Electromagnetic hypersensitivity - state of the art and the legal situation in Sweden

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Socialstyrelsen

THE NATIONAL BOARD OF HEALTH AND WELFARE

- a government agency under the Ministry of Health and Social Affairs
- activities and duties within
  - social services
  - health and medical services
  - environmental health
  - communicable disease prevention
  - control and epidemiology
- the Government determines the policy guidelines for our work

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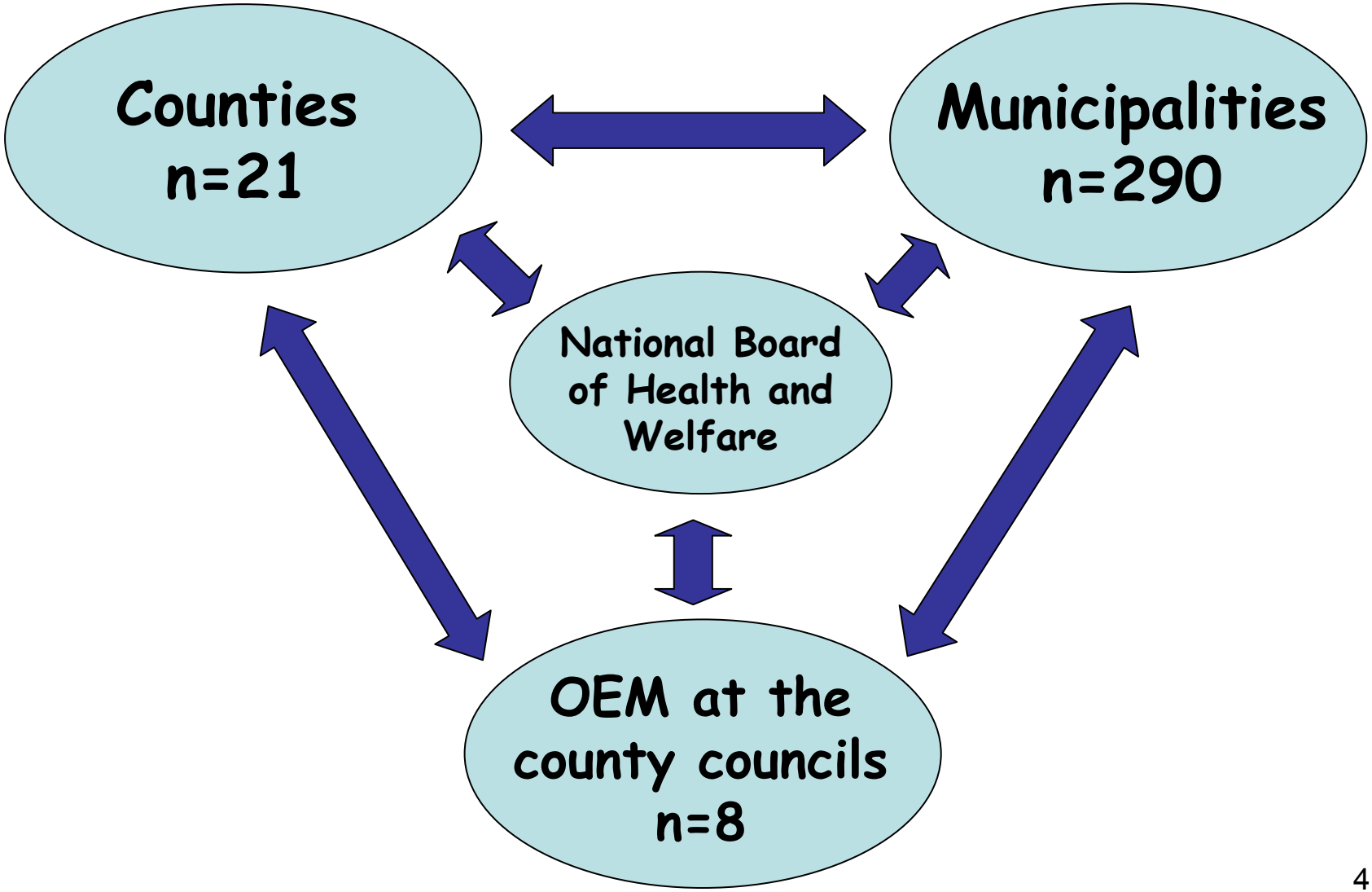
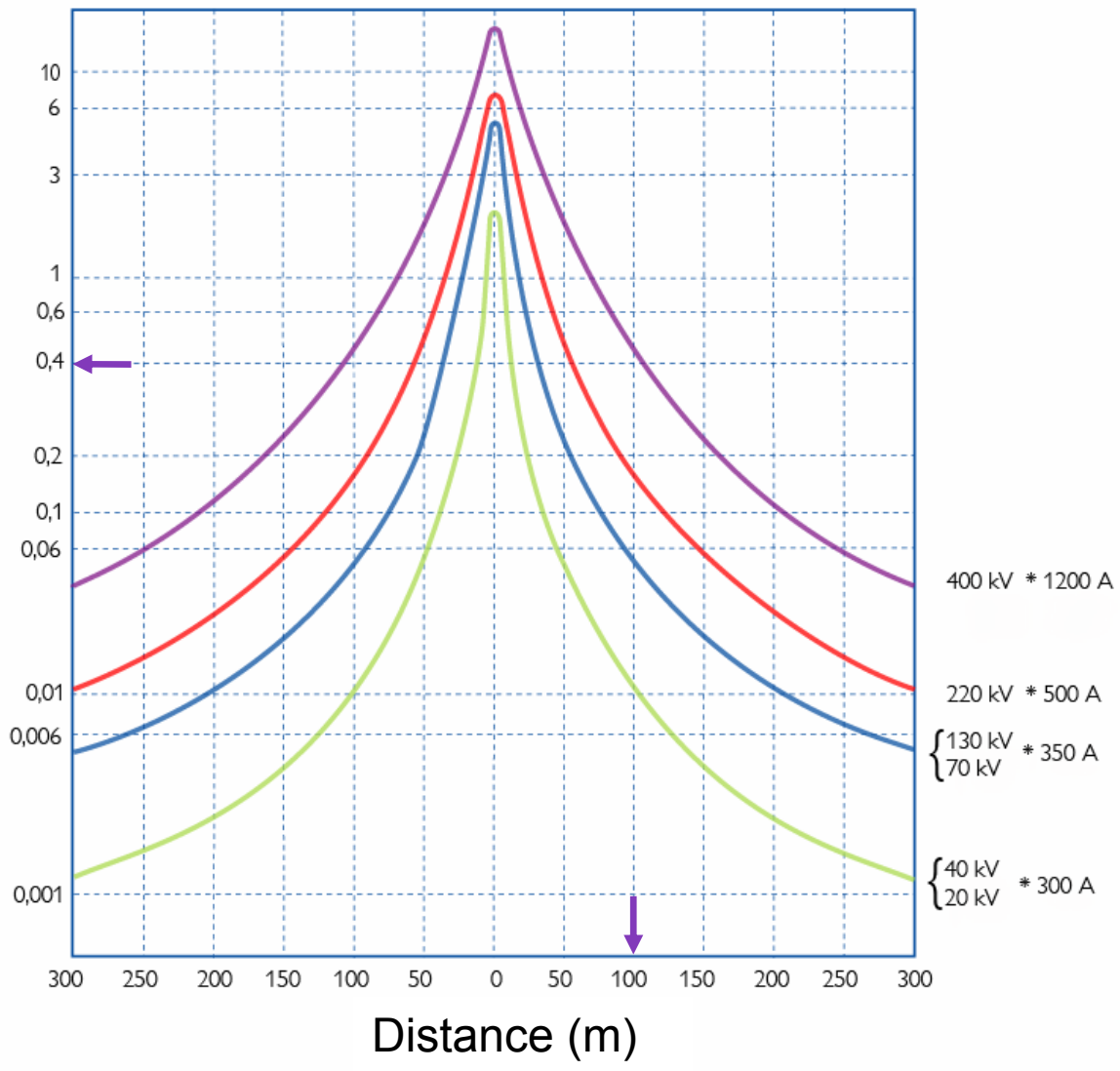
Public Health Management

