

Gliom-Inzidenzraten in den nordischen Ländern im Kontext möglicher Mobilfunk-assoziiierter Risiken

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Übersicht

Evidenz epidemiologischer Studien:

- Kohortenstudien aus Dänemark und Großbritannien mit Hunderttausenden von Teilnehmern zeigen keine erhöhten Gliom-Risiken
aber: keine Expositionsdaten um besonders häufige Nutzer separat zu analysieren
- Einige Fallkontrollstudien zeigen ebenfalls keinen Zusammenhang
aber: meist Studien von vor dem Jahr 2000, so dass Nutzungszeit eher kurz war
- Eine multinationale und eine frz. Studie zeigen moderat erhöhtes Gliom-Risiko unter den häufigsten Nutzern (<5% der Studienpopulation)
aber: Hinweise, dass der Zusammenhang ein statistisches Artefakt sein könnte
- Eine Studienserie in Schweden zeigt ein generell erhöhtes Gliom-Risiko
aber: schon mit früheren Inzidenzstudien als widersprüchlich eingestuft

Hypothese:

Weil Handy-Nutzung so weit verbreitet ist, müssten sich die in den epidemiologischen Studien beobachteten erhöhten Risiken in den entsprechenden Risikogruppen über die Zeit durch einen messbaren, kompatiblen Anstieg der Gliom-Inzidenzrate zeigen

Data for Incidence Analyses

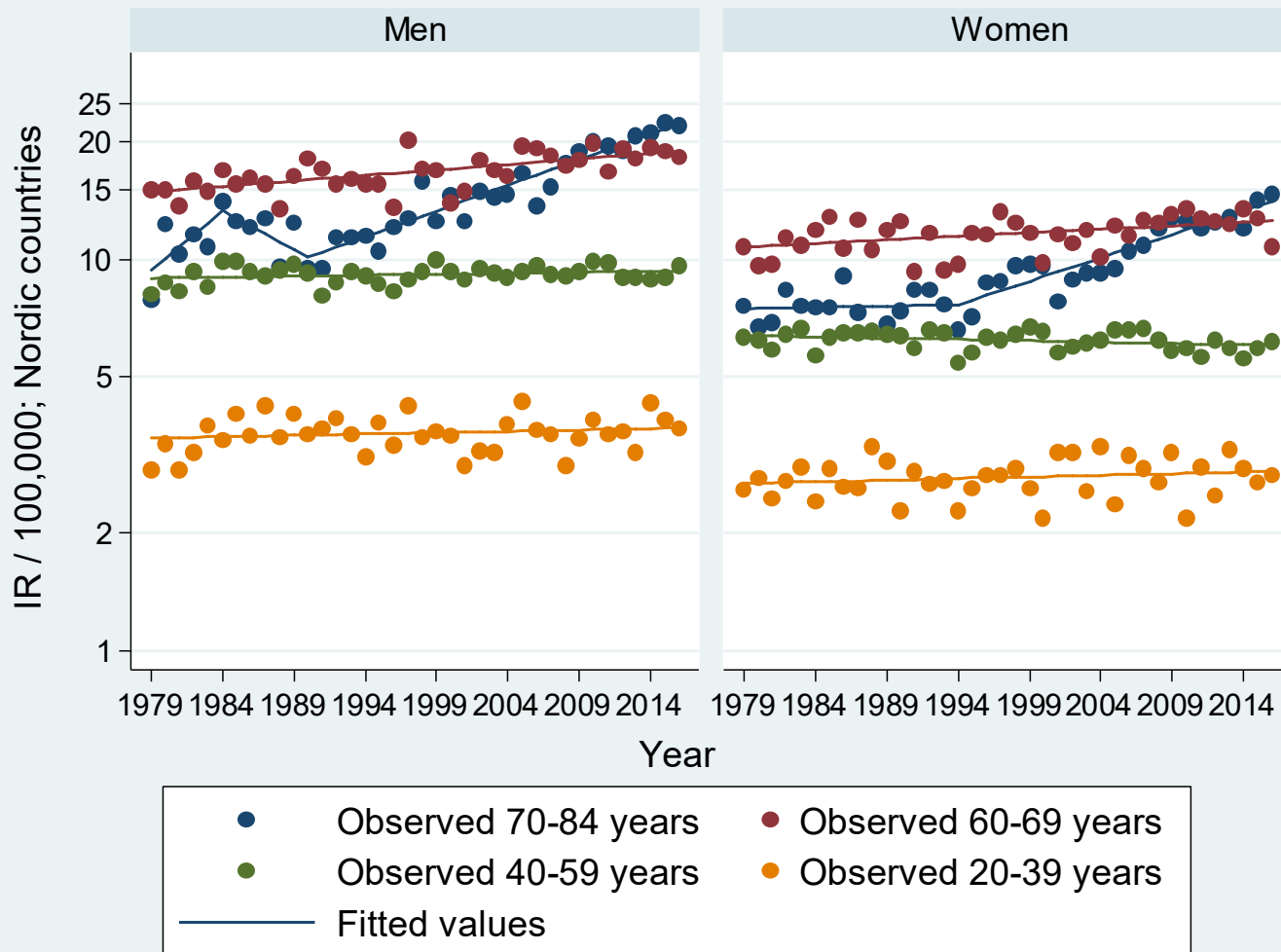
- Data on number of cases from population based cancer registries in Denmark, Finland, Norway and Sweden
- 28,015 male and 20,630 female primary glioma cases
- Aged 20 to 84 years old
- Diagnosed between 1979 and 2016
- Population data from population registries (5 year age groups)
- Total person-years: 663 million

