

# Cell Phones and Your Health

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September 10, 2015

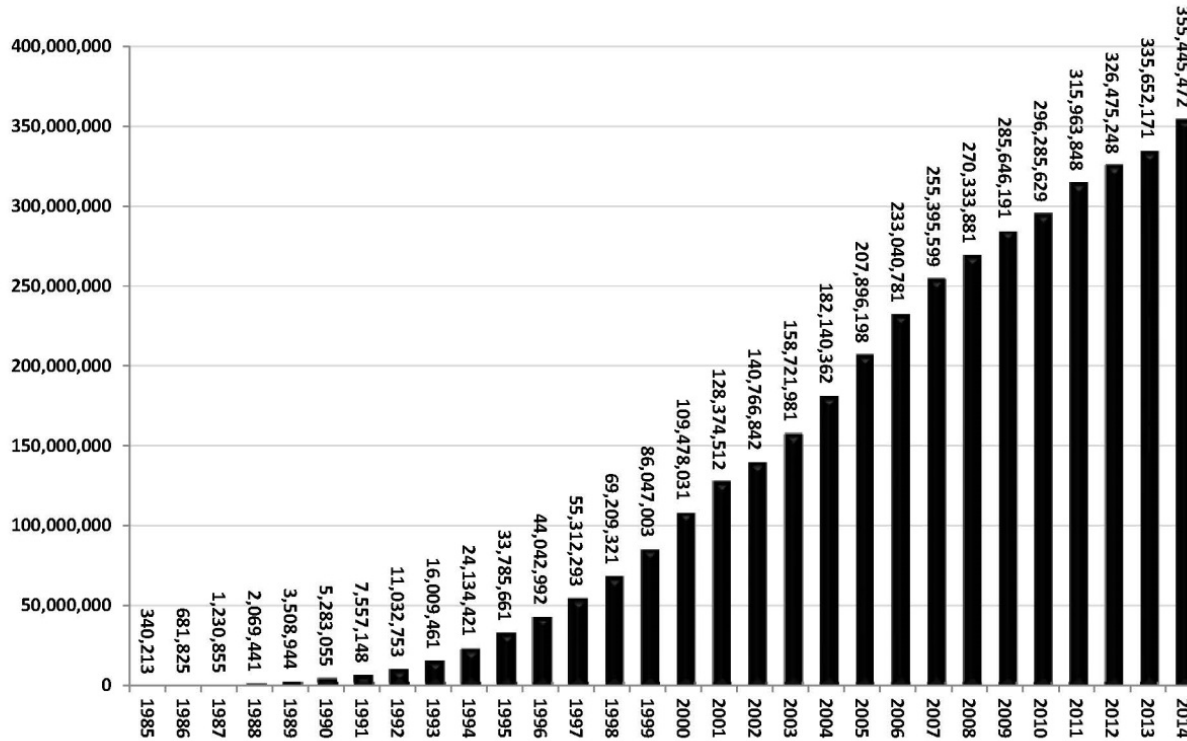
[SaferEMR.com](http://SaferEMR.com)