- Responsibility for health protection and environmental medicine
- Detect, prevent and eliminate health hazards in the environment
- Central authority in the enivronmnental health
- Guidance for municipalities, counties and county councils
- Investigate and revise relevant regulations
- Evaluate the application and effect of law within the sphere of environmental health

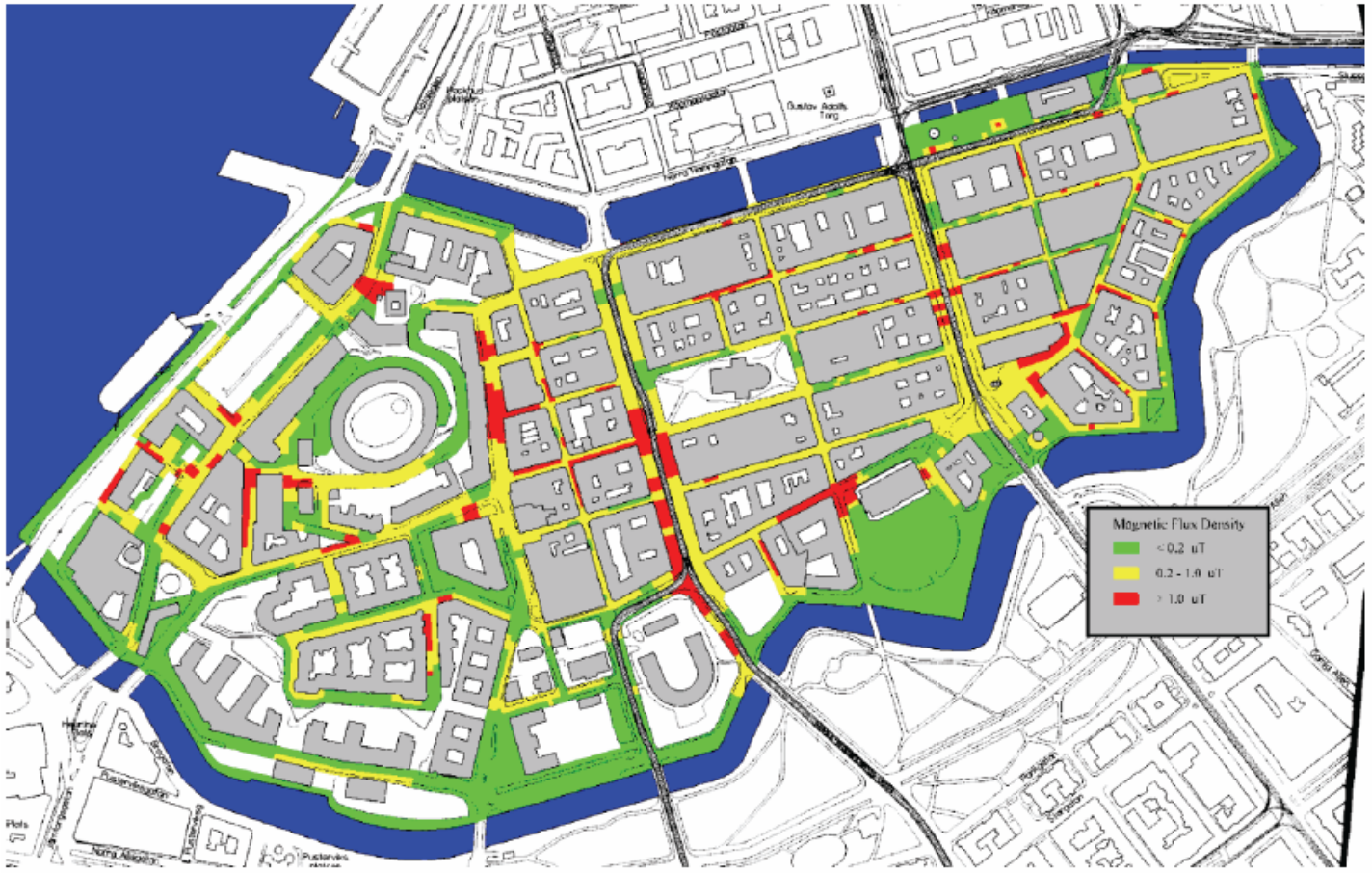
Health protection network



Magnetic fields (μT)



reference value 100 μT



Magnetic fields 1 m above ground in central Gothenburg
Green <0.2 µT, yellow >0.2 µT, red >1 µT