- E.g., 2016: 1,724 observed cases in 19.7 million 20-84 years old

- Annual age standardised incidence rates (European standard)

- Time trends: *Joinpoint regression models* allowing for changes in time trends

Age-specific glioma incidence rates



Summary Incidence Analysis

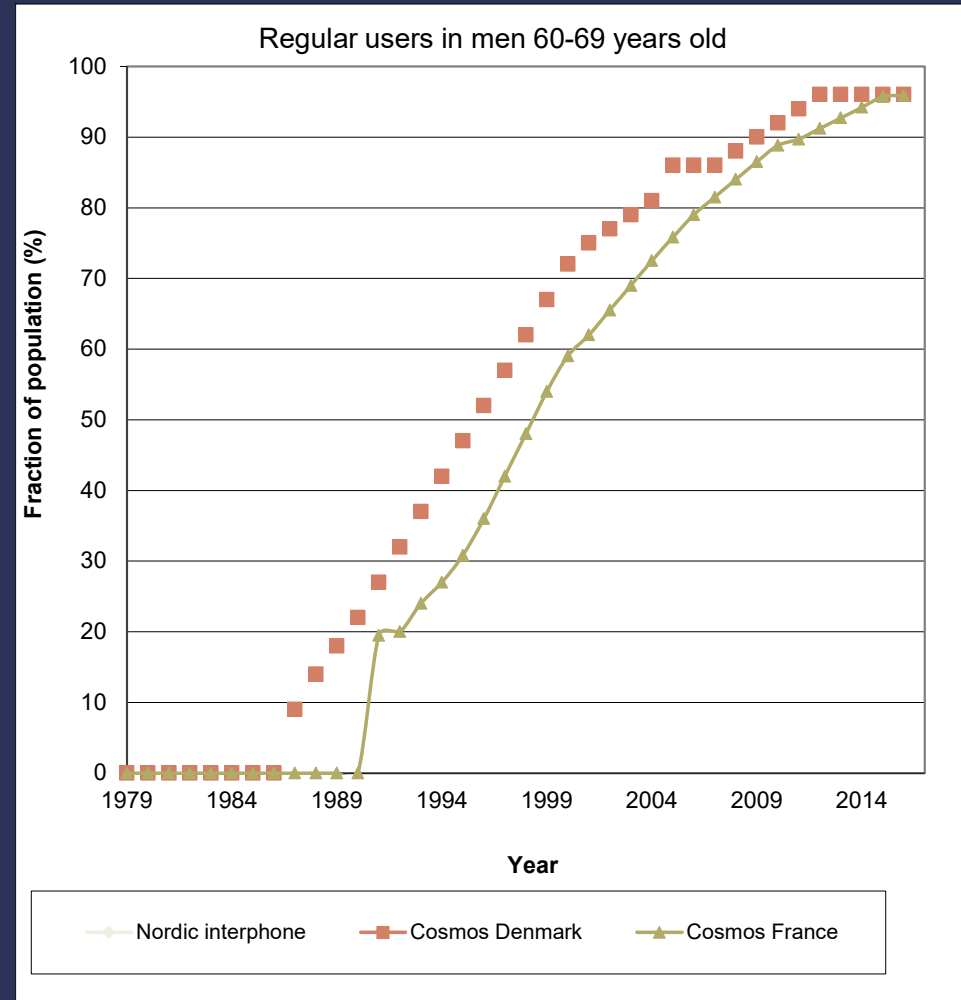
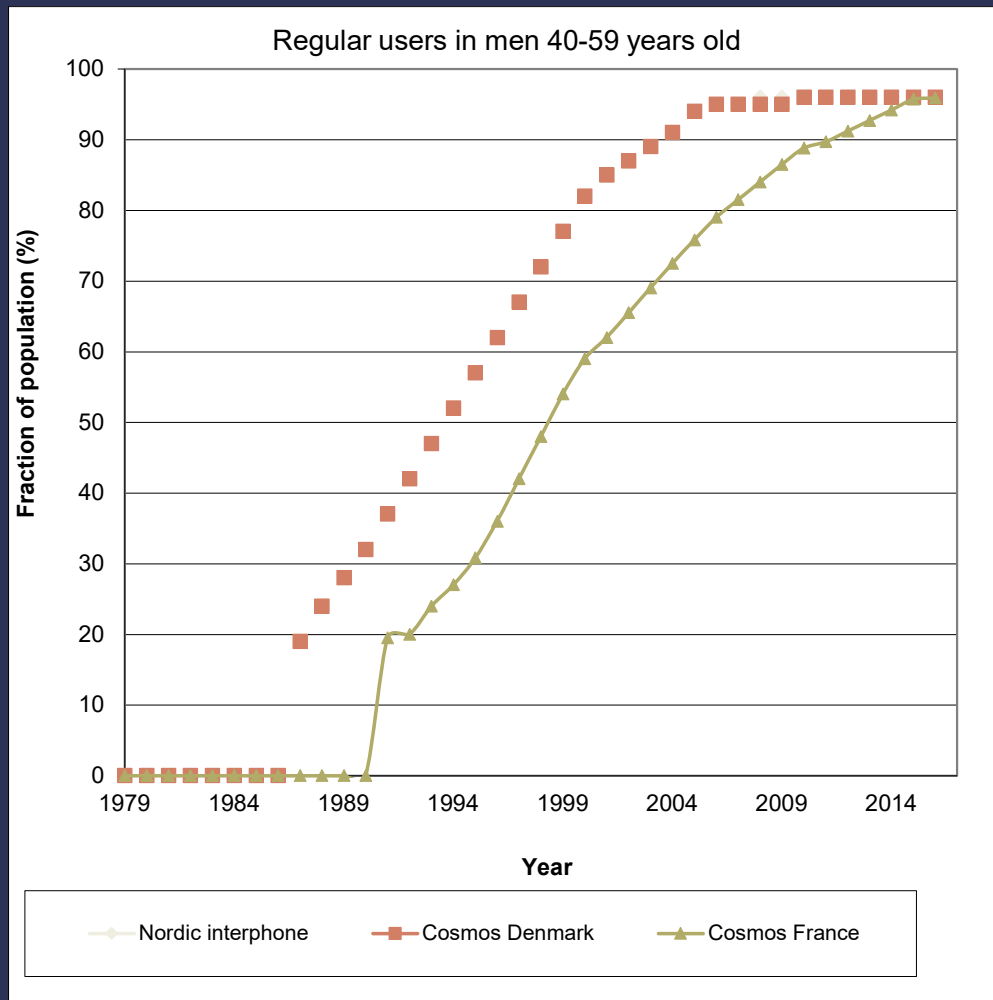
- Updated previous analyses (1979-2008) of Nordic glioma incidence rates (IR) by 8 additional years of data
- No modification of long term time trends in IR of glioma in last decades of observation
- Overall, in ages < 59 years, IR were relatively stable
- Increases in IR in ages 60-69 years, and in 70-84 yrs
 - Improved access to improved diagnosis tools
 - Improved registration of cancer cases (Denmark, Norway)
 - Increased tendency to perform biopsies (oligodendroglioma, treatment guidelines)
 - Changes in risk factors?