# USA: Rapid growth in cell phone use

Estimated Subscriber Connections



Year-End Estimated Connections Exceed 355 Million

Source: CTIA

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**355 mil.  
connections**

**208 mil.  
smartphones**

**298,055  
cell sites**

**\$188 bil.  
annual revenue**

**\$430 bil.  
investment**

**CTIA: Dec. 2014**

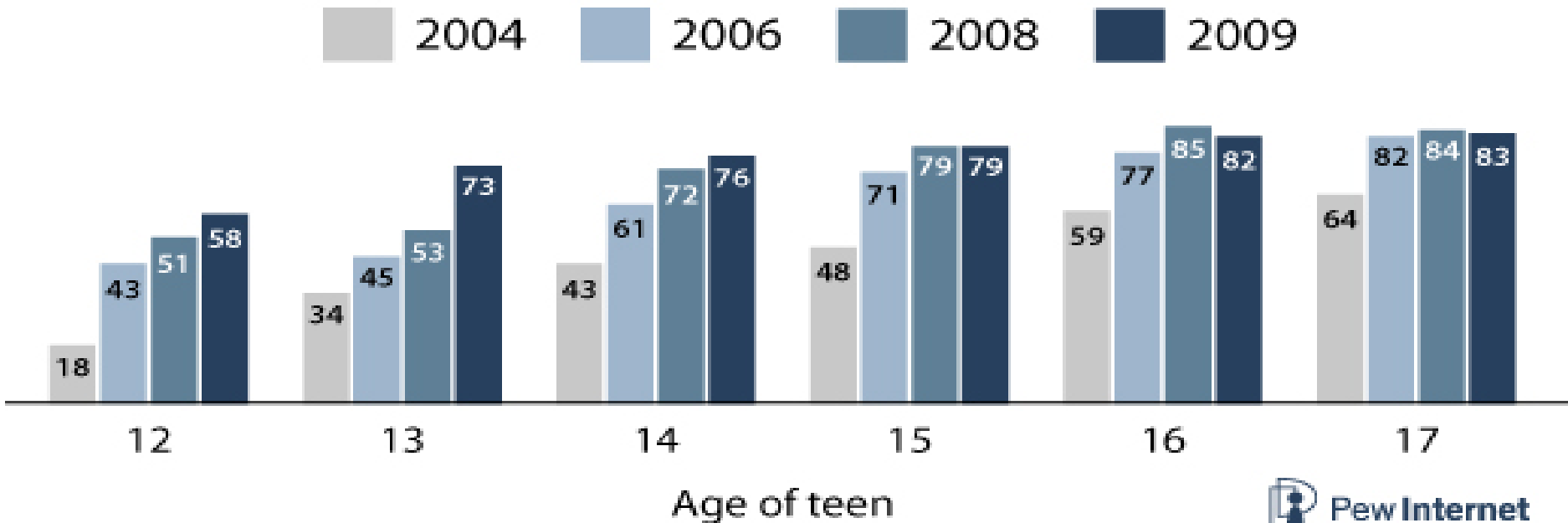
<http://bit.ly/CTIA12-2014>



# Adolescent cell phone use

## Older teens more likely to own cell phones

The percentage of teens who have a cell phone, by age (2004-2009)



**88% of 13-17 year olds in US have cell phones**  
**73% have smartphones**

Pew Internet (<http://pewrsr.ch/1J03zea>), 4/9/2015



# Demise of the landline



## US Households\* (Jan-Jun, 2014)

- 44.0% wireless-only
- 33.1% wireless-mostly
- 20.3% landline-only
- 2.6% no phone

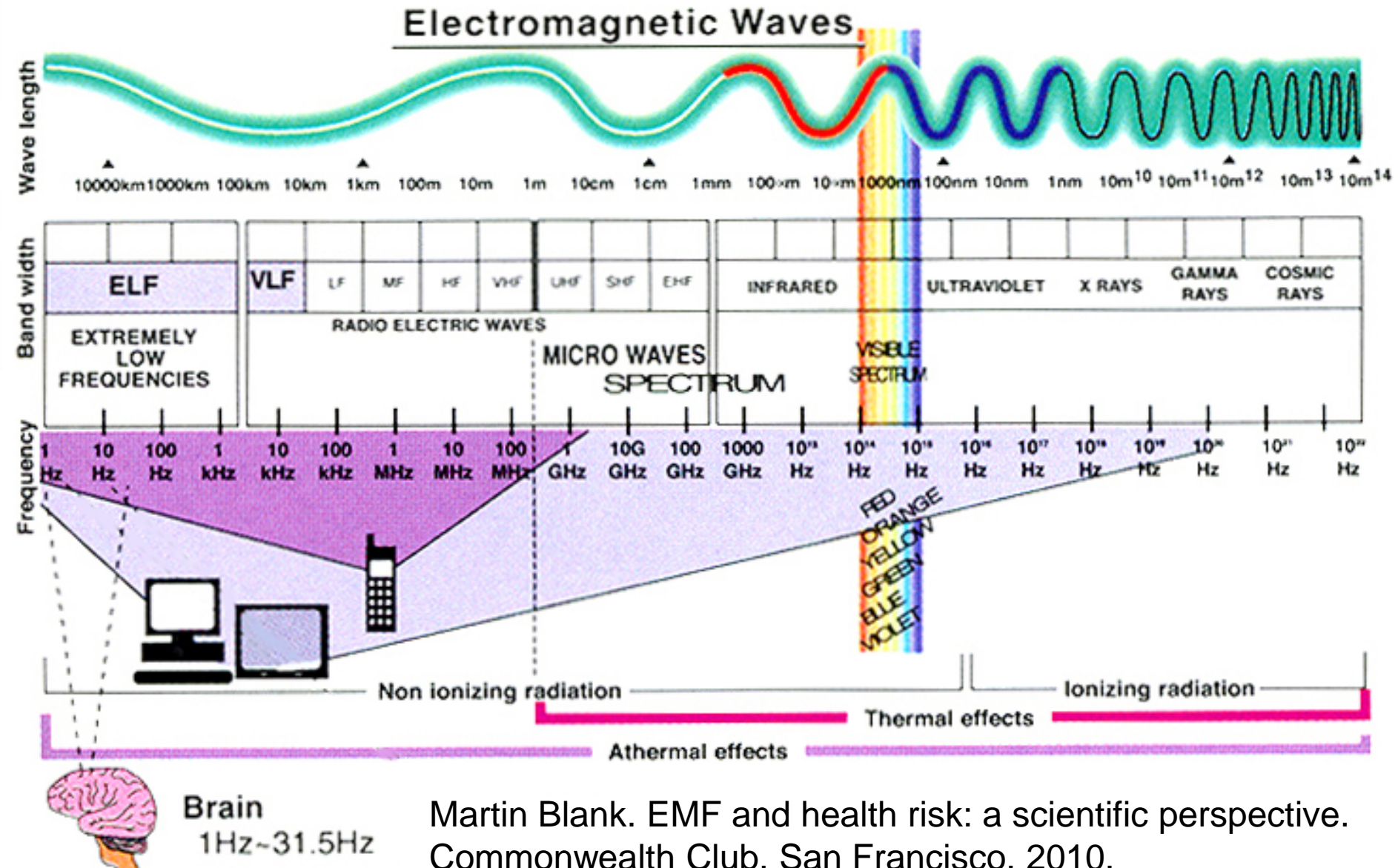
NHIS. NCHS, CDC. Dec., 2014.