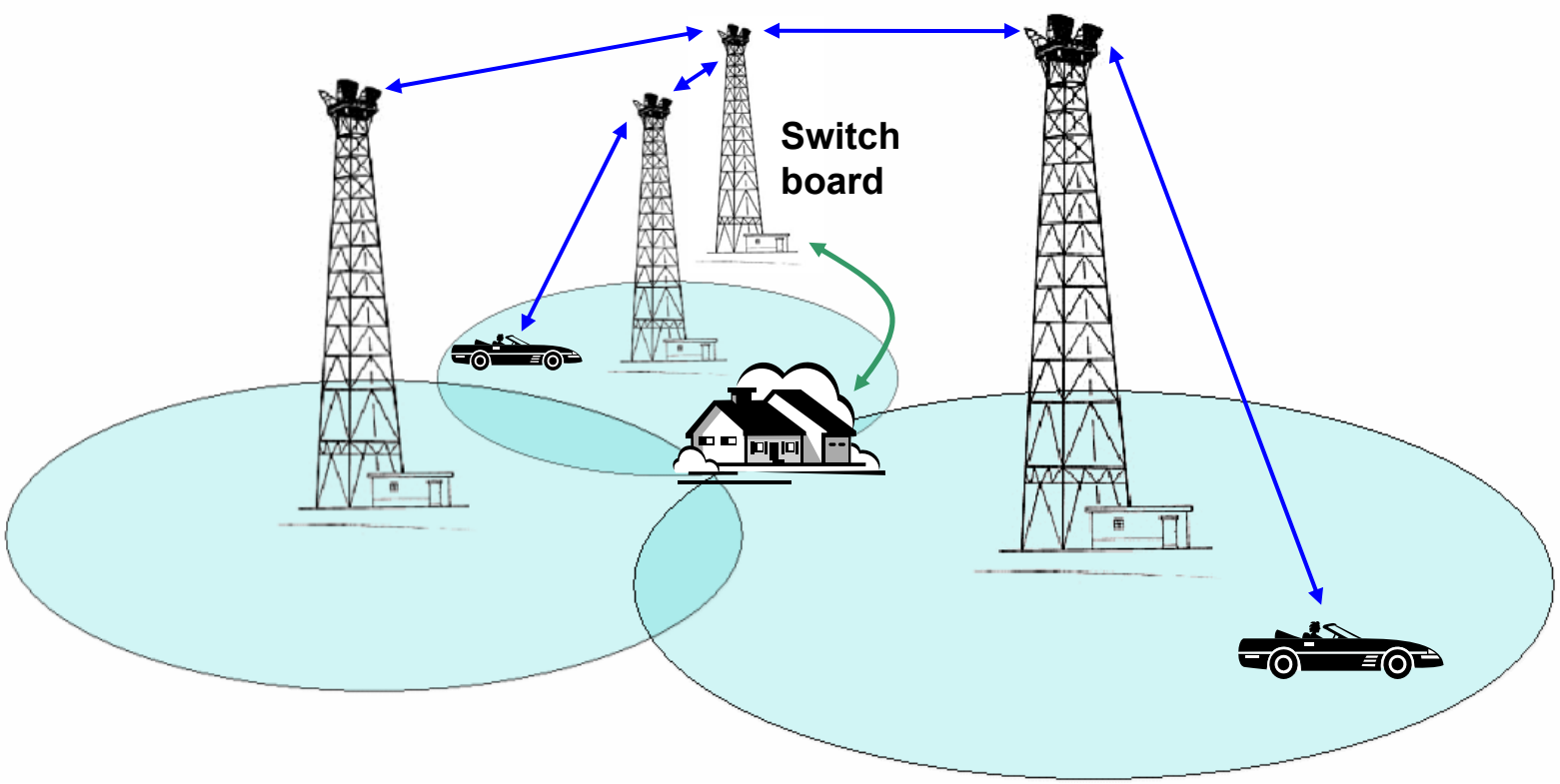
http://www.fas.se/upload/dokument/publiaktioner/pdf/FAS-EMF-2009.pdf

ELF	0.1 m (μT)	0.5 m (μT)	1.0 m (μT)	Freq (Hz)	Ref value* (μT)
Vacuum cleaner 1600 W	6	0.3	<0.05	50	100
Hairdryer	30	0.5	<0.05	50	100
Alarm clock	2.1	0.14	0.08	50	100
Microwave oven 700 W	14	1.5	0.30	50	100
Flat computer screen 19 inch	<0.05	<0.05	<0.05	50	100
TV, not flat screen	0.8	0.1	<0.05	50	100
Electrical stove	0.8	0.1	<0.05	50	100
Induction oven†	1.2	0.07	<0.05	25,000	6.25

†Also magnetic fields 50 Hz similar values as electric oven *public

Occupation	Freq (Hz)	Typical exposure (μT)	Ref value** (μT)
Engine driver train	16.7	10	1,500
Relay interlocking plant 400 kV	50	10-40	500
Welding	50	1-300	500
Officework	50	0.2	500

