640 hrs exposure, Ipsilateral OR = 1.96 [95% CI = (1.22–3.22)])

From Table 5: INTERPHONE Study Group. Brain tumour risk in relation to mobile telephone use: results of the INTERPHONE international case-control study. *Int J Epidemiol* (2010); 39(3):675-694.

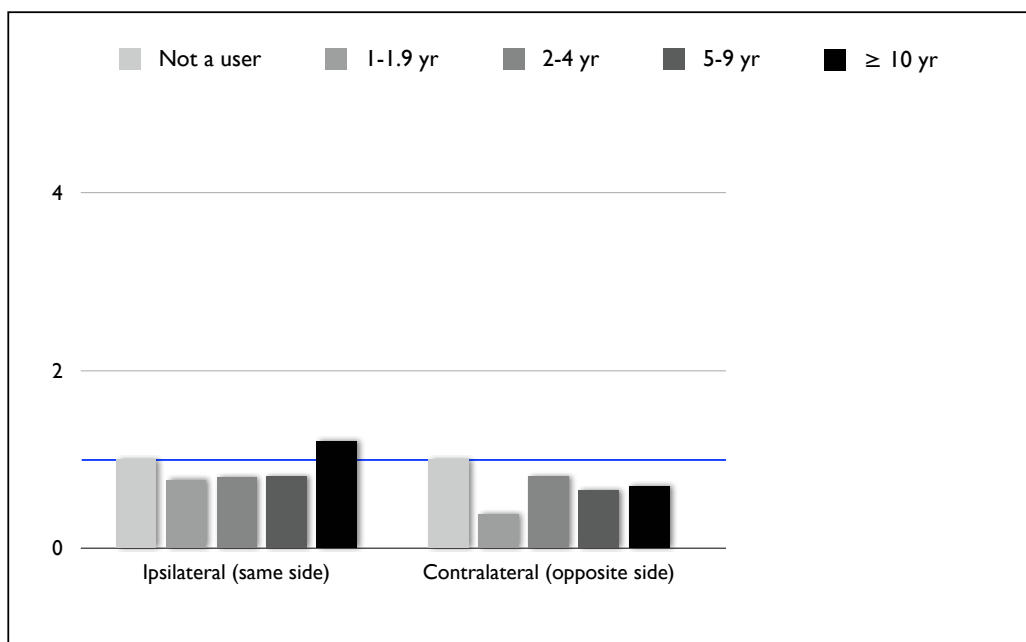
Odds Ratio for Glioma (by Years of Use)



Stratified by years of exposure.

INTERPHONE Study Group. Brain tumour risk in relation to mobile telephone use: results of the INTERPHONE international case-control study. *Int J Epidemiol* (2010); 39(3):675-694.

Odds Ratio for Glioma (by Years of Use)



Glioma risk by side of head they habitually held the phone.
Also stratified by years of exposure.

INTERPHONE Study Group. Brain tumour risk in relation to mobile telephone use: results of the INTERPHONE international case-control study. *Int J Epidemiol* (2010); 39(3):675-694.

INTERPHONE Study 2011

Acoustic neuroma risk in relation to mobile telephone use: Results of the INTERPHONE international case-control study

The INTERPHONE Study Group^{*1}

ARTICLE INFO

Article history:
Received 13 April 2011
Received in revised form 9 May 2011
Accepted 10 May 2011
Available online 23 August 2011

Keywords:
Acoustic neuroma
Vestibular schwannoma
Brain tumour
Mobile phones
Radiofrequency electromagnetic fields
Epidemiology

ABSTRACT

Background: The rapid increase in mobile telephone use has generated concern about possible health risks of radiofrequency electromagnetic fields from these devices. **Methods:** A case-control study of 1105 patients with newly diagnosed acoustic neuroma (vestibular schwannoma) and 2145 controls was conducted in 13 countries using a common protocol. Past mobile phone use was assessed by personal interview. In the primary analysis, exposure time was censored at one year before the reference date (date of diagnosis for cases and date of diagnosis of the matched case for controls); analyses censoring exposure at five years before the reference date were also done to allow for a possible longer latent period. **Results:** The odds ratio (OR) of acoustic neuroma with ever having been a regular mobile phone user was 0.85 (95% confidence interval 0.69–1.04). The OR for ≥ 10 years after first regular mobile phone use was 0.76 (0.52–1.11). There was no trend of increasing ORs with increasing cumulative call time or cumulative number of calls, with the lowest OR (0.48 (0.30–0.78)) observed in the 9th decile of cumulative call time. In the 10th decile (≥ 1640 h) of cumulative call time, the OR was 1.32 (0.88–1.97); there were, however, implausible values of reported use in those with ≥ 1640 h of accumulated mobile phone use. With censoring at 5 years before the reference date the OR for ≥ 10 years after first regular mobile phone use was 0.83 (0.58–1.19) and for ≥ 1640 h of cumulative call time it was 2.79 (1.51–5.16), but again with no trend in the lower nine deciles and with the lowest OR in the 9th decile. In general, ORs were not greater in subjects who reported usual phone use on the same side of the head as their tumour than in those who reported it on the opposite side, but it was greater in those in the 10th decile of cumulative hours of use. **Conclusions:** There was no increase in risk of acoustic neuroma with ever regular use of a mobile phone or for users who began regular use 10 years or more before the reference date. Elevated odds ratios observed at the highest level of cumulative call time could be due to chance, reporting bias or a causal effect. As acoustic neuroma is usually a slowly growing tumour, the interval between introduction of mobile phones and occurrence of the tumour might have been too short to observe an effect, if there is one.

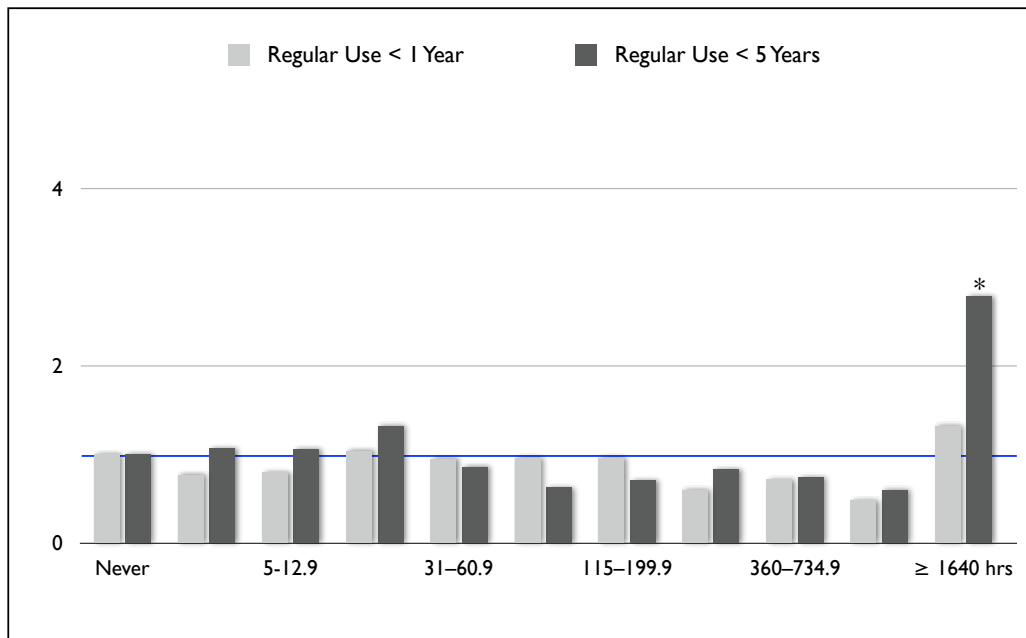
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2011 INTERPHONE study of acoustic neuroma

Funded in significant part by the telecommunications industry.

Cardis E, Schüz J. Acoustic neuroma risk in relation to mobile telephone use: results of the INTERPHONE international case-control study. *Cancer Epidemiol* (2011); 35(5):453-464.

Odds Ratio for Acoustic Neuroma with Cell Phone Use



From 2011 INTERPHONE study of acoustic neuroma, Table 2.

This study was also funded in major part by the telecommunications industry.

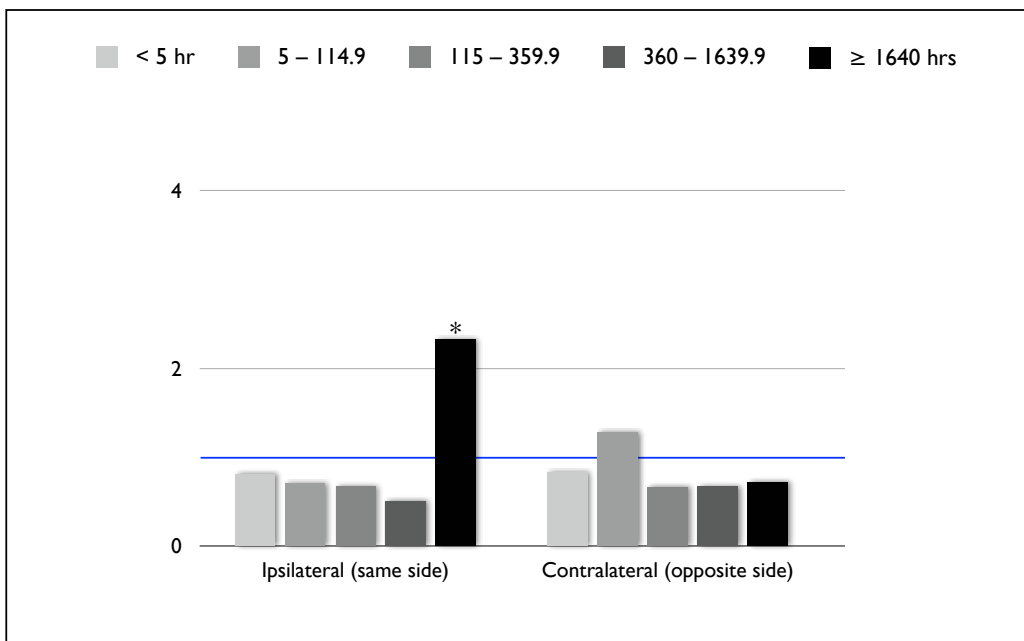
In their conclusion, the authors stated that this data showed “no trend of increasing risk with increasing cumulative call time”

They discounted their findings for the highest decile of exposure.

But with ≥ 1640 hrs exposure in 1 - 5 years of exposure, OR = 2.79 [95% CI = (1.51–5.16)]

From Table 2: Cardis E, Schüz J. Acoustic neuroma risk in relation to mobile telephone use: results of the INTERPHONE international case-control study. *Cancer Epidemiol* (2011); 35(5):453-464.