<http://bit.ly/wireless1214>





# Cell Phone Basics



# IARC RF working group: Overview



- IARC - WHO (2011)
  - “Gold standard” for carcinogenicity
  - 31 member expert working group
- Reviewed carcinogenic mechanisms, animal & epidemiologic studies

# IARC RF working group: Official press release



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 cancer, associated with wireless phone use.

# IARC RF working group: Press conference



- **Christopher Wild, IARC Director:** "it is important that additional research be conducted into the long-term, heavy use of mobile phones. Pending the availability of such information, it is important to take pragmatic measures to reduce exposure such as hands-free devices or texting."
- **Jonathan Samet:** "the evidence, while still accumulating, is strong enough to support a conclusion and the **2B classification**. The conclusion means that there could be some risk, and therefore we need to keep a close watch for a link between cell phones and cancer risk."



# Glioma risk: 3 recent case-control studies



	<b>Interphone (2010)</b>	<b>Interphone (App. 2) (2010)</b>	<b>Hardell (2013)</b>	<b>CERENAT (2014)</b>
<b>“Heavy” Lifetime Use</b>	<b>1.40*</b> 1640+ hrs	<b>1.82*</b> 1640+ hrs	<b>1.75*</b> 1640+ hrs	<b>2.89*</b> 896+ hrs
<b>10+ years</b>	0.98	<b>2.18*</b>	<b>1.79*</b>	1.61

**Current estimated lifetime risk of glioma in US is from 1 in 200 to 1 in 250.**

# Hardell Research Group: Case-control studies since IARC



- Wireless phone use  $\geq 25$  years
  - Glioma: OR = 3.3 (95% CI: 1.6 – 6.9)
- Wireless phone use  $\geq 20$  yrs
  - Acoustic neuroma: OR = 4.4 (95% CI: 2.2 – 9.0)

Hardell et al. *Int J Oncology*. 43:1833-1845. 2013.

Hardell et al. *Int J Oncology*. 43: 1036-1044. 2013.

# Oxidative stress from low-intensity radiofrequency radiation

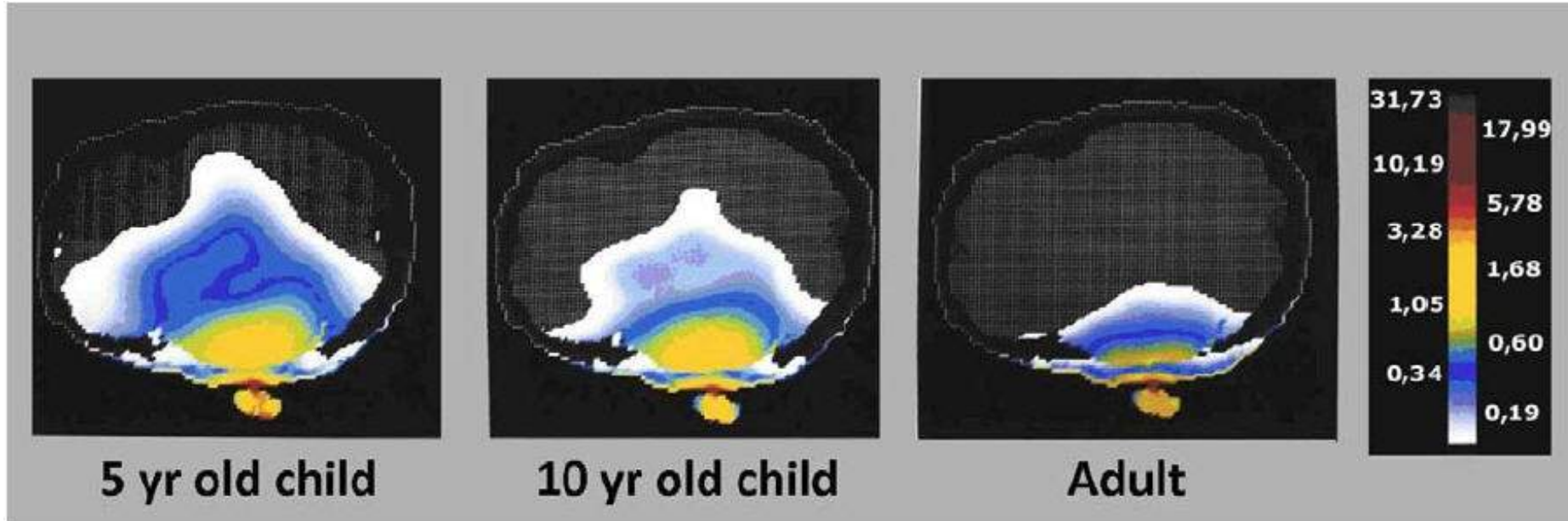


## Yakymenko et al. (2015) review

- 93 studies (16 cellular, 73 animal / plant, 4 human) found significant effects
- 7 studies found no effects
- Cell signaling disrupted, stress proteins, free radical formation, DNA-damage
- Carcinogenicity, neurologic disorders including electrohypersensitivity