Methods Simulation Study

- There are epidemiological studies of case-control design which reported elevated risks associated to use of mobile phone
- We created risk scenarios with a range of at-risk groups, and risk levels, based on risks reported in those studies
 - Men 40-59 yrs old: APC=0.1 (0.0; 0.3) [1979-2016]
 - Men 60-69 yrs old: APC=0.6 (0.4; 0.9) [1979-2016]
- Evidence: No effect-measure modification of risk by age
 - In Hardell et al, 2015, those aged 20-49 and 50+ at first use of mobile phone had the same risk increase
 - In Coureau et al, 2014, higher associations were observed for 30–59-years-old subjects, compared to 18-29 and 60+.
 - In Interphone, 2010, there was no appreciable effect modification by age or sex in any of the glioma results

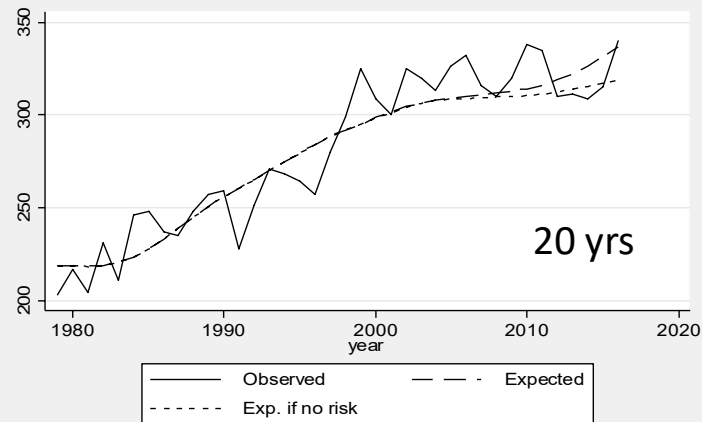
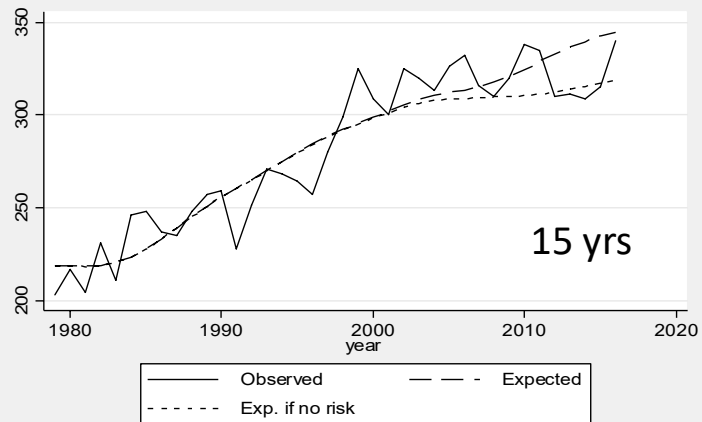
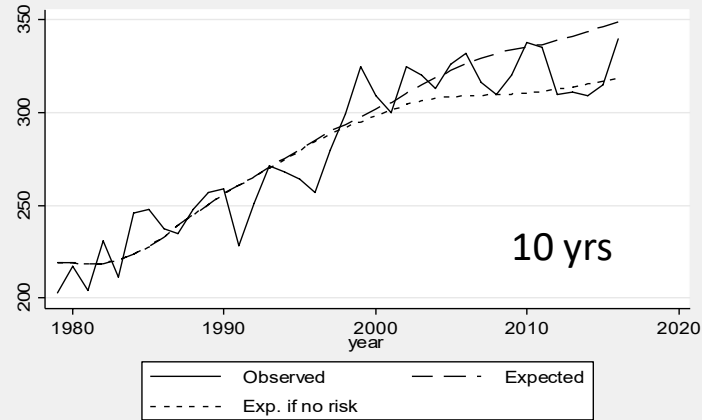
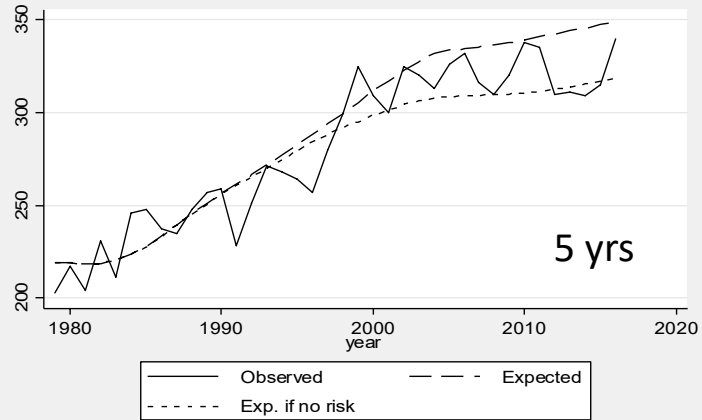
Identification of reference	Period of case recruitment	Size of case-control study	Age at diagnosis	Exposure definition	OR	95% CI
Hardell and Carlberg (Pathophysiology, 2015)	1997-1999, 2000-2003 and 2007-2009	1498 malignant brain tumour cases; risk analysis on 1380 glioma cases and 3430 controls	18-80	use of mobile phones more than one year	1.3	1.1 to 1.6
				10 to 15 years after first using a mobile phone (higher risks reported for persons exposed longer)	1.4	1.1 to 1.9
Cerenat study (Coureau et al, OEM, 2014)	2004-2006	253 gliomas cases and 892 matched controls	16 +	self-reported lifetime cumulative mobile phone conversations ≥ 339 hours	1.78	0.98 to 3.24
				self-reported lifetime cumulative mobile phone conversations ≥ 896 hours	2.89	1.41 to 5.93
Interphone international study (13 countries) (IJE, 2010)	2000-2004	2708 gliomas cases and 2972 matched controls	30-59	self-reported lifetime cumulative mobile phone conversations ≥ 1640 hours	1.40	1.03 to 1.89
Interphone-Canada (Moioli et al, AJE, 2017)	2001-2004	170 gliomas cases and 653 controls	30-59	>558 hours of cumulative hours of use	2.0	1.2 to 3.4

Modelling prevalence of regular mobile phone users



SIR Analysis in 40-59 year old men

Risk scenario: RR=1.1, all users at risk after an induction period



Exposure distribution of Nordic Interphone controls;
0.5 IR increase explained

SIR results in men 40-59 years old

At risk group		All mobile phone users									
		5 yrs lag		10 yrs lag		15 yrs lag		20 yrs lag			
Hypothetical RR		SIR	95%CI	SIR	95%CI	SIR	95%CI	SIR	95%CI		
	2.5	0.6	(0.59; 0.62)	0.69	(0.67; 0.70)	0.79	(0.78; 0.81)	0.91	(0.90; 0.93)		
	2	0.7	(0.69; 0.71)	0.77	(0.76; 0.78)	0.85	(0.84; 0.87)	0.94	(0.93; 0.96)		
	1.5	0.83	(0.81; 0.84)	0.87	(0.86; 0.89)	0.93	(0.91; 0.94)	0.98	(0.96; 1.00)		
	1.4	0.86	(0.84; 0.87)	0.9	(0.88; 0.92)	0.94	(0.92; 0.96)	0.98	(0.96; 1.00)		
	1.3	0.89	(0.88; 0.91)	0.92	(0.91; 0.94)	0.96	(0.94; 0.98)	0.99	(0.97; 1.01)		
	1.2	0.93	(0.91; 0.95)	0.95	(0.93; 0.97)	0.98	(0.96; 0.99)	1.00	(0.98; 1.02)		
	1.1	0.97	(0.95; 0.99)	0.98	(0.96; 1.00)	0.99	(0.97; 1.01)	1.00	(0.99; 1.02)		
	1.08	0.98	(0.96; 1.00)	0.99	(0.97; 1.01)	1.00	(0.98; 1.02)	1.01	(0.99; 1.03)		
	1.05	0.99	(0.97; 1.01)	1.00	(0.98; 1.02)	1.00	(0.98; 1.02)	1.01	(0.99; 1.03)		

Exposure distribution of Nordic Interphone controls; 0.5*IR increase explained

SIR results in men 60-69 years old

At risk group		All mobile phone users							
		5 yrs lag		10 yrs lag		15 yrs lag		20 yrs lag	
Hypothetical RR	SIR	95% CI	SIR	95% CI	SIR	95% CI	SIR	95% CI	
	2.5	0.68	(0.67; 0.70)	0.73	(0.72; 0.75)	0.84	(0.82; 0.86)	0.97	(0.95; 0.99)
	2.0	0.78	(0.76; 0.80)	0.83	(0.81; 0.84)	0.91	(0.89; 0.93)	1.01	(0.99; 1.03)
	1.5	0.91	(0.89; 0.93)	0.94	(0.92; 0.96)	0.99	(0.97; 1.02)	1.05	(1.03; 1.08)
	1.4	0.94	(0.92; 0.97)	0.97	(0.95; 0.99)	1.01	(0.99; 1.04)	1.06	(1.04; 1.09)
	1.3	0.98	(0.96; 1.00)	1.00	(0.98; 1.02)	1.03	(1.01; 1.06)	1.07	(1.05; 1.10)
	1.2	1.02	(0.99; 1.04)	1.03	(1.01; 1.05)	1.05	(1.03; 1.08)	1.08	(1.06; 1.10)
	1.1	1.06	(1.03; 1.08)	1.06	(1.04; 1.09)	1.08	(1.05; 1.10)	1.09	(1.07; 1.11)
	1.08	1.06	(1.04; 1.09)	1.07	(1.05; 1.10)	1.08	(1.06; 1.11)	1.09	(1.07; 1.12)
	1.05	1.08	(1.05; 1.10)	1.08	(1.06; 1.11)	1.09	(1.06; 1.11)	1.09	(1.07; 1.12)

Exposure distribution of Nordic Interphone controls;
0.5*IR increase explained

Identification of reference	Age at diagnosis	Exposure definition	OR	95% CI	Compatibility with main SIR Analysis
Hardell and Carlberg (Pathophysiology, 2015)	18–80	use of mobile phones more than one year	1.3	1.1 to 1.6	Not compatible
		10 to 15 years after first using a mobile phone (higher risks reported for persons exposed longer)	1.4	1.1 to 1.9	Not compatible
Cerenat study (Coureau et al, OEM, 2014)	16 +	self-reported lifetime cumulative mobile phone conversations ≥ 339 hours	1.78	0.98 to 3.24	Not compatible
		self-reported lifetime cumulative mobile phone conversations ≥ 896 hours	2.89	1.41 to 5.93	Not compatible for 40-59 years
-Interphone (Canada) (Momoli et