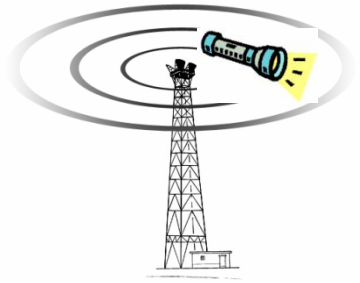
* *occupation



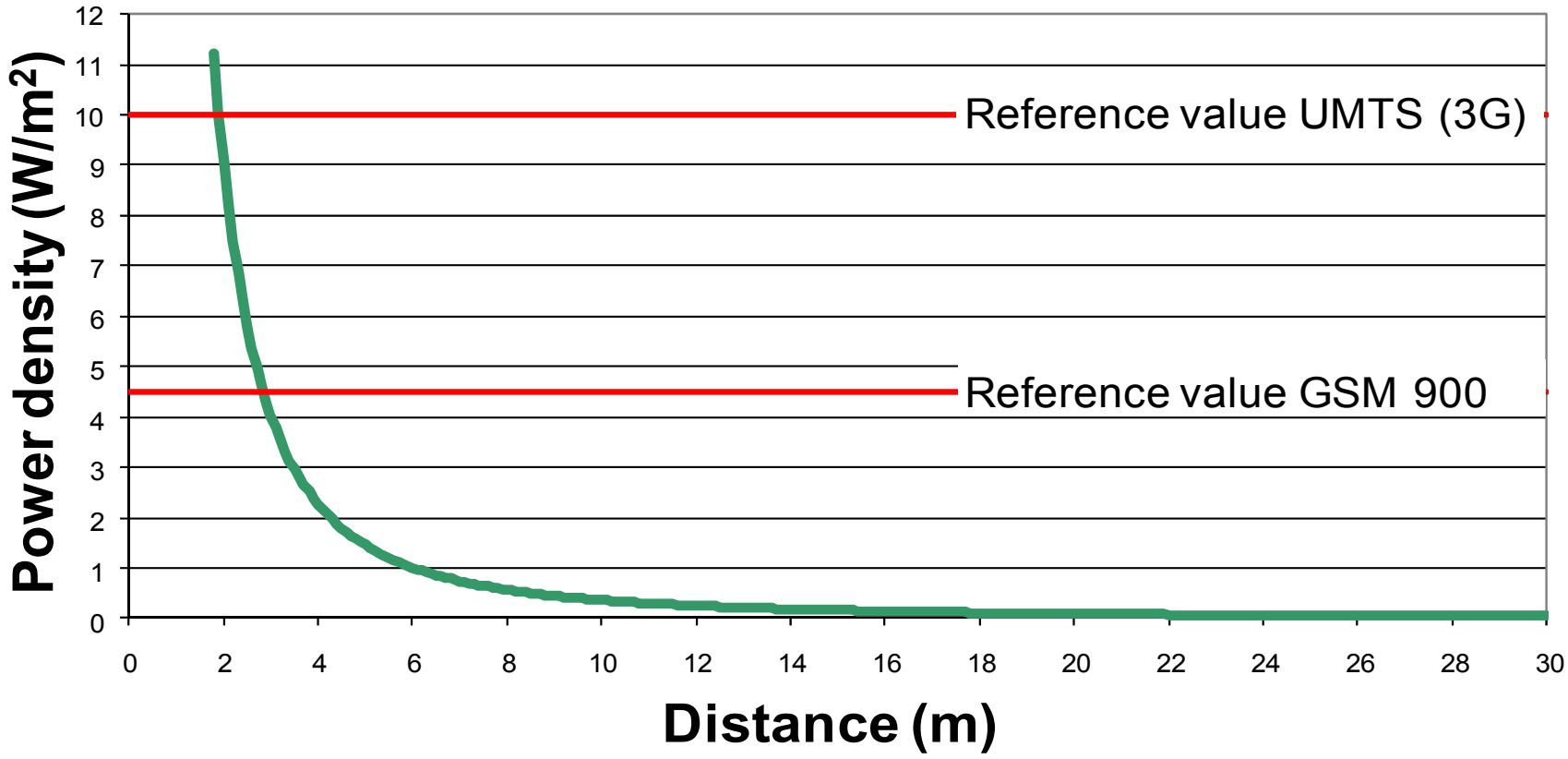
More base stations = Lower output = Lower exposure!

talking in mobile phone 1,000 > than the mobile base station

2 m distance from person talking in mobile phone 200 > than the mobile phone base station



Mobile base station



Average power density 48 places in Gothenburg area

		Measurements	Reference values	
Source	Frequency (MHz)	Power density (mW/m^2)	Power density (mW/m^2)	Exp rate (%)
FM radio	100	0.28	2 000	0.014
Analogue TV	600	0.06	3 000	0.002
Digital TV	700	0.02	3 500	0.0006
NMT base stations	450	0.0005	2 250	0.00002
GSM900 base stations	900	0.14	4 500	0.003
GSM1800 base stations	1800	0.04	9 500	0.0004
3 G base stations	1 900	0.04	9 500	0.0004
Others	--	0.002	--	--
Total	**--**	**0.57**		**0.02**

RF from the sun and sky 3 $\mu W/m^2$

Nilsson J, Rydh M. 2004. “RF Exposure from Broadcast and Mobile Phone Systems” Institutionen för Elektromagnetik, Chalmers Tekniska Högskola, Göteborg

Terminology

Sensitivity to electricity

Electromagnetic hypersensitivity (EHS)

Allergy to electricity

Idiopathic Environmental Intolerance
attributed to exposure to electromagnetic field

Electromagnetic hypersensitivity (EHS)

- symptoms near or when using electrical equipment
- giving varying degrees of discomfort or illness of the individual
- and the individual relates to the activation of the electrical equipment

(Bergqvist RALF 2000)