# Child's brain absorbs 2X the radiation



**Figure 1.** Estimation of the penetration of electromagnetic radiation from a cell phone based on age (Frequency GSM 900 Mhz) (On the right, a scale showing the *Specific Absorption Rate* at different depths, in W/kg) [1]\*

Gandhi et al., 2012



# CEFALO: Children's brain tumor risk

- Case-control study – Denmark, Sweden, Switzerland, Norway (2004-2008)
- Youth 7-19 years of age
  - 352 cases, 646 controls
- “**Regular**” cellphone use: OR = 1.36 (0.92-2.02)
  - 3 nations (OR's = 1.49 to 1.73); Norway (OR = 0.51)
- Operator records: > 2.8 yrs cellphone use
  - **OR = 2.14** (1.07-4.29)

Aydin et al. J Natl Cancer Inst. 103:1264-1276. 2011.



# Brain cancer incidence: Recent increases over time



- **USA:** frontal lobe in adults 20-29 years of age; GBM in frontal & temporal lobes & cerebellum (overall population)
- **Norway & Finland:** overall population
- **Denmark:** GBM for males
- **England:** frontal & temporal lobes (overall)
- **Australia & New Zealand:** over age 70
- **Sweden:** tumor registry unreliable

# Other potential health risks in humans from wireless phone use



- **Tumors**: acoustic neuroma, meningioma, parotid, pituitary & thyroid glands; breast
- **Sperm damage** & male infertility
- **Reproductive effects**: memory, ADHD, autism?
- **Children**: ADHD, headaches, hearing
- **Electromagnetic hypersensitivity**
  - Headaches, dizziness, fatigue, insomnia, tinnitus, skin rashes, heart palpitations

# European Environment Agency: Policy recommendations



- Reduce cell phone radiation exposure, especially children & young adults
- Use phones hands-free & text
- Issue cell phone warning labels
- Adopt more stringent radiation standards
- Governments should fund research
- Manufacturers improve cell phone design

<http://bit.ly/EEArecommends>

# Alarmism vs. denialism—what about precaution?





# Industry position: CTIA—The Wireless Association

“The FCC, the FDA, the National Cancer Institute, and the World Health Organization have each evaluated the scientific research on wireless phones and each has found that the weight of the scientific research has not shown that wireless phone use causes any adverse health effects.”

CTIA, May 27, 2012





# U.S. government: Radio Frequency Interagency Working Group



# WHO & US federal agency positions



- WHO: “To date, no adverse health effects have been **established as being caused by** mobile phone use.”
- FCC: “currently no scientific evidence establishes a causal link between wireless device use and cancer or other illnesses.”
- FDA: “The scientific evidence does not show a danger to any users of cell phones from RF exposure, including children and teenagers.”
- NCI: “currently no consistent evidence that non-ionizing radiation increases cancer risk ...The only known biological effect of radiofrequency energy is heating.”



# Federal government position

- **Need to wait for conclusive evidence yet govt. makes minimal investment in research**
- “the overlap of federal agency responsibilities ... leaves leadership unclear and encourages a **pass-the-buck attitude.**” (Cities of Boston & Philadelphia, 2013) <http://bit.ly/1kAYSu7>
- "the electromagnetic radiation standards used by the FCC continue to be based on thermal heating, a criterion now nearly 30 years out of date and inapplicable today." (U.S. Dept. of Interior, 2014) <http://1.usa.gov/1jn3CZg>

# International EMF Scientist Appeal



[EMFscientist.org](http://EMFscientist.org)

- Petition calls for precautionary health warnings & stronger regulation of electromagnetic fields
- Submitted to UN & WHO (May 11, 2015)
- Signed by 200+ EMF scientists

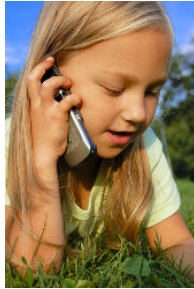
# Berkeley: Cell phone “Right to Know” ordinance



- Berkeley City Council unanimously adopted cell phone consumer disclosure ordinance (May 12, 2015)
- CTIA filed lawsuit – 1<sup>st</sup> Amendment
- Harvard Law Prof. Lawrence Lessig v. Ted Olson
- See [SaferEMR.com](http://SaferEMR.com) for updates & [media coverage](#)