Acoustic Neuroma Risk (< 1 year of cell phone use)



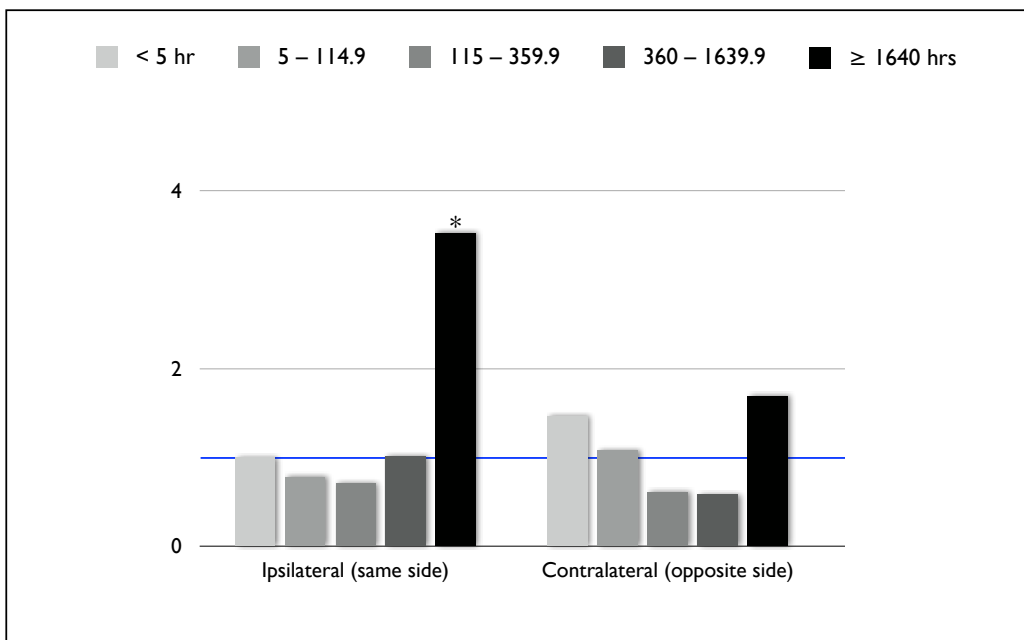
In the high use group, risk of acoustic neuroma was significantly higher on the side of the head where the subject habitually held the cell phone.

1640 hours in 1 year = 4.5 hours a day = 31.5 hours/week

With ≥ 1640 hrs exposure, ipsilateral tumor Odds Ratio = 2.33 [95% CI = (1.23-4.40)]

From Table 3: Cardis E, Schüz J. Acoustic neuroma risk in relation to mobile telephone use: results of the INTERPHONE international case-control study. *Cancer Epidemiol* (2011); 35(5):453-464.

Acoustic Neuroma Risk (< 5 years of cell phone use)



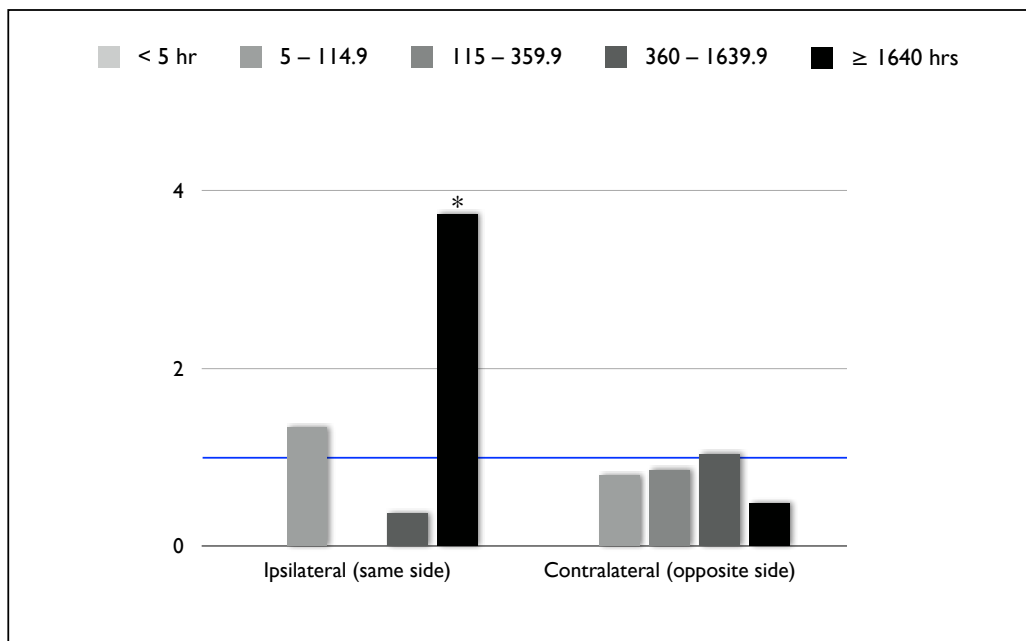
Risk increased with increased years of exposure.

1640 hours in 5 years = 0.9 hours a day = 6.3 hours/week

With ≥ 1640 hrs exposure, ipsilateral tumor Odds Ratio = 3.53 [95% CI = (1.59-7.82)]

From Table 3: Cardis E, Schüz J. Acoustic neuroma risk in relation to mobile telephone use: results of the INTERPHONE international case-control study. *Cancer Epidemiol* (2011); 35(5):453-464.

Acoustic Neuroma Risk (≥ 10 years of cell phone use)



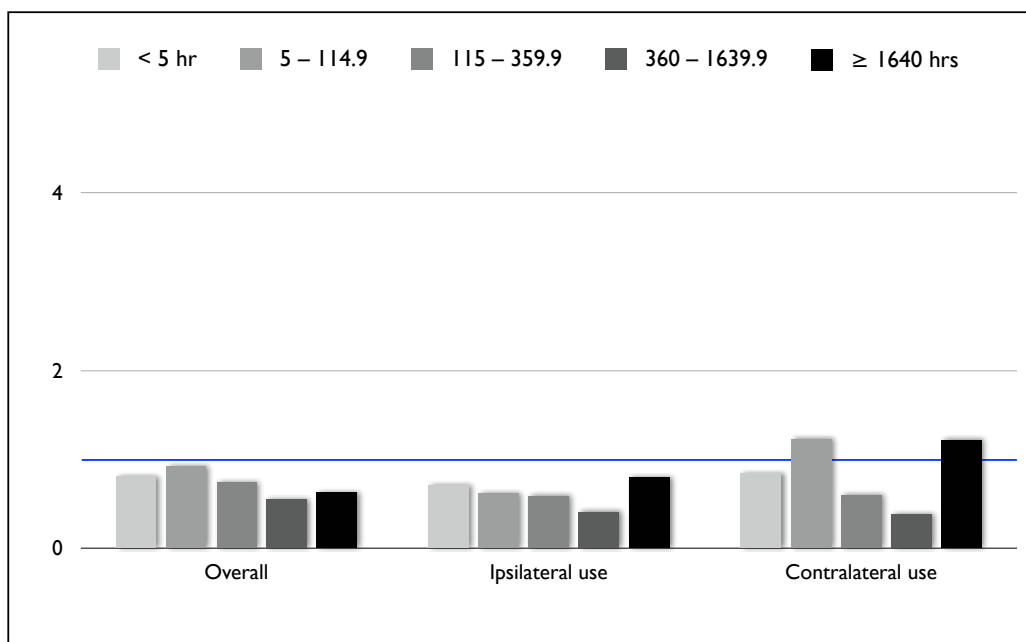
Higher risk with ten or more years of exposure.

1640 hours in 10 years = less than half an hour a day. = 3.2 hours/week = 0.45 hours a day

With ≥ 1640 hrs exposure, ipsilateral tumor Odds Ratio = 3.74 [95% CI = (1.58–8.83)]

From Table 4: Cardis E, Schüz J. Acoustic neuroma risk in relation to mobile telephone use: results of the INTERPHONE international case-control study. *Cancer Epidemiol* (2011); 35(5):453-464.

Acoustic Neuroma Risk with 1 to 4 Years of Cell Phone Use

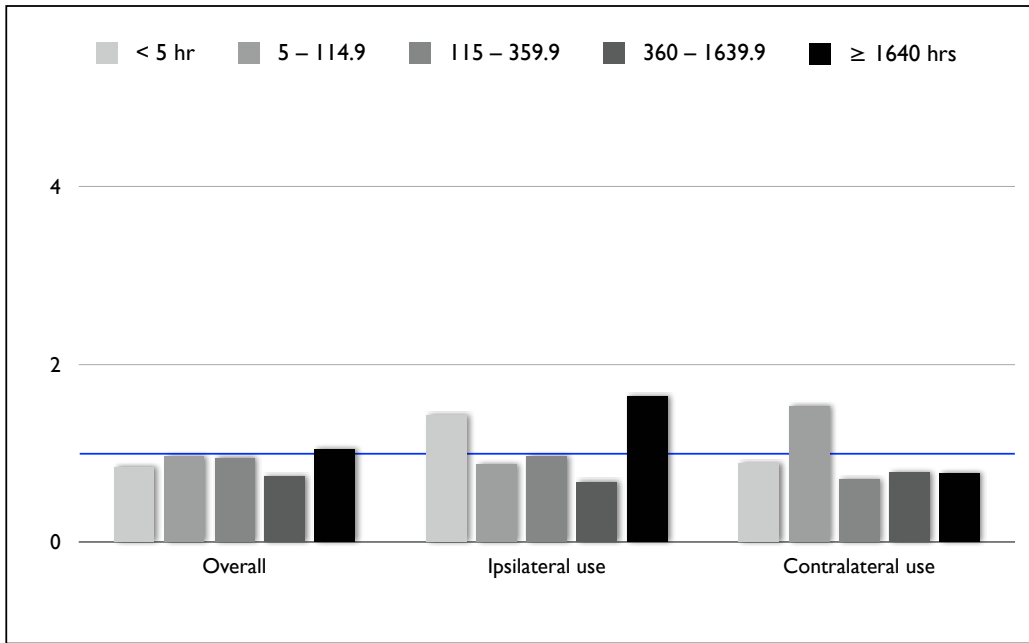


2011 INTERPHONE study of acoustic neuroma

From Table 4: Short, medium, long-term accumulation of >1640 hours.

Cardis E, Schüz J. Acoustic neuroma risk in relation to mobile telephone use: results of the INTERPHONE international case-control study. *Cancer Epidemiol* (2011); 35(5):453-464.

Acoustic Neuroma Risk with 5 to 9 Years of Cell Phone Use

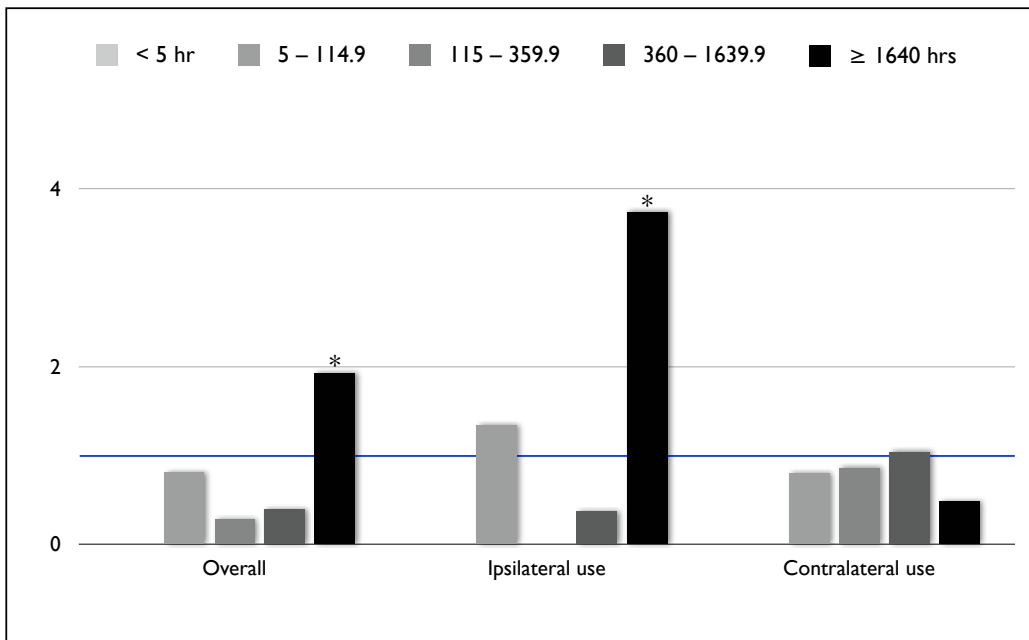


2011 INTERPHONE study of acoustic neuroma

From Table 4: Short, medium, long-term accumulation of >1640 hours.