EHS is not a diagnosis in Swedish healthcare

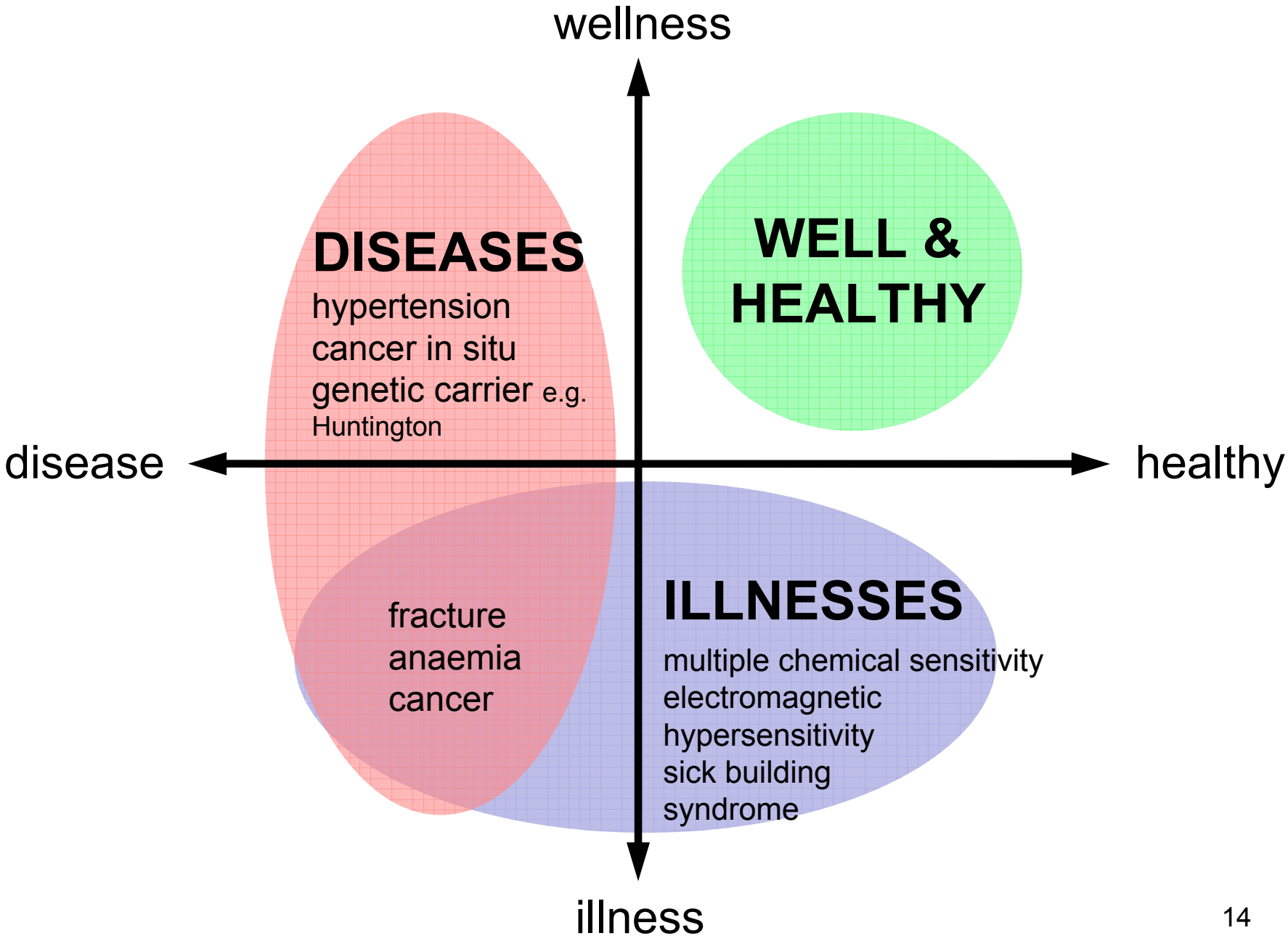
EHS is characterized by a variety of non-specific symptoms, which afflicted individuals attribute to exposure to EMF.

dermatological symptoms
• redness, tingling, and burning sensations

neurasthenic and vegetative symptoms
• fatigue, tiredness, concentration difficulties, dizziness, nausea, heart palpitation, and digestive disturbances

not part of any recognized syndrome.

WHO factsheet 296 2005


wellness
DISEASES
hypertension
cancer in situ
genetic carrier e.g.
Huntington
WELL &
HEALTHY
disease
healthy
fracture
anaemia
cancer
ILLNESSES
multiple chemical sensitivity
electromagnetic
hypersensitivity
sick building
syndrome
illness

Sensitivity to electricity

- 1,5 % Stockholm county
  - Hillert L, 2002
- 1,9 % Skåne county
  - Carlsson F, 2005
- 8-10 % Germany
  - Infas 2002-2006
- 3,2 % California
  - Levallois, 2002
- 4 % England
  - Eltiti, 2007
- 5 % Switzwerland
  - Schreier, 2006

Environmental Health Report 2009

Swedish: http://www.socialstyrelsen.se/Lists/Artikelkatalog/Attachments/8494/2009-126-70_200912670_rev.pdf

English: http://www.socialstyrelsen.se/Lists/Artikelkatalog/Attachments/8338/2009-126-116_2009126116_rev.pdf

hat impact on your health, do you believe electromagnetic fields from e.g. electrical appliances, power lines have?

egative impact:

HR 2001 3,1 % (200,000 adults in Sweden)

women 50-59 years 4,9%

Environmental Health Report 2009

Percentage of people ≥1 time/week

	EHS	Population
Heat/burning sensation in the skin	27 %	2.0 %
Itching, burning eyes	22	7.5
Fatigue	52	34
Headache	24	12
Nausea, dizziness	8.7	3.4
Difficulties to concentrate	25	5.9

EHS - provocation studies

Rubin GJ *et al* - review

(Pychosom Med 2005, Bioelectromagnetics 2010)

- 46 studies involve 1,175 volounteers
- little evidence suggest that individuals with EHS can detect EMF
- many studies have found evidence that a nocebo effect can explain acute symptoms
- research needs to clarify chronic exposures and test new varieties of electromagnetic emissions
- best evidence suggests that EHS should not be viewed as a bioelectromagnetic phenomenon

Hypothesis to EHS

Electrical or magnetic fields
- via serotonin/melatonin effects, free radicals

Increased excitability of nervous system

Psykological mechanisms
- Stress/conditioning
- Attribuation
- Somatization
- Nocebo

Light flickering

Chemical influences
- e.g. phenols, flame retardants, mercury from amalgam

”Multi-factorial”

No support for the hypothesis that people with electrical hypersensitivity have an increased sensitivity to EMF and RF

No scientific support for the relationship between RF and acute symptoms or objective measurable physiological responses

FAS 2008

FAS 2009

SCENIHR 2009

SSM 2009:36

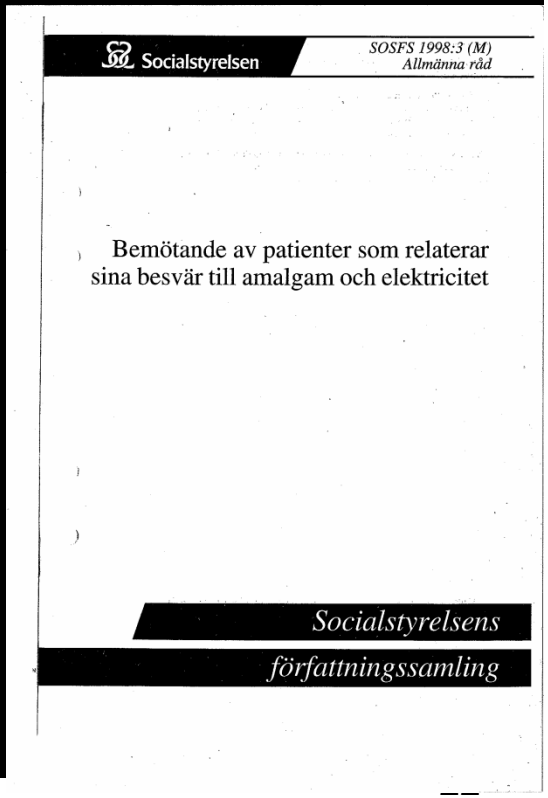
Future research

- provocation studies probably does not lead to any new findings
- nocebo-effect has been emphasized in several recent studies and reviews
- functional brain imaging promising to study placebo- and nocebo-mechanisms