# Contact information



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## Tumor risk review papers

- Myung et al (2009) Mobile phone use & risk of tumors: a meta-analysis. <http://1.usa.gov/12wBOmd>
- Khurana et al (2009) Cell phones & brain tumors: a review including long-term epi data. <http://1.usa.gov/1jel7s0>
- Levis et al (2011) Mobile phones & head tumours: the discrepancies in cause-effect relationships in the epi studies-how do they arise. <http://1.usa.gov/1gzK8vl>
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- Hardell, Carlberg (2013) Using the Hill viewpoints from 1965 for evaluating strengths of evidence of the risk for brain tumors associated with use of mobile and cordless phones. Rev Environ Health. <http://1.usa.gov/1jelT8p>



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## Tumor risk review papers

- WHO (2013) IARC monographs on the evaluation of carcinogenic risks to humans. Volume 102: Non-ionizing radiation, Part 2: Radiofrequency electromagnetic fields. <http://bit.ly/10oIE3o>
- Morgan et al (2015) Mobile phone radiation causes brain tumors and should be classified as a probable human carcinogen (2A) (Review). <http://1.usa.gov/1EqL1DF>

## Tumor risk case-control studies

- Interphone Study Group (2010) Brain tumour risk in relation to mobile phone use: results of the Interphone international case-control study. <http://1.usa.gov/IBm2nJ>
- Interphone Study Group (2011) Acoustic neuroma risk in relation to mobile telephone use: results of the INTERPHONE international case-control study. <http://1.usa.gov/18CRSNA>



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## Tumor risk case-control studies

- Hardell et al (2013) Case-control study of the association between malignant brain tumours diagnosed between 2007 and 2009 and mobile and cordless phone use. <http://1.usa.gov/1c7WF4T>
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- Aydin et al (2011) Mobile phone use & brain tumors in children & adolescents: a multi-center case-control study. <http://1.usa.gov/1baLADg>
- Coureau et al (2014) Mobile phone use and brain tumours in the CERENAT case-control study. <http://bit.ly/1DWgzRi>

## Breast cancer case series

- West et al (2013) Multifocal breast cancer in young women with prolonged contact between their breasts and their cellular phones. <http://1.usa.gov/1yFRFBH>



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## Brain tumor incidence trends

- Inskip et al (2010) Brain cancer incidence trends in relation to cellular telephone use in the United States.  
<http://1.usa.gov/1DXyCGR>
- Zada et al (2012) Incidence trends in the anatomic location of primary malignant brain tumors in the United States: 1992-2006.  
<http://1.usa.gov/1tRnRPJ>
- Hardell & Carlberg (2015). Increasing rates of brain tumours in the Swedish National Inpatient Register & the Causes of Death Register. <http://bit.ly/1aDHJmf>



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## Mechanisms

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- Ruediger (2009) Genotoxic effects of radiofrequency electromagnetic fields. <http://1.usa.gov/1gzLuX3>
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- Yakymenko et al (2015) Oxidative mechanisms of biological activity of low-intensity radiofrequency radiation. <http://bit.ly/1Hgg8fa>





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## Reproductive Health Effects

- Adams et al (2014). Effect of mobile telephones on sperm quality: A systematic review and meta-analysis. <http://bit.ly/1pUnmDq>
- LaVignera et al (2011) Effects of the exposure to mobile phones on male reproduction: a review of the literature. <http://1.usa.gov/1eQXwuv>
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- Divan et al (2012) Cell phone use and behavioural problems in young children. <http://1.usa.gov/1iu5qPn>