Cardis E, Schüz J. Acoustic neuroma risk in relation to mobile telephone use: results of the INTERPHONE international case-control study. *Cancer Epidemiol* (2011); 35(5):453-464.

Acoustic Neuroma Risk with 10 + Years of Cell Phone Use



2011 INTERPHONE study of acoustic neuroma

From Table 4: Short, medium, long-term accumulation of ≥1640 hours.

Cardis E, Schüz J. Acoustic neuroma risk in relation to mobile telephone use: results of the INTERPHONE international case-control study. *Cancer Epidemiol* (2011); 35(5):453-464.



Risk of brain tumours in relation to estimated RF dose from mobile phones: results from five Interphone countries

E Cardis,¹ B K Armstrong,² J D Bowman,³ G G Giles,^{4,5} M Hours,⁶ D Krewski,⁷ M McBride,⁸ M E Parent,⁹ S Sadetzki,^{10,11} A Woodward,¹² J Brown,² A Chetrit,¹⁰ J Figuerola,¹ C Hoffmann,^{11,13} A Jarus-Hakak,¹⁰ L Montestrucq,⁶ L Nadon,⁹ L Richardson,¹⁴ R Villegas,¹ M Vrijheid¹

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Accepted 20 May 2011
Published Online First 9 June 2011

ABSTRACT

Objectives The objective of this study was to examine the associations of brain tumours with radio frequency (RF) fields from mobile phones.

Methods Patients with brain tumour from the Australian, Canadian, French, Israeli and New Zealand components of the Interphone Study, whose tumours were localised by neuroradiologists, were analysed. Controls were matched on age, sex and region and allocated the 'tumour location' of their matched case. Analyses included 553 glioma and 676 meningioma cases and 1762 and 1911 controls, respectively. RF dose was estimated as total cumulative specific energy (TCSE; J/kg) absorbed at the tumour's estimated centre taking into account multiple RF exposure determinants.

Results ORs with ever having been a regular mobile phone user were 0.93 (95% CI 0.73 to 1.18) for glioma and 0.80 (95% CI 0.66 to 0.96) for meningioma. ORs for glioma were below 1 in the first four quintiles of TCSE

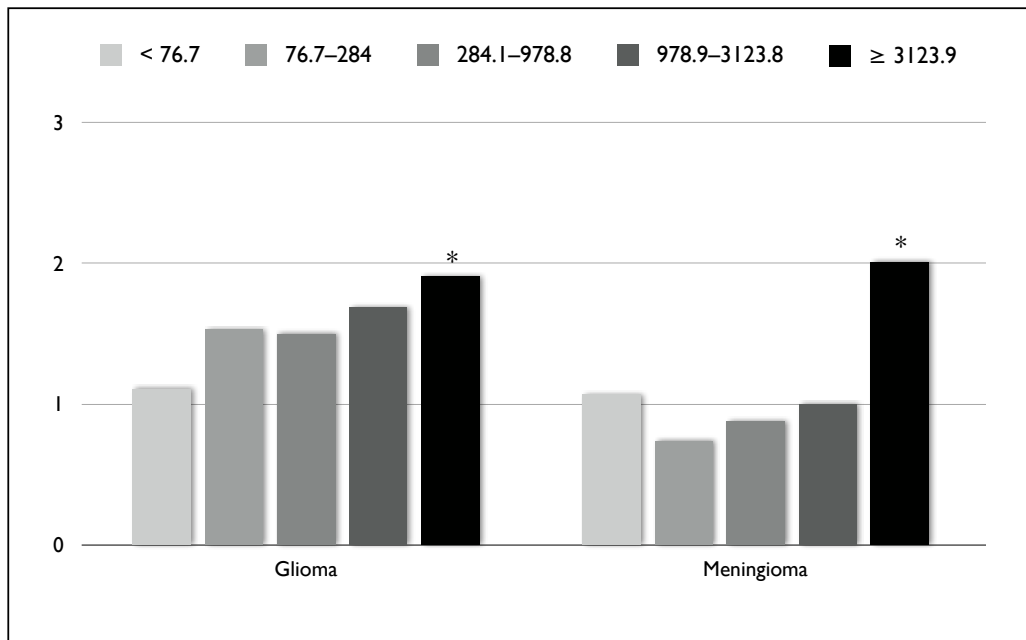
What this paper adds

- ▶ Previous epidemiological studies of mobile phone use and brain cancer risk have used information on mobile phone use as a proxy measure of exposure to radio frequency fields from mobile phones.
- ▶ Most studies have not observed increased ORs in relation to ever having been a mobile phone user. There were suggestions, however, of an increased risk of glioma in long-term and heavy users, though biases and errors prevent a causal interpretation.
- ▶ The relationship between radio frequency energy absorbed at the tumour location and mobile phone use history is complex. In addition to amount of use, it depends on phone type, network properties, conditions of use and

Interphone latest study 2011

Cardis E, Armstrong BK, Bowman JD et al. Risk of brain tumours in relation to estimated RF dose from mobile phones: results from five Interphone countries. *Occup Environ Med* (2011); 68(9):631-640.

Odds Ratio for Brain Tumor (7+ years of cell phone use)



Stratified by Total Cumulative Energy Exposure (joules/kilogram)

From Table 3: Cardis E, Armstrong BK, Bowman JD et al. Risk of brain tumours in relation to estimated RF dose from mobile phones: results from five Interphone countries. *Occup Environ Med* (2011); 68(9):631-640.

Our results suggest that there may be an increase in risk of glioma in the most exposed area of the brain among long-term and heavy users of mobile phones. These results are uncertain (in light of the uncertainties associated with tumour centre localisation, radio frequency dose estimation and sample size) and require replication before they can be taken to indicate a cause effect relationship.

From the conclusions of the 2001 INTERPHONE study (industry-financed).

Study authors finally admitted that their data showed increase risk of glioma, but said that this finding required replication before being taken as a cause and effect relationship.

This despite the fact that this finding was already a replication of their previously published data, and had also been confirmed several times in the published data of the Hardell group in Sweden.

BBC NEWS

HEALTH

20 October 2011 Last updated at 21:11 ET

Mobile phone brain cancer link rejected

By Nick Triggle
Health correspondent, BBC News

Further research has been published suggesting there is no link between mobile phones and brain cancer.

The risk mobiles present has been much debated over the past 20 years as use of the phones has soared.

Danish study: Proclaimed as evidence that cell phones are safe.

420,095 subscribers in the cohort — who had subscriptions by 1994/95.

Exposure is judged by presence of a cell phone contract, no record of actual usage.

200,507 corporate users excluded — **and placed in the control group.**

2550 juveniles excluded — **and placed in the control group.**

Frei P, Poulsen AH, Johansen C, Olsen JH, Steding-Jessen M, Schuz J. Use of mobile phones and risk of brain tumours: update of Danish cohort study. *BMJ* (2011); 343(d6387).

Danish Study 2011

Danish study: Proclaimed as evidence that cell phones are safe.

420,095 subscribers in the cohort — who had subscriptions by 1994/95. Exposure is judged by presence of a cell phone contract, no record of actual usage.

200,507 corporate users excluded — and placed in the control group.

2550 juveniles excluded — and placed in the control group.

Half the subjects in the 2009 Johansen et al study had less than two years of cell phone use.

Second publication: Schuz 2006

Only 61% of subscribers reported making or receiving at least 1 call a week in prior six months

All users who began subscription after 1995 were put in the “unexposed” reference population.

Third publication Schuz et al 2011

Same study group

Control group 2.9 million Danes

Fourth publication: Frei et al 2011 *BMJ*

~ 42% of initial cohort excluded (and placed in control group).

Also in the control group — the 85% of Danes that got a cell phone contract between 1995 and 2004.

“Number of subscription years” is used as a surrogate for actual hours of usage.

18–29 year old excluded

Cohort established by grants from Danish telecom companies. Sources of funding of the International Epidemiology Institute (Rockville, MD, USA) have never been declared.

In this study, the control group was contaminated with so many cell phone users that the results of the study were essentially meaningless. Two reviews stating this fact were published in the same issue of *BMJ*, along with the Friis study.

Frei P, Poulsen AH, Johansen C, Olsen JH, Steding-Jessen M, Schuz J. Use of mobile phones and risk of brain tumours: update of Danish cohort study. *BMJ* (2011); 343(d6387).

Philips A, Lamburn G. Updated study contains poor science and should be disregarded. *BMJ* (2011); 343(d7899); author reply d7912).

Soderqvist F, Carlberg M, Hardell L. Review of four publications on the Danish cohort study on mobile phone subscribers and risk of brain tumors. *Rev Environ Health* (2012); 27(1):51-58.

Studies from the Hardell Group in Sweden

INTERNATIONAL JOURNAL OF ONCOLOGY 38: 1465-1474, 2011

Pooled analysis of case-control studies on malignant brain tumours and the use of mobile and cordless phones including living and deceased subjects

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²Department of Radiation Physics, Umeå University, SE-901 87 Umeå, Sweden

Received December 6, 2010; Accepted January 20, 2011

DOI: 10.3892/ijo.2011.947

Abstract. We studied the association between use of mobile and cordless phones and malignant brain tumours. Pooled analysis was performed of two case-control studies on patients with malignant brain tumours diagnosed during 1997-2003 and matched controls alive at the time of study inclusion and one case-control study on deceased patients and controls diagnosed during the same time period. Cases and controls or relatives to deceased subjects were interviewed using a structured questionnaire. Replies were obtained for 1,251 (85%) cases and 2,438 (84%) controls. The risk increased with

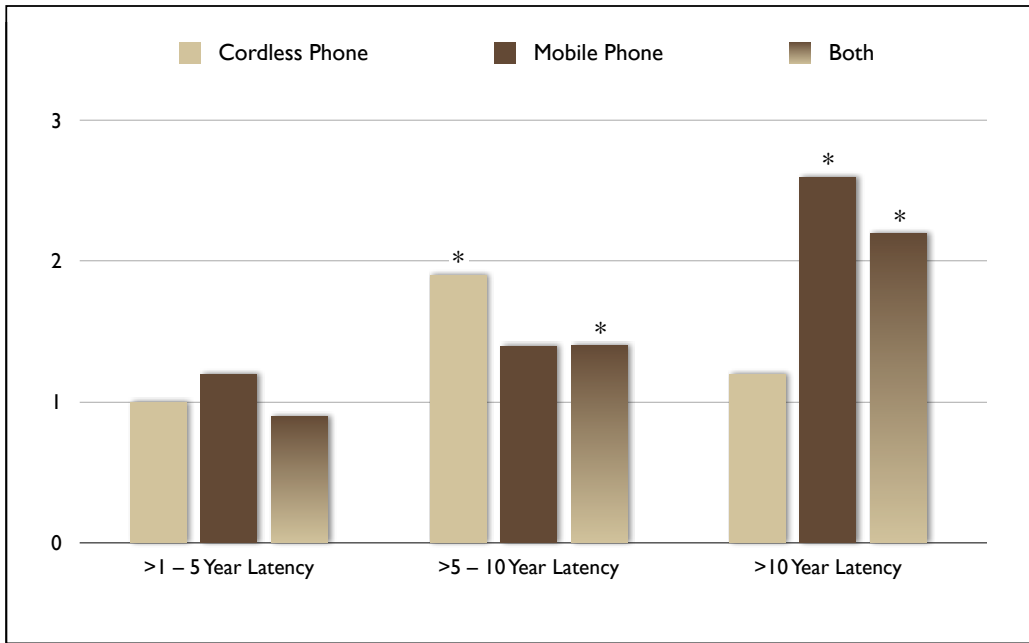
emissions from wireless devices such as mobile phone base stations, broadcast transmission towers, pagers and personal digital assistants, wireless networks and other sources of RF radiation (1).