General guidelines on the reception of patients with regard to their problems with amalgam and electricity SOSFS 1998:3

Medical professionals:

- listen, take the patient seriously and foster trust
- give time to the patients to describe his/her various symptoms
- understand that problems and symptoms are real and not imagined
- respect the patient's explanation
- right to an all-round medical examination



General guidelines on the reception of patients with regard to their problems with amalgam and electricity SOSFS 1998:3

Medical history
symptoms in details
previous and current diseases
medication
social situation incl occupation, work conditions, family situation,
tobacco/alcohol consumption

Physical examination

Laboratory tests
blood status, ESR
serum iron
B12/folic acid
electrolytes including calcium
S-creatinine
liver tests
S-glucose
thyroid tests
urine status
Borrelia, viral serology

Differential diagnoses
skin diseases such as atopic eczema, rosacea and other exanthema
allergies, asthma, bronchial hyperactivity
anaemia
malabsorption
endocrine or metabolic illness
neurologic diseases
infection
collagenosis
malignancy
mental disturbance such as depression, anxiety etc.
somatoform syndrome
other environment-related symptom

Treatment and actions

adapted to the conditions in each case

experience with successful drug therapy is limited

cognitive behavioral therapy can be positive if the patient is motivated

none established effects by reducing EMF exposure

long-term sick leave should be avoided

Sensitivity to electricity

- primary care important
- knowledgeable and interested physicians early in the disease process
- professional and dignified treatment
- unbiased assessment important

Prognosis

Good, if appropriate action:

- early in the course of the disease
- in mild cases with only skin symptoms

Worse, for long-standing cases with multiple symptoms

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No list of disability or impairments (no “authorized disabilities”)

Financial support to NGOs with disability issues on the programs e.g. the Swedish Association for the Electro Sensitive

Social and medical support based on the appraisal of that person’s ability or hindrance and not on specified diagnoses

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- Building and operation of mobile base stations are not licensed under the Swedish Environmental Code
- People's concerns can not alone be the basis for actions against the establishment of mobile base stations with the support of the Environmental Code
- The precautionary principle is therefore not applicable to mobile base stations

Medical effects of EMF

- High exposures to low frequency fields induces currents in the body that can cause:
  - nerve stimulation 10-100 mV/m
  - painful sparks 0.6-1.5 kV/m
  - magnetophosphenes 5-15 mT (50 Hz)

- High exposures to RF fields induce heat in the body and can cause internal burns. Catarract appears at 100 W/kg.

International Agency for Research on Cancer (IARC)

Group 1: carcinogenic to humans (α-, β-, γ-radiation)

Group 2a: probably carcinogenic to humans (UV-light)

Group 2b: possibly carcinogenic to humans (ELF)

Group 3: not classifiable as to its carcinogenicity to humans (static electric fields)

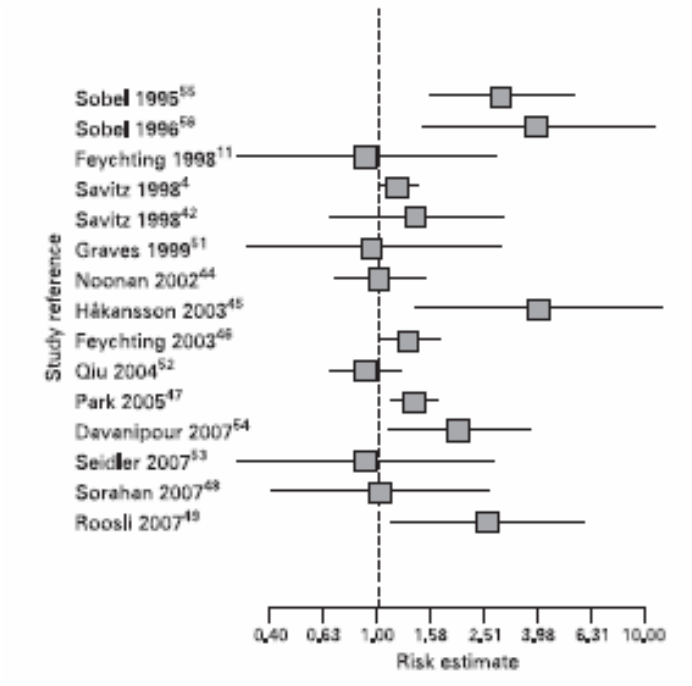
Group 4: probably not carcinogenic to humans

WHO ELF (0-100 Hz)

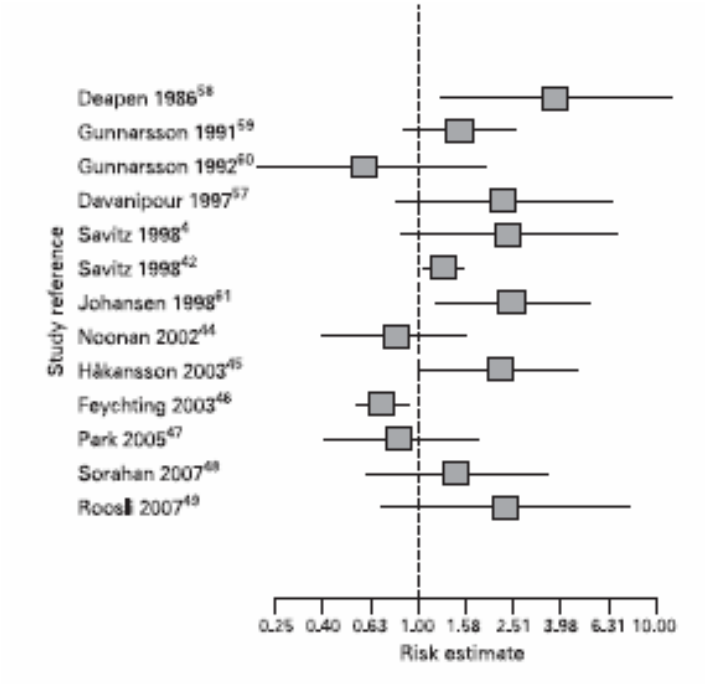
- Childhood leukaemia - possibly carcinogen
- Other childhood cancer - evidence inadequate
- Breast cancer - weak association
- Reproductive/developmental disorders – inadequate
- Cardiovascular disease - not shown association
- Neurodegenerativ disorders - PD, MS no evidence
  ALS, AD inadequate
- Cognitive system - less clear
- Electromagnetic hypersensitivity - unrelated

EHC 2007:238

Occupational exposure to ELF



Alzheimer's disease

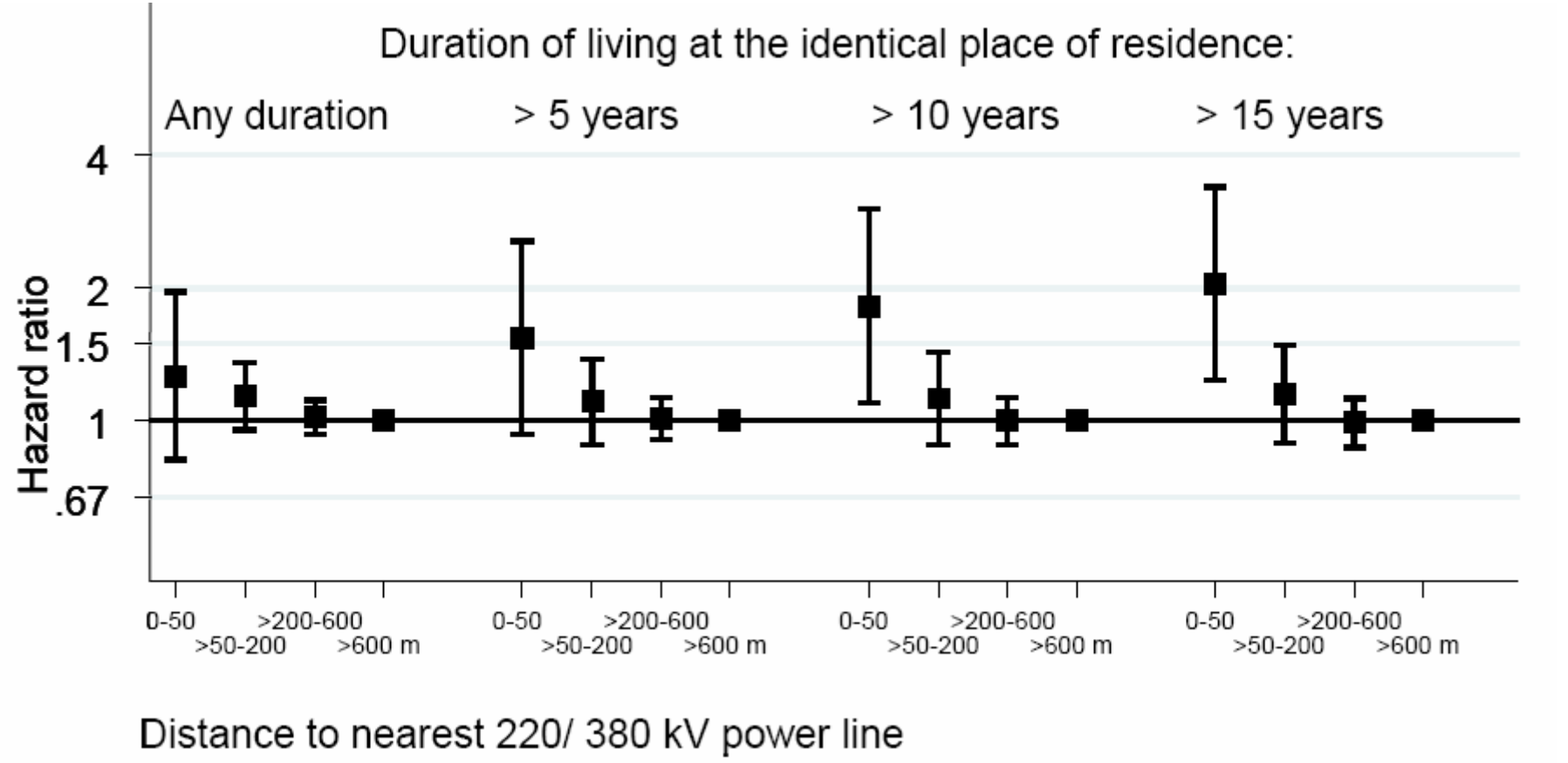


Amyotrophic lateral sclerosis

Kheifets, OEM 2009

Alzheimer's disease

Power line	1 µT can occur
380 kV	50-80 m
220 kV	40-55 m



* adjusted for sex, educational level, occupational attainment, urban-rural area, civil status, language region, number of apartments per building, and living within 50 m of a major road.

Huss et al., AJE, 2009

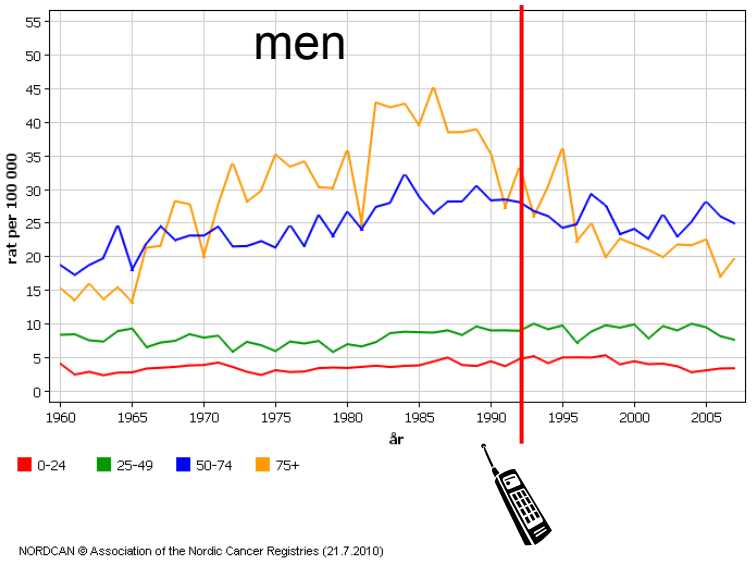
RF (100 kHz - 300 GHz)

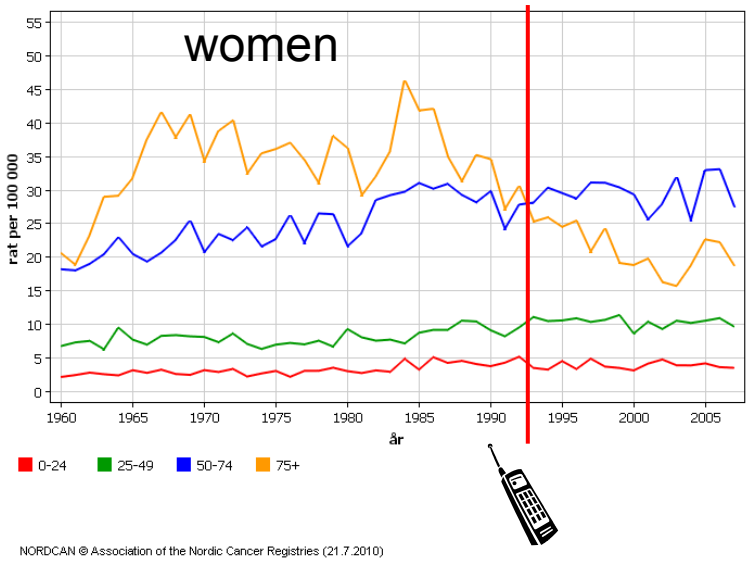
- Animal studies carcinogenicity - no consistent results
- In vitro, ROS, genotoxicity, apoptosis, gene expression, immunology, enzyme activity – no effects
- Great uncertainty about biomarkers (S100B, TTR)
- Epidemiological, animal and cell studies - unlikely RF causes cancer
- Brain tumours: more epidemiological studies with better methods and longer follow-up time for safer conclusions, mobile use < than latency
- BBB damage of cellphones – not confirmed
- Cognitive effects, EEG changes, few studies – unclear significance
- Functional imaging (PET, NIRS) – conflicting results
- HRV, HT in a few studies of mobile phones and/or base stations
- No scientific support for RF exposure and self-reported symptoms, repeated studies are required due to contradictory results
- No reproductve disturbance or abnormality in animals or humans
- The effect on sperm quality – no basis for assessment

FAS 2008:1
FAS 2008:2
FAS 2009
SSI 2008:12
SCENIHR 2009
SSM 2009:36

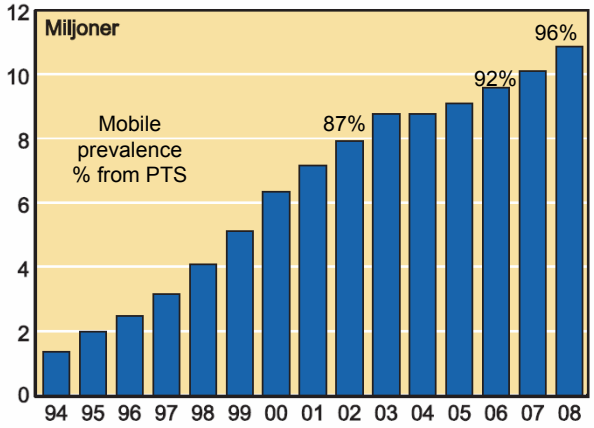
NO REASON TO CHANGE GUIDE LINES

Brain tumour incidence in Sweden 1960-2007





Introduced in market	Mobile telephone generation
1981 1986	NMT 450 NMT 900
1992 1997	GSM 900 GSM 1800
2000	UMTS 3G



Mobile phone subscriptions in Sweden

E Cardis (5th Ministerial Conference on Environ Health) Parma 2010

Health effects of RF not demonstrated at this point

But there are indications that there might be a risk

… if there is a risk, it is likely to be greater for exposures in childhood and adolescents …

Why would the risk be larger?

- Children who start using phones will have many years of use
- Much greater quantity of use compare to previous generations
- SAR tend to be higher in children's brain tissue
- Child brain tissue more sensitive?

Links to documents

FAS årsrapporter www.fas.se

SSM vetenskapliga råd årsrapporter www.ssm.se

WHO's faktablad 322, 304, 296, 299 och 193 om elektromagnetiska fält och folkhälsa http://www.who.int/en/

EU-kommissionens vetenskapliga kommitté SCENIHR 2009

IARC vol 80 om ELF http://monographs.iarc.fr/ENG/Monographs/vol80/volume80.pdf

ICNIRP guidelines 1998 http://www.icnirp.de/

Myndigheternas försiktighetsprincip om lågfrekventa elektriska och magnetiska fält - en vägledning för beslutsfattare 1996 http://www.av.se/dokument/publikationer/adi/adi_477.pdf

Socialstyrelsens Meddelandeblad om EMF från kraftledningar 2005
http://www.socialstyrelsen.se/NR/rdonlyres/6CB54FB2-CCE6-4EDF-A780-52133C469750/3579/2005110.pdf

Socialstyrelsens Meddelandeblad om Elektromagnetiska fält från mobilbasstationer och annan trådlös teknik 2008 http://www.socialstyrelsen.se/Publicerat/2008/10058/2008-1-11.htm

Miljöhälsorapport MHR 2009 http://www.socialstyrelsen.se/Publicerat/2009/10349/200-126-70.htm

Bemötande av patienter som relaterar sina besvär till amalgam och elektricitet SOSF 1998:3
http://www.sos.se/sosfs/1998_3/1998_3.htm

Magnetfält och hälsorisker http://www.socialstyrelsen.se/Lists/Artikelkatalog/Attachments/8434/2009-126-212_2009126212.pdf