## Exposure

- Kelsh et al (2010) Measured radiofrequency exposure during various mobile-phone use scenarios. <http://1.usa.gov/1eQXinm>
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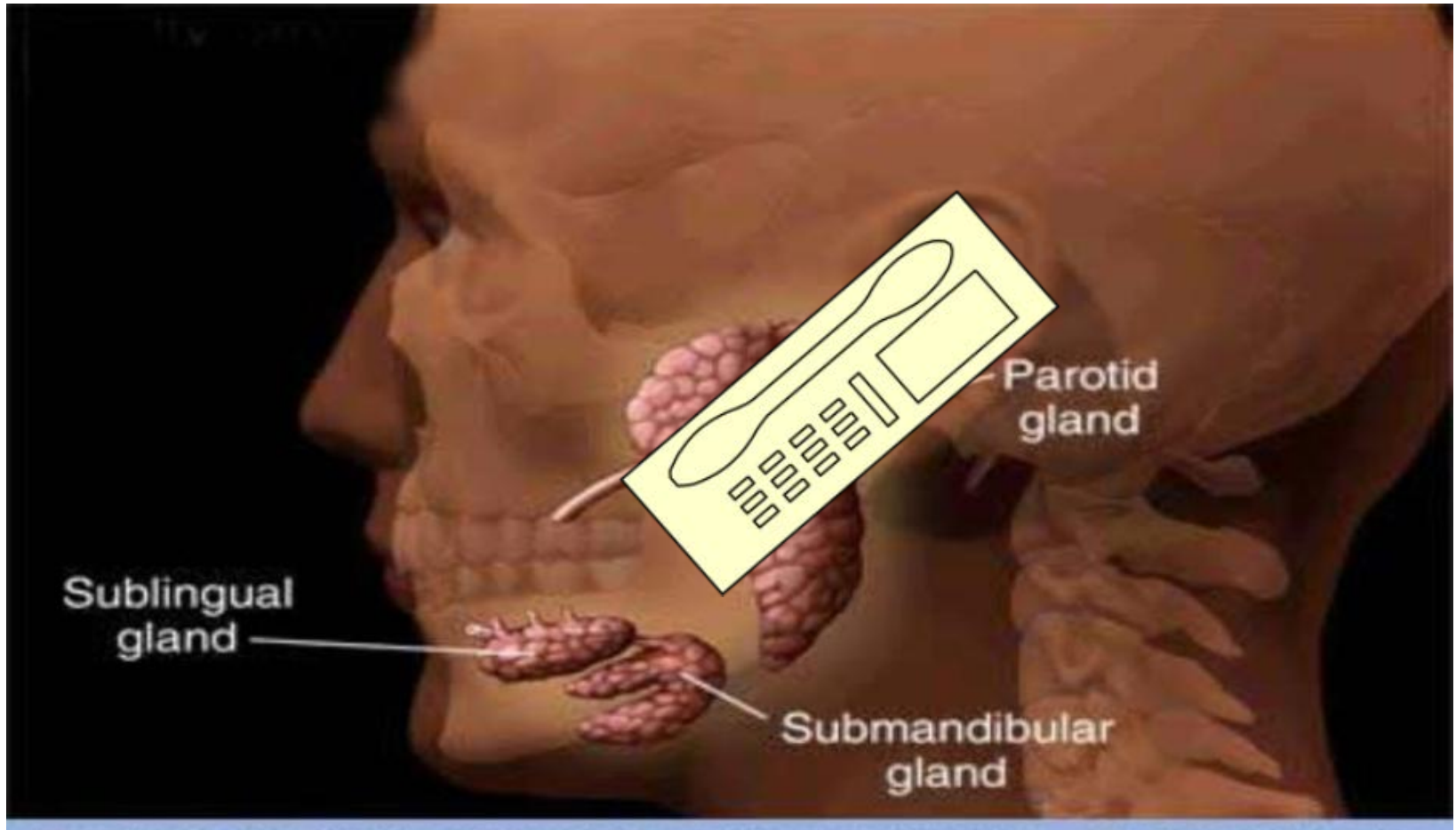
## Other

- 206 signees. International EMF Scientist Appeal. May 11, 2015.  
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- Alster, N (2015). Captured agency: How the FCC is dominated by the industries it presumably regulates. Harvard University.  
<http://bit.ly/FCCcaptured>

# Supplemental Slides



# Israel: Parotid gland tumors triple over time



Source: Environmental Health Trust



# Israel: Increase in parotid gland tumors (PGT) over 30 years

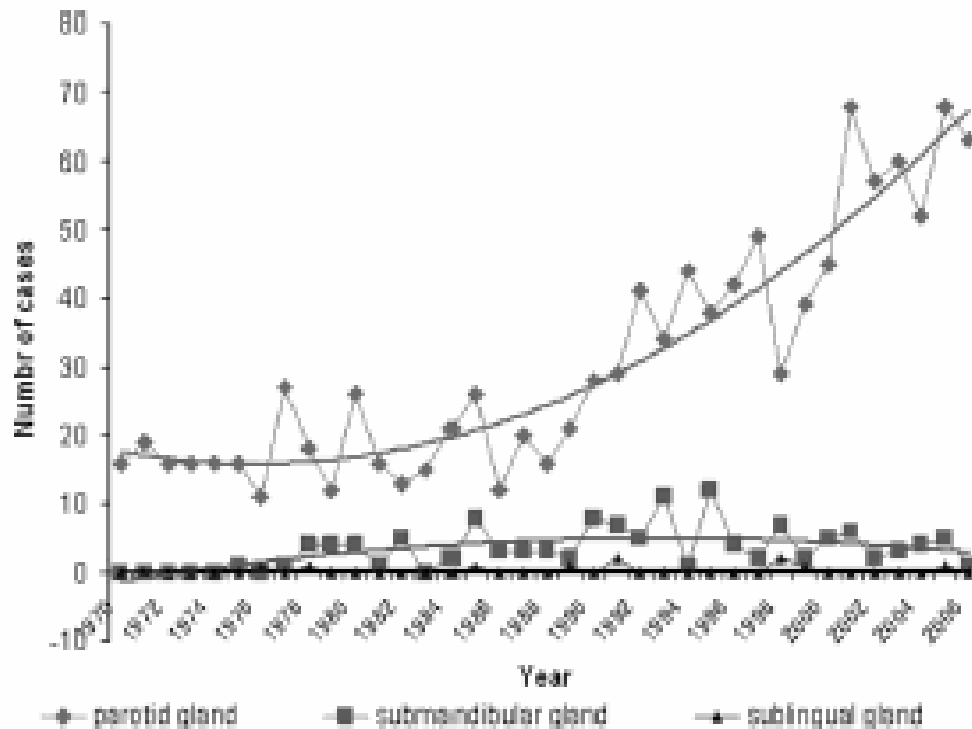


FIGURE. For trend analyses, we added regression lines and calculated  $R^2$  values. Parotid gland cancer:  $R^2 = 0.83$ ; Submandibular gland cancer:  $R^2 = 0.36$ ; Sublingual gland cancer:  $R^2 = 0.02$ .