The brain is the target organ of the body with highest near field exposure to microwaves during use of a handheld wireless phone. Thus, fear of an increased risk for brain tumours from RF fields emitted from mobile phones has dominated the debate the last decade. Of equal importance is use of the desktop cordless phones.

The most reliable research on the tumor risks of cell phones has been performed by the Hardell group in Sweden. This group does not receive funding from the cell phone industry.

This is the only group that has controlled for use of in-home cordless phones as well as cell phones [which makes their data more reliable].

Tumor Risk by Years of Use – Glioma

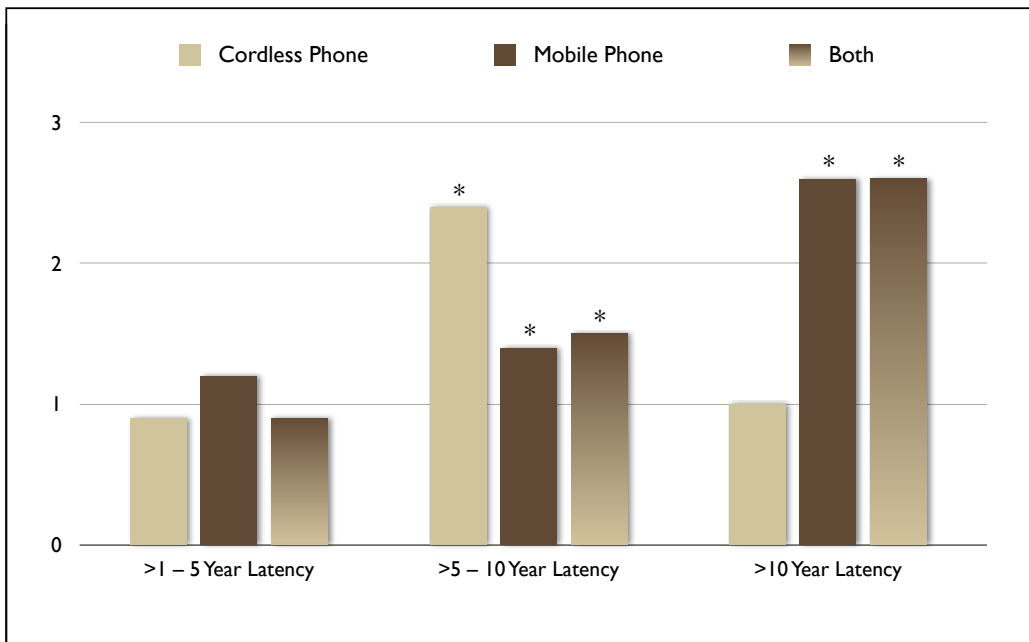


Orient to the bar graph.

Hardell group -- current summary

From Table IV: Hardell L, Carlberg M, Hansson Mild K. Pooled analysis of case-control studies on malignant brain tumours and the use of mobile and cordless phones including living and deceased subjects. *Int J Oncol* (2011b); 38(5):1465-1474.

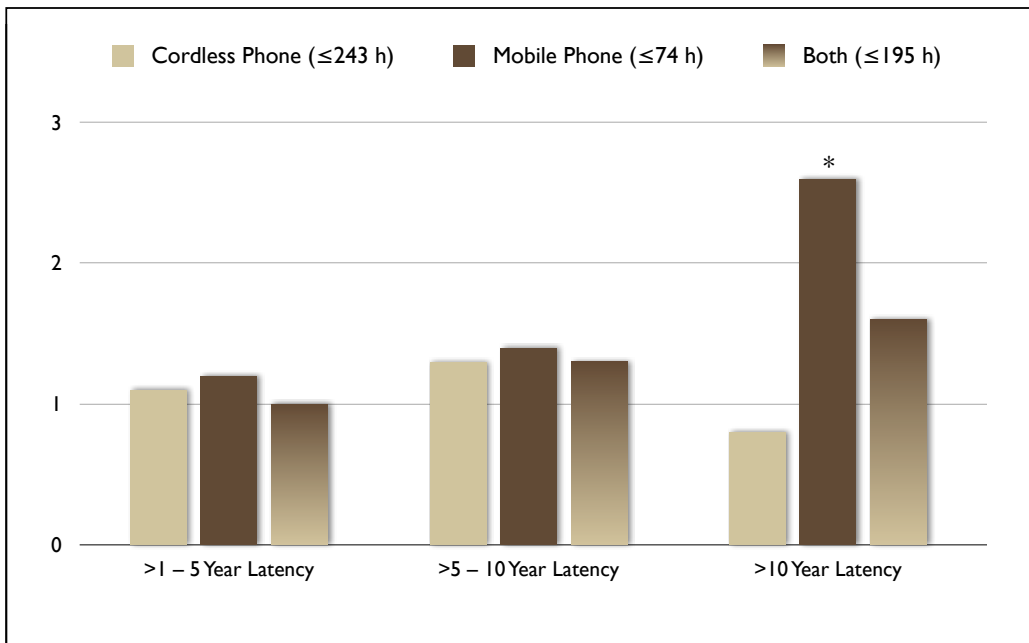
Tumor Risk by Years of Use – Astrocytoma



Hardell group -- current summary

From Table IV: Hardell L, Carlberg M, Hansson Mild K. Pooled analysis of case-control studies on malignant brain tumours and the use of mobile and cordless phones including living and deceased subjects. *Int J Oncol* (2011b); 38(5):1465-1474.

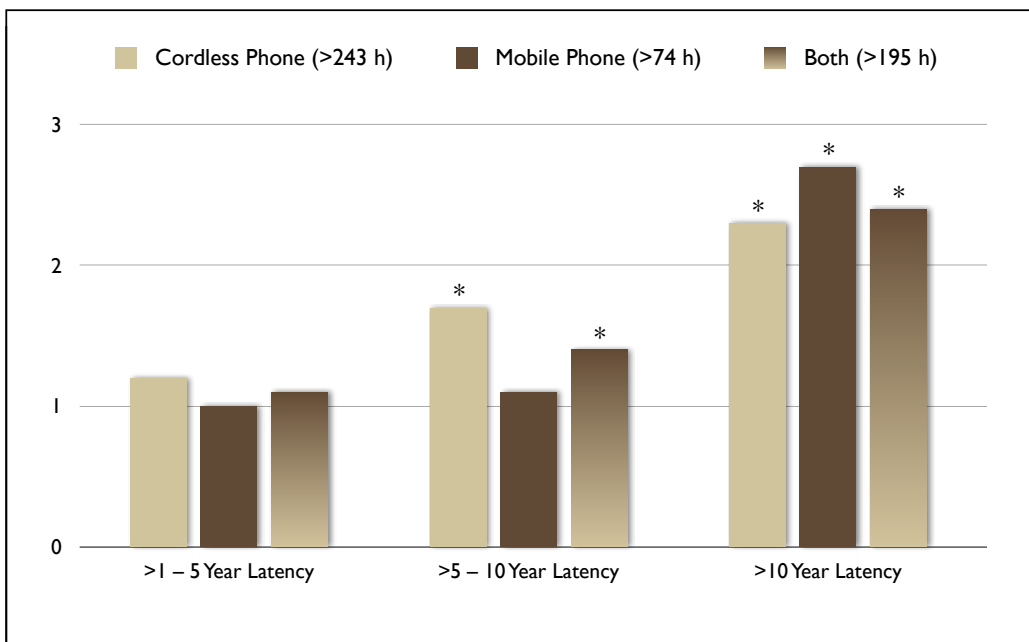
Risk of All Brain Tumors (Usage Below Median)



Hardell group -- current summary

From Table IV: Hardell L, Carlberg M, Hansson Mild K. Pooled analysis of case-control studies on malignant brain tumours and the use of mobile and cordless phones including living and deceased subjects. *Int J Oncol* (2011b); 38(5):1465-1474.

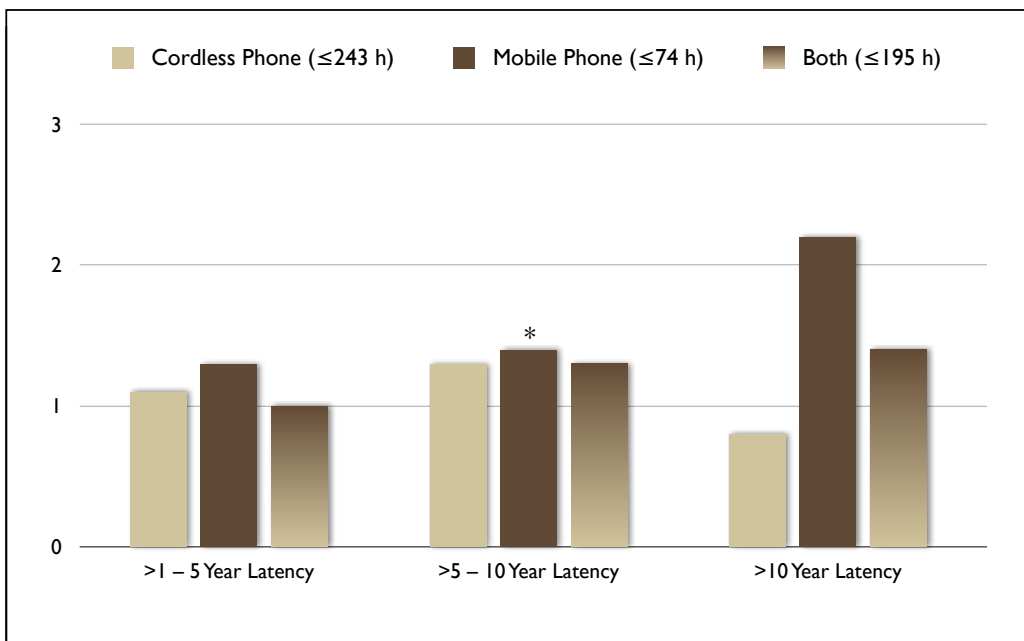
Risk of All Brain Tumors (Usage Above Median)



Hardell group -- current summary

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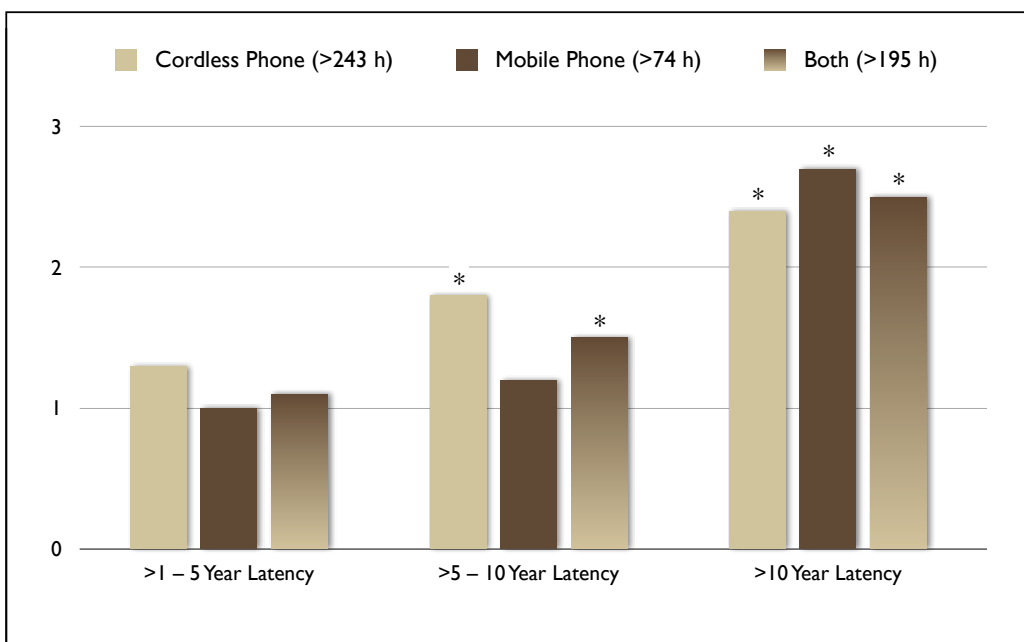
Risk of Glioma (Usage Below Median)



Hardell group -- current summary

From Table IV: Hardell L, Carlberg M, Hansson Mild K. Pooled analysis of case-control studies on malignant brain tumours and the use of mobile and cordless phones including living and deceased subjects. *Int J Oncol* (2011b); 38(5):1465-1474.

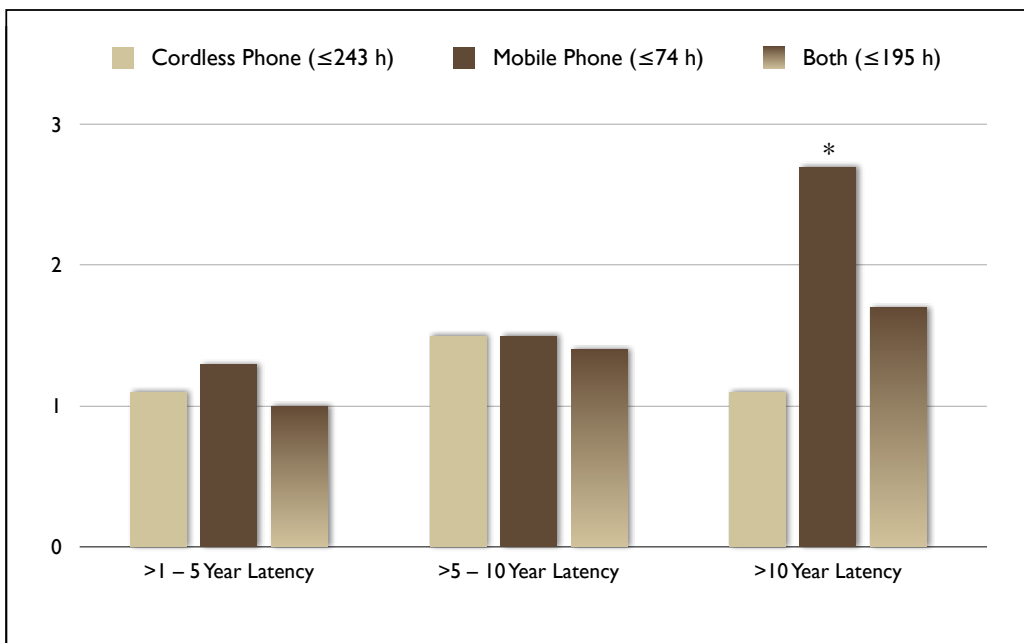
Risk of Glioma (Usage Above Median)



Hardell group -- current summary

From Table IV: Hardell L, Carlberg M, Hansson Mild K. Pooled analysis of case-control studies on malignant brain tumours and the use of mobile and cordless phones including living and deceased subjects. *Int J Oncol* (2011b); 38(5):1465-1474.

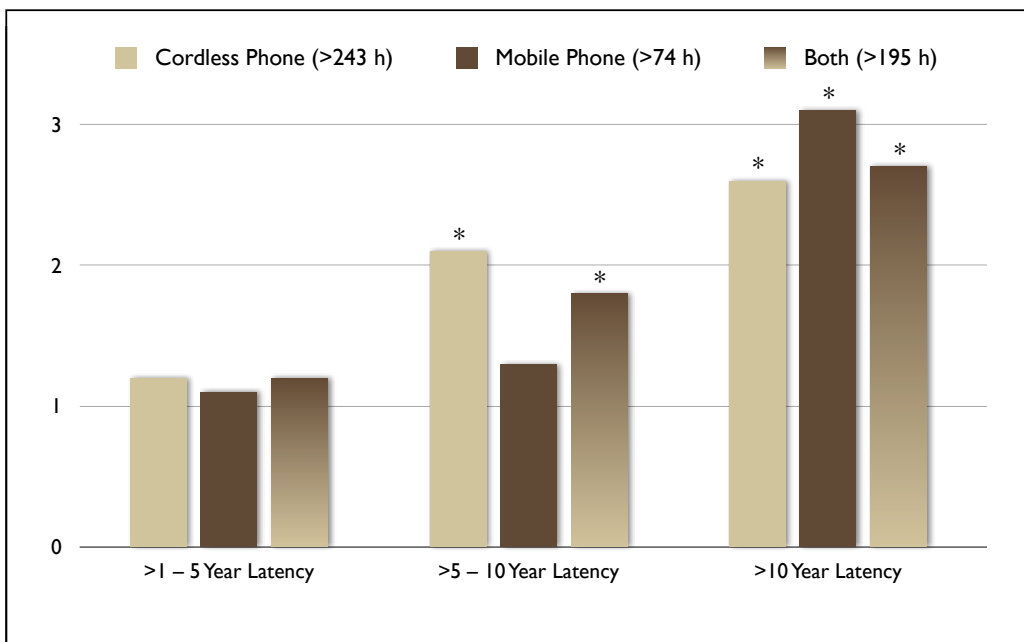
Risk of Astrocytoma (Usage Below Median)



Hardell group -- current summary

From Table IV: Hardell L, Carlberg M, Hansson Mild K. Pooled analysis of case-control studies on malignant brain tumours and the use of mobile and cordless phones including living and deceased subjects. *Int J Oncol* (2011b); 38(5):1465-1474.

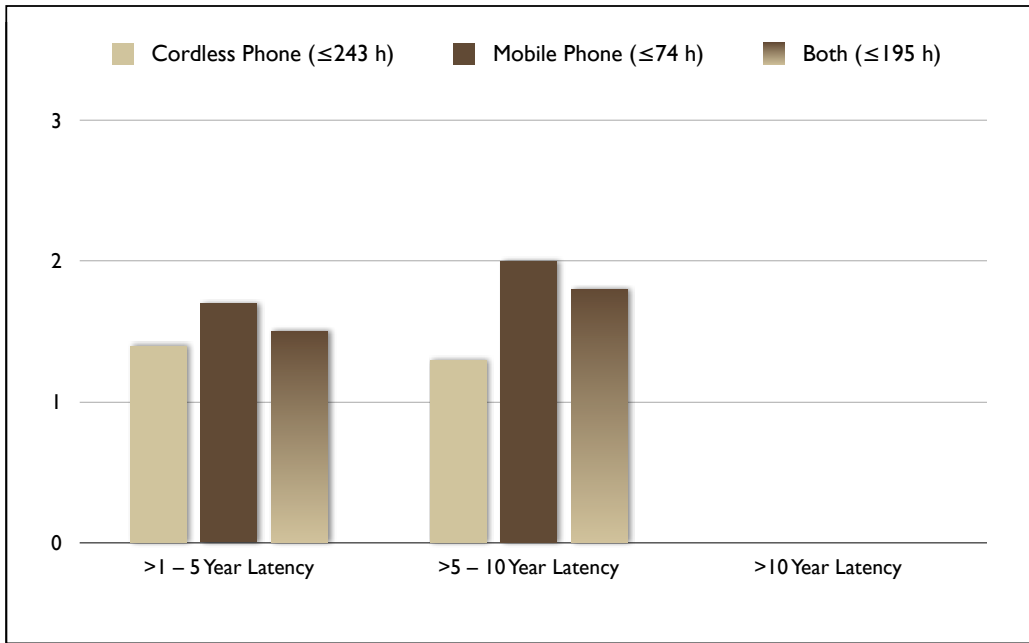
Risk of Astrocytoma (Usage Above Median)



Hardell group -- current summary

From Table IV: Hardell L, Carlberg M, Hansson Mild K. Pooled analysis of case-control studies on malignant brain tumours and the use of mobile and cordless phones including living and deceased subjects. *Int J Oncol* (2011b); 38(5):1465-1474.

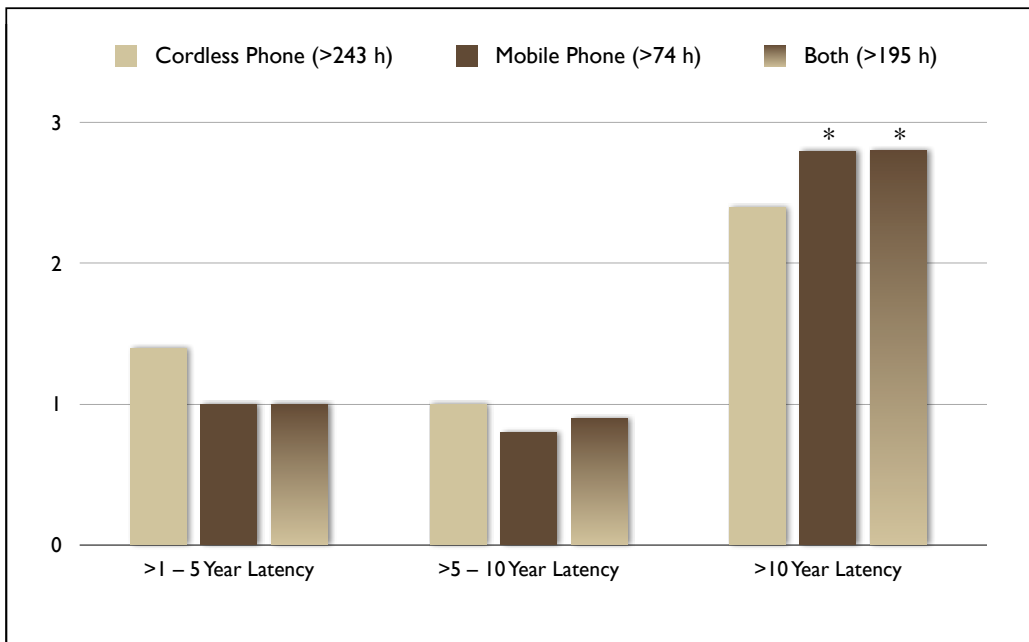
Risk of Oligodendroglioma (Usage Below Median)



Hardell group -- current summary

From Table IV: Hardell L, Carlberg M, Hansson Mild K. Pooled analysis of case-control studies on malignant brain tumours and the use of mobile and cordless phones including living and deceased subjects. *Int J Oncol* (2011b); 38(5):1465-1474.

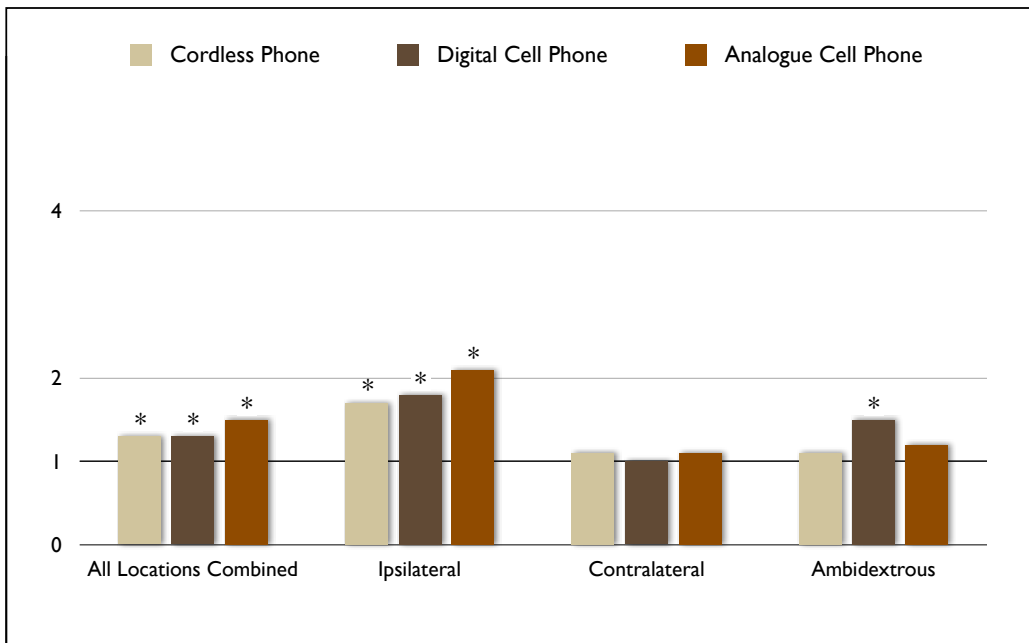
Risk of Oligodendroglioma (Usage Above Median)



Hardell group -- current summary

From Table IV: Hardell L, Carlberg M, Hansson Mild K. Pooled analysis of case-control studies on malignant brain tumours and the use of mobile and cordless phones including living and deceased subjects. *Int J Oncol* (2011b); 38(5):1465-1474.

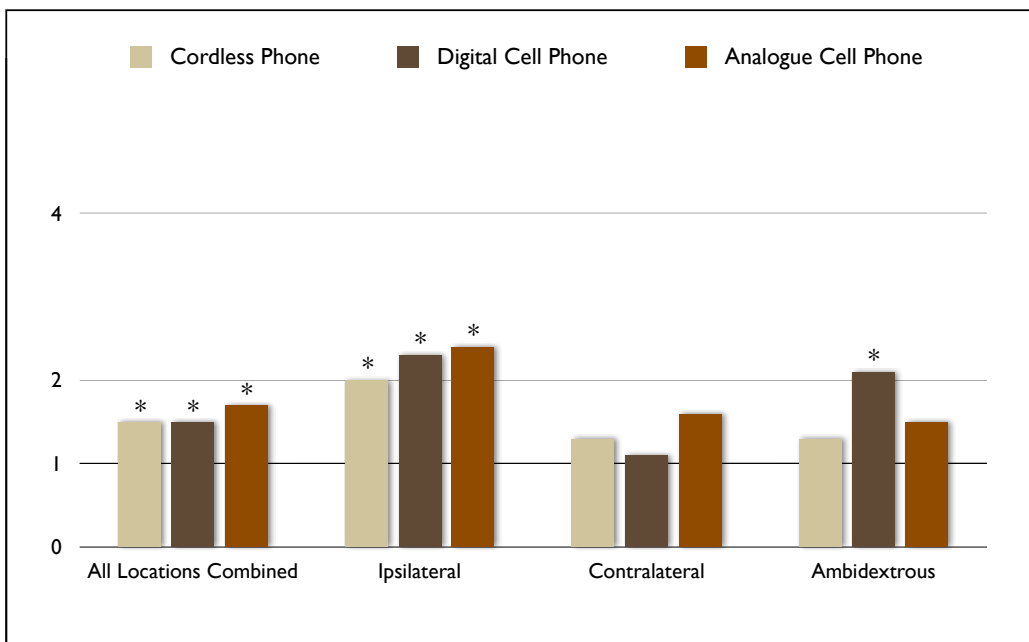
Risk of Tumor by Location – All Tumor Types



Hardell group -- current summary

From Table 3: Hardell L, Carlberg M, Hansson Mild K. Pooled analysis of two case-control studies on use of cellular and cordless telephones and the risk for malignant brain tumours diagnosed in 1997-2003. *Int Arch Occup Environ Health* (2006b); 79(8):630-639.

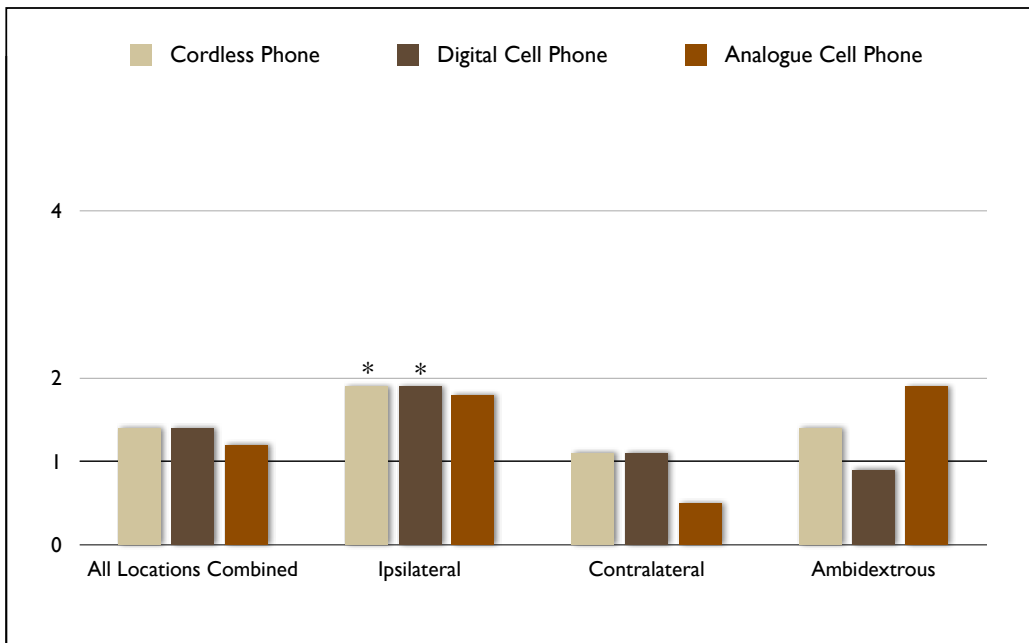
Risk of Tumor by Location – High Grade Astrocytoma



Hardell group -- current summary

From Table 3: Hardell L, Carlberg M, Hansson Mild K. Pooled analysis of two case-control studies on use of cellular and cordless telephones and the risk for malignant brain tumours diagnosed in 1997-2003. *Int Arch Occup Environ Health* (2006b); 79(8):630-639.

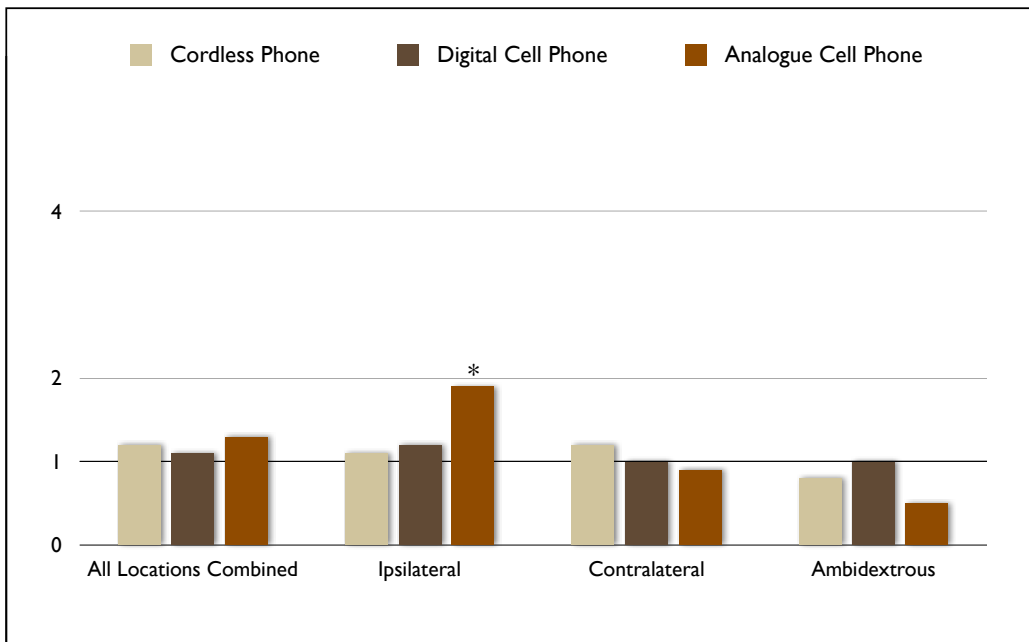
Risk of Tumor by Location – Low Grade Astrocytoma



Hardell group -- current summary

From Table 3: Hardell L, Carlberg M, Hansson Mild K. Pooled analysis of two case-control studies on use of cellular and cordless telephones and the risk for malignant brain tumours diagnosed in 1997-2003. *Int Arch Occup Environ Health* (2006b); 79(8):630-639.

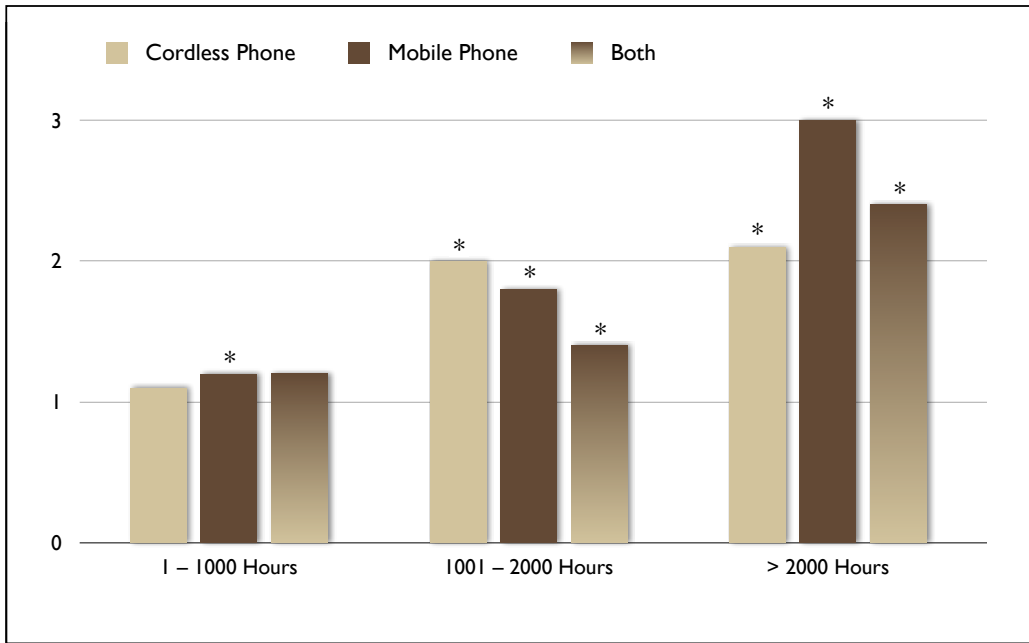
Risk of Tumor by Location – Other Malignant Tumors



Hardell group -- current summary

From Table 3: Hardell L, Carlberg M, Hansson Mild K. Pooled analysis of two case-control studies on use of cellular and cordless telephones and the risk for malignant brain tumours diagnosed in 1997-2003. *Int Arch Occup Environ Health* (2006b); 79(8):630-639.

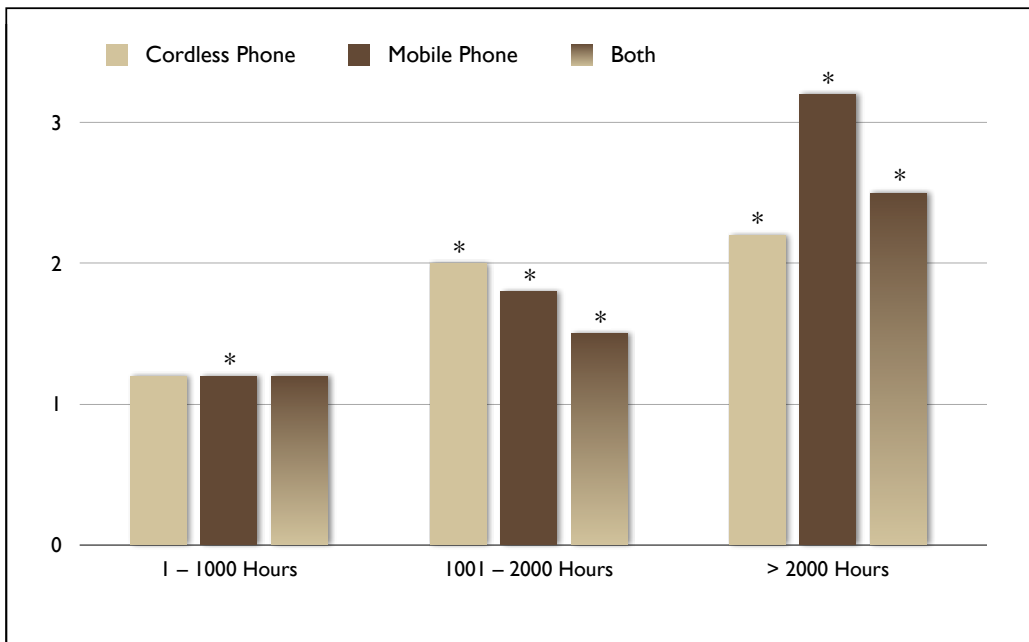
Tumor Risk by Cumulative Hours of Use – Any Brain Cancer



Hardell group -- current summary

From Table III: Hardell L, Carlberg M, Hansson Mild K. Pooled analysis of case-control studies on malignant brain tumours and the use of mobile and cordless phones including living and deceased subjects. *Int J Oncol* (2011b); 38(5):1465-1474.

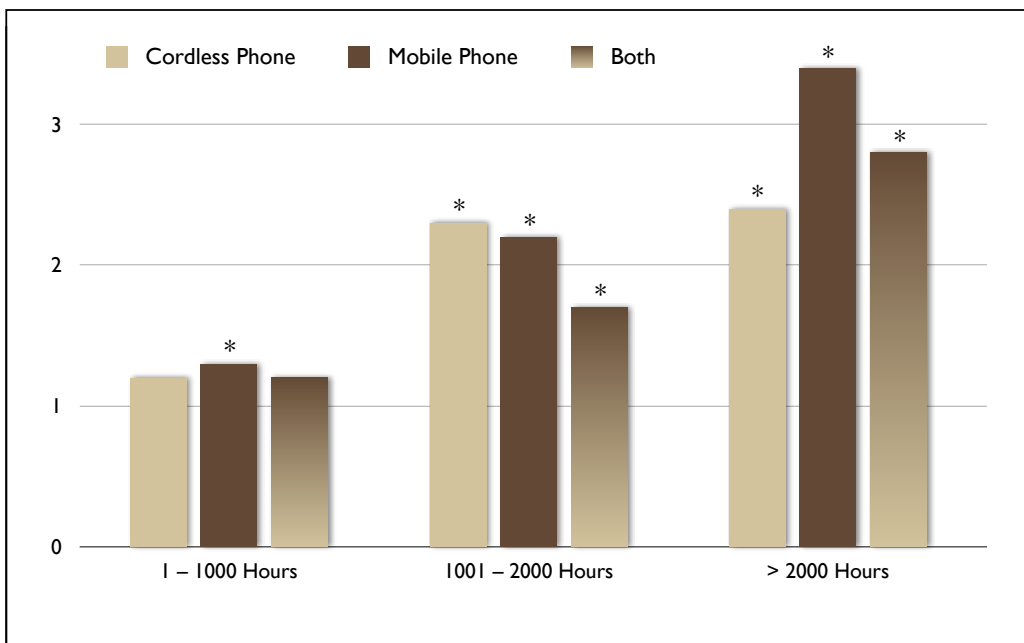
Tumor Risk by Cumulative Hours of Use – Glioma



Hardell group -- current summary

From Table III: Hardell L, Carlberg M, Hansson Mild K. Pooled analysis of case-control studies on malignant brain tumours and the use of mobile and cordless phones including living and deceased subjects. *Int J Oncol* (2011b); 38(5):1465-1474.

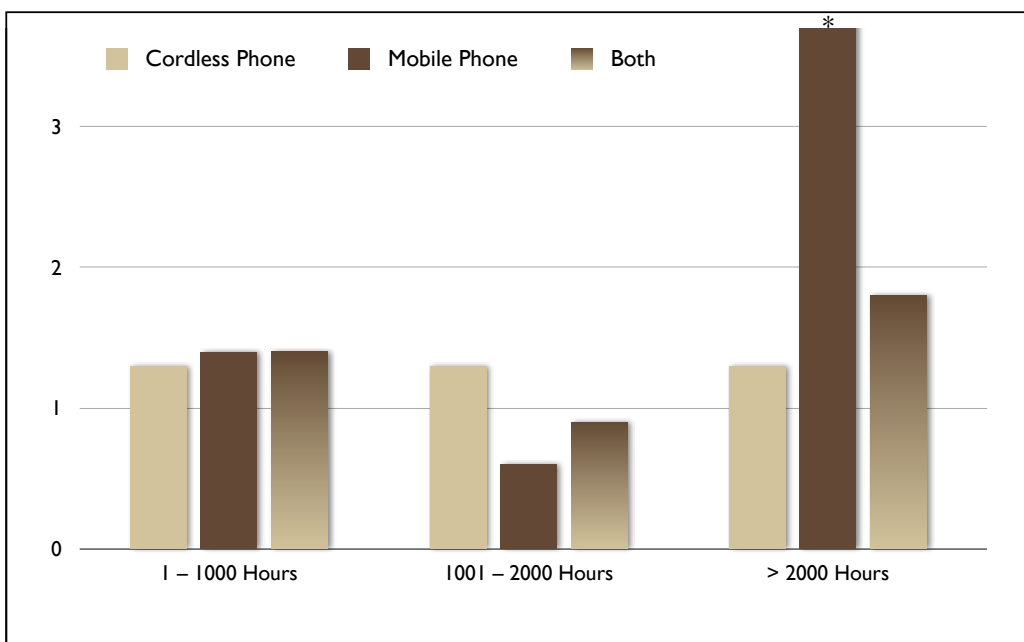
Tumor Risk by Cumulative Hours of Use – Astrocytoma



Hardell group -- current summary

From Table III: Hardell L, Carlberg M, Hansson Mild K. Pooled analysis of case-control studies on malignant brain tumours and the use of mobile and cordless phones including living and deceased subjects. *Int J Oncol* (2011b); 38(5):1465-1474.

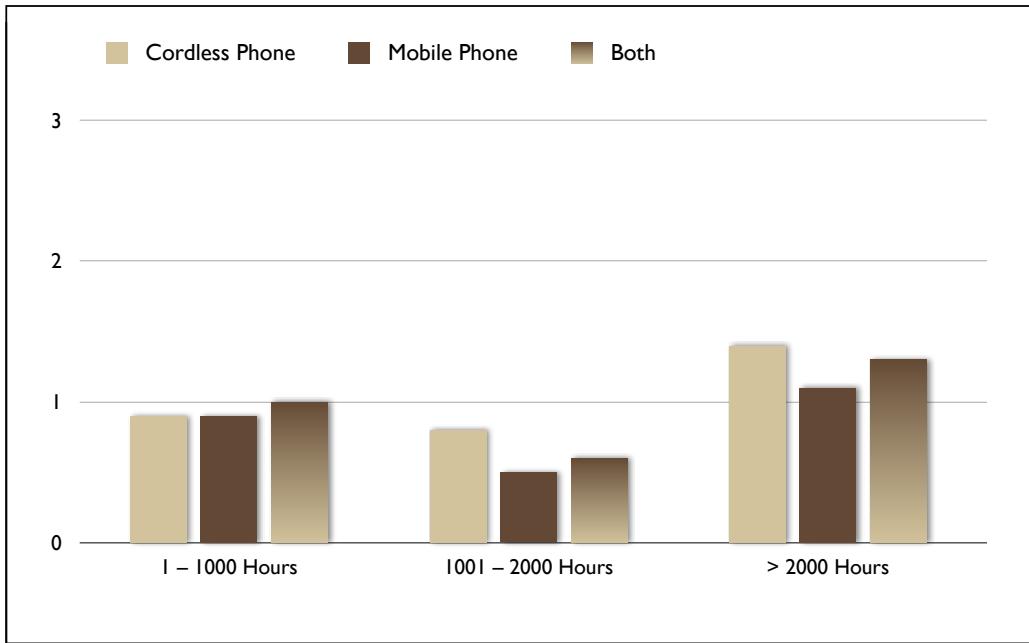
Tumor Risk by Cumulative Hours of Use – Oligodendroglioma



Hardell group -- current summary

From Table III: Hardell L, Carlberg M, Hansson Mild K. Pooled analysis of case-control studies on malignant brain tumours and the use of mobile and cordless phones including living and deceased subjects. *Int J Oncol* (2011b); 38(5):1465-1474.

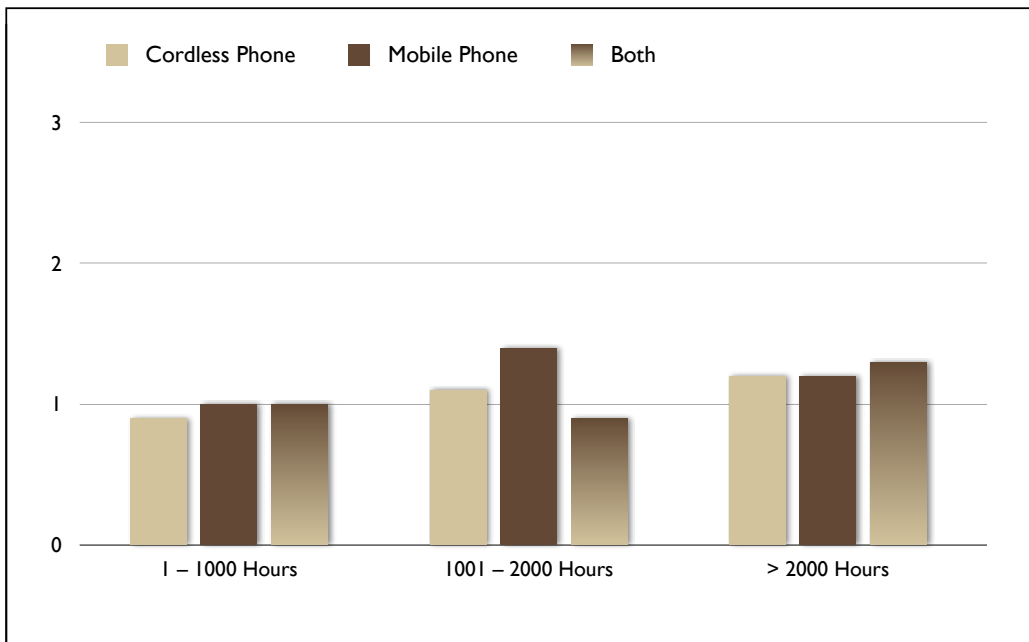
Tumor Risk by Cumulative Hours of Use – Other/Mixed Glioma



Hardell group -- current summary

From Table III: Hardell L, Carlberg M, Hansson Mild K. Pooled analysis of case-control studies on malignant brain tumours and the use of mobile and cordless phones including living and deceased subjects. *Int J Oncol* (2011b); 38(5):1465-1474.

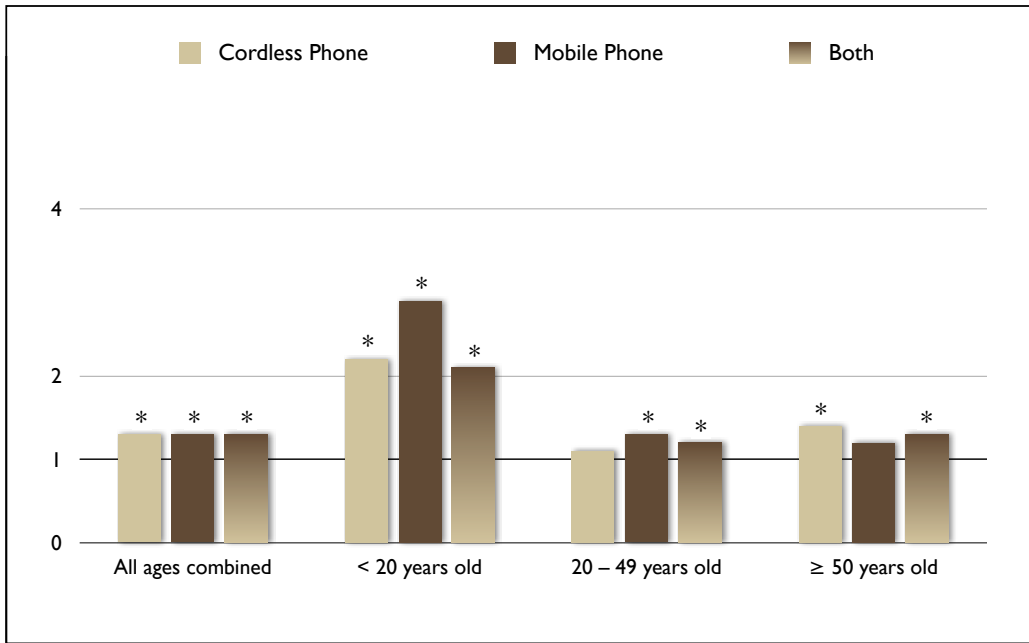
Tumor Risk by Cumulative Hours of Use – Other Brain Malignancy



Hardell group -- current summary

From Table III: Hardell L, Carlberg M, Hansson Mild K. Pooled analysis of case-control studies on malignant brain tumours and the use of mobile and cordless phones including living and deceased subjects. *Int J Oncol* (2011b); 38(5):1465-1474.

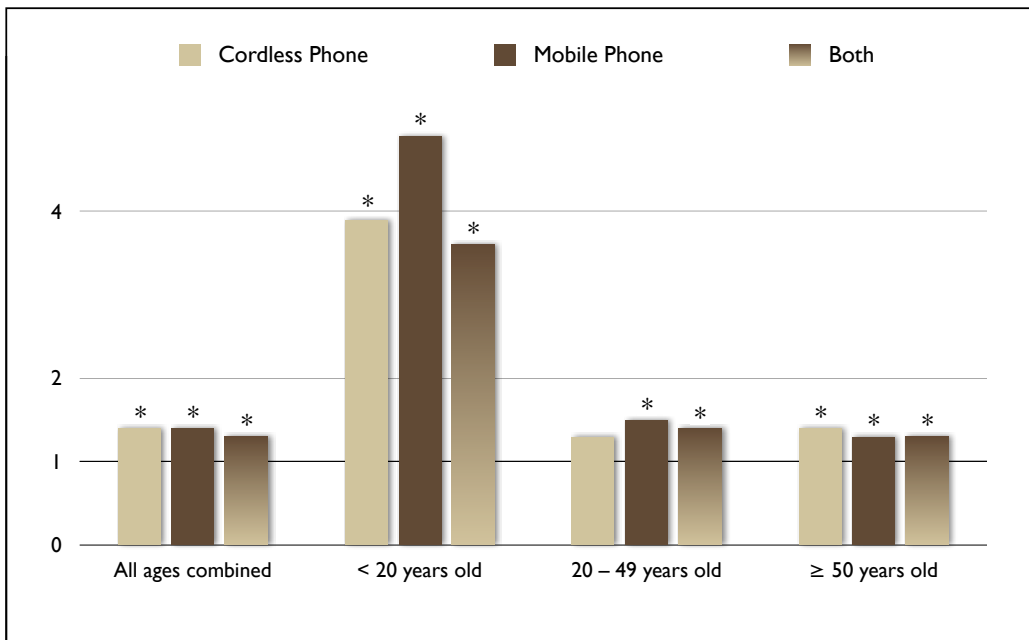
Tumor Risk by Age of First Use – Any Brain Cancer



Hardell group -- current summary

From Table V: Hardell L, Carlberg M, Hansson Mild K. Pooled analysis of case-control studies on malignant brain tumours and the use of mobile and cordless phones including living and deceased subjects. *Int J Oncol* (2011b); 38(5):1465-1474.

Tumor Risk by Age of First Use – Astrocytoma



Hardell group -- current summary

From Table V: Hardell L, Carlberg M, Hansson Mild K. Pooled analysis of case-control studies on malignant brain tumours and the use of mobile and cordless phones including living and deceased subjects. *Int J Oncol* (2011b); 38(5):1465-1474.

RECOMMENDATIONS r.e. SMART METERS:

EWEB should adopt a policy of minimizing their RF footprint in the residential community.

I'm through describing the problem now. If you'd like, I can briefly review our group's recommendations to the Board.

If EWEB chooses to go ahead with RF smart meters, the solution is to use these tools in a safer way.

Design the system to truly minimize the amount of RF signal that is being produced.

Most engineering choices in AMI have not been designed with these goals in mind.

The industry has devoted more energy to denying risk than it has to designing systems that are "smart" enough to minimize that risk.

But our group thinks that it could be possible to take a prudent approach and still get the job done.

What can EWEB do to actually "work the problem"? Let's summarize the situation:

The Problem:

Excessive RF exposure can cause acute symptoms in many people.

As we've shown, some people get acute symptoms from excessive RF exposures (headaches, insomnia, fatigue, vertigo, tinnitus, other symptoms of EHS).

People like this exist in Eugene.

How many people might this be in our town?

Based on existing research, a conservative guess might be 3 to 5% of the population.

3% of 150,000 people is 4,500 people.

The Problem:

Excessive RF exposure can also cause severe chronic problems.

Chronic RF exposure increases oxidative stress in living systems.

Increased cancer and male infertility are only two of many problems potentially caused by chronic elevation of oxidative stress.

Allowing an “opt out” is not a practical solution.



Customers should certainly have the option of “opting out” of having a meter on their house.

But we do not feel that an “opt out” policy is a solution to the public health problem.

You can’t “opt out” of all the meters on the wall of your rental apartment complex. Or the ones on the wall of the complex right across the alley from your apartment.

You can’t “opt out” of exposure to your neighbor’s meter, that is ten feet away from your bedroom window.

You can’t “opt out” of exposure to the meter on the other side of your bedroom wall if you are a baby in a crib.

You can’t “opt out” of exposure to transmissions from the radio tower 100 meters from your house.

An “opt out” doesn’t protect people who DON’T opt out, if a health hazard is being produced.

Strategies for solving the problem:

Residential exposures to constant RF transmissions are harmful, even at low levels, and should be avoided.

A better solution is to recognize the potential problem, and design a system to truly minimize risk, by reducing transmissions to a functional minimum.

Constant transmissions can and should be avoided.

Strategies for solving the problem:

Frequent and repetitive intermittent transmissions are also probably harmful, and should be avoided.

MESH network meters like the ones EWEB was testing a year ago are a case in point, as they transmit multiple times a minute. **EWEB staff should be applauded for steering away from that technology.**

Our group thinks that the MESH technology in the in-home "Zigbee" network is also likely to be harmful to the public. It is lower powered, but contemporary research shows that chronic low power RF exposures can have serious consequences.

It would be a mistake for EWEB to get married to this technology, and invest many millions of dollars in an infrastructure that will become less and less acceptable to the public down the line.

The solution here (for the smaller percentage of your customers who may want to share this functionality in the future) might be to **explore a broadband communication option** that allows them to remotely adjust their thermostat over the internet, rather than via the smart meter network.

80% of the households in our area have broadband at the present time.

Strategies for solving the problem:

Nocturnal exposures are more problematic than daytime exposures.

RF's potential to suppress nocturnal melatonin secretion and disturb sleep is a serious problem. Chronic suppression of melatonin can increase incidence of breast cancer and some other cancers.

The best solution is to avoid nocturnal RF transmissions.

Fortunately, EWEB doesn't need real-time access to billing data. So **it shouldn't be necessary to upload usage data at night.**

A broadband remote control option would eliminate the need for tower -> meter communications at night.

Strategies for solving the problem:

Occasional and infrequent daytime exposures are much less likely to cause an increase in chronic problems for the population at large.

Industry routines are to upload usage data every four hours. But EWEB is only billing once a month.

The solution here is to upload usage data much less frequently.

If you can fit all the Beatles albums plus Bach's Mass in B Minor on an iPod, it should be possible to design a smart meter protocol that only requires an upload once every two weeks, or less frequently.

This is the direction the industry needs to go in.

EWEB should explore this issue with their vendors, and push for this sort of functionality in any system that they purchase.

Strategies for solving the problem:

Occasional and infrequent daytime exposures may still provoke acute symptoms in a portion of the population.

People with EHS will be likely to react acutely to intermittent exposures in their residential neighborhoods, even if these exposures are infrequent.

Part of addressing this problem is to upload data as infrequently as possible.

A data upload by the system once every two weeks might not be a significant release in exposure burden to this part of the population, where a data upload every four hours could be expected to have significant adverse consequences on their quality of life.

Infrequent transmissions at predictable times might be much easier for these people to deal with.

They will certainly want to opt out of having a meter on their house.

Other steps might also be found to mitigate residential exposures for these members of the population, if RF communications are to be used by EWEB.

Finding a “smart” way to move forward:



We're all trying to work towards the benefit of our community and our environment.

The AMI program is an attempt to reduce EWEB's carbon footprint, aid in energy conservation, and enable more effective utilization of renewable energy sources down the line.

These are laudable goals.

The key thing here is to avoid solving one problem with tools that create a new one.

If EWEB is really “smart” about how we use “smart meters”, the advisory group thinks that it should be possible to find a way to make it work without harming the community.

This will require a progressive approach that looks at some new ways to approach the engineering problem.