Source: Epidemiology 22(130). 2011.



# Israel: PGT case-control study

- Elevated risks for regular cell phone users & heavy users in rural areas.
- For ipsilateral use, 49% increased risk for highest category of call time.
- Positive dose-response trend.

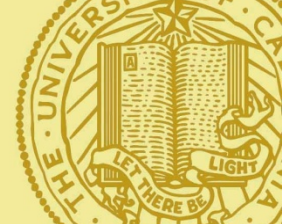
**Sadetzki et al. Amer J Epidemiol. 167 (4): 457-467. 2008.**



# Israel: Israeli Dental Association PGT warning



- Young people should limit direct exposure of the head to microwave radiation from cell phones.
- More than 14 nations have issued precautionary health warnings to limit cell phone use.

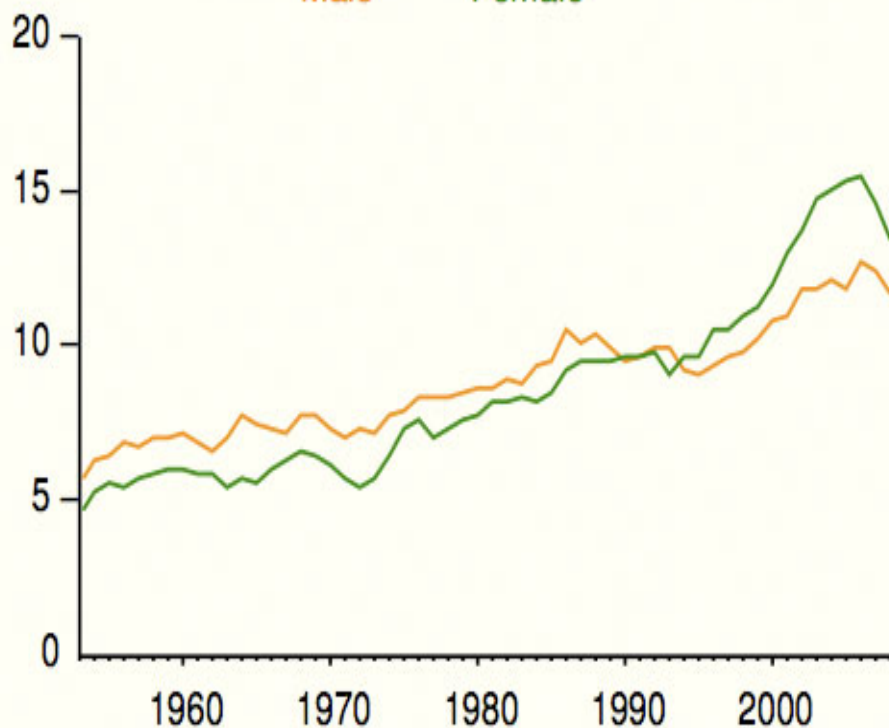


# Brain cancer incidence: Norway

## Increasing Brain Cancer Incidences in Norway 2005-2009 (NORDCAN)

Age-standardized rates (W) over time  
Incidence

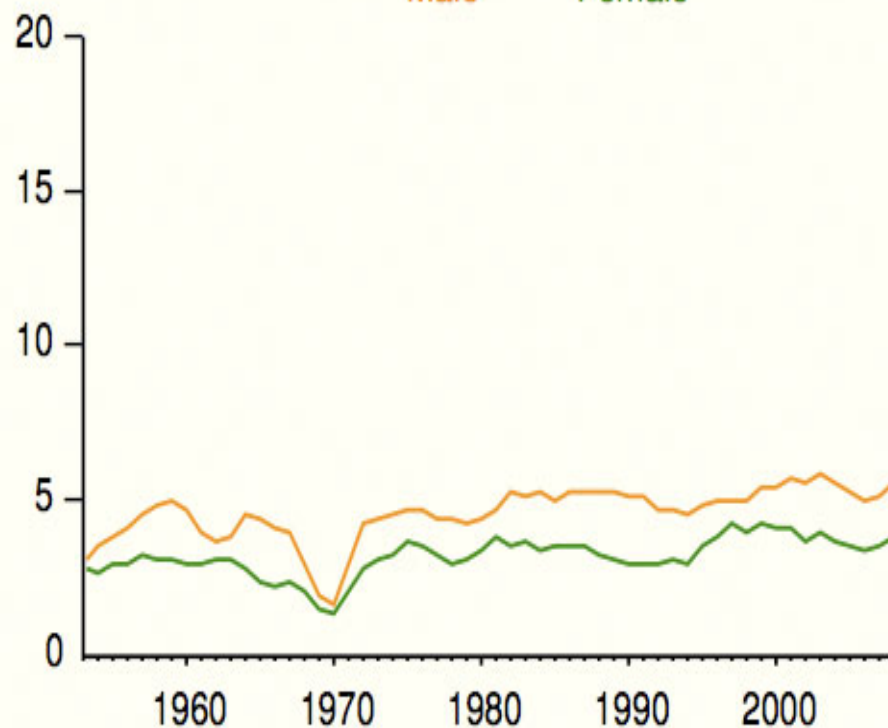
Male Female



NORDCAN

Age-standardized rates (W) over time  
Mortality

Male Female



NORDCAN

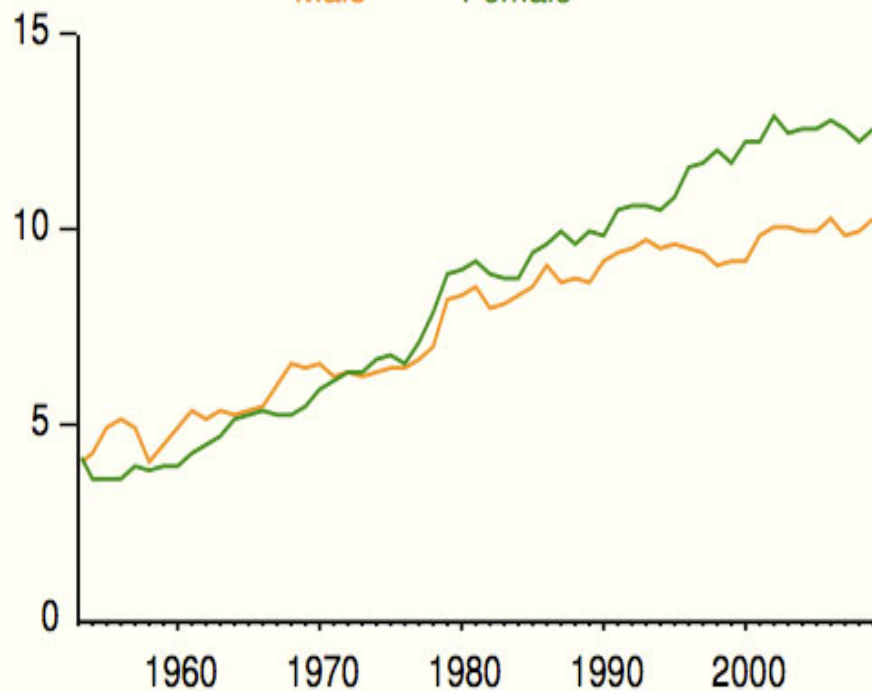


# Brain cancer incidence: Finland

Increasing Brain Cancer Incidences in Finland 2005-2009 (NORDCAN)

Age-standardized rates (W) over time  
Incidence

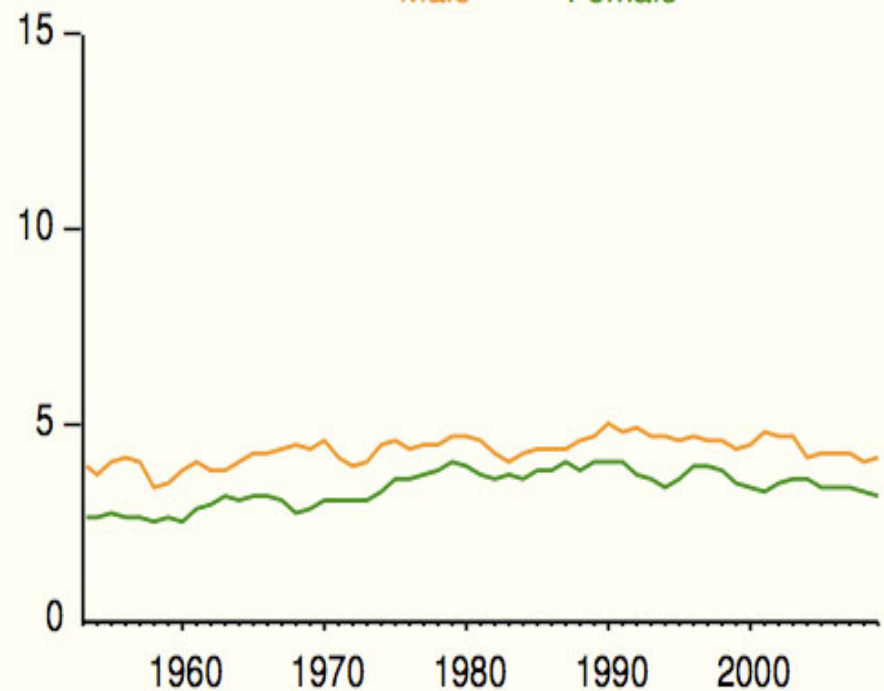
Male Female



NORDCAN

Age-standardized rates (W) over time  
Mortality

Male Female



NORDCAN



# Brain cancer incidence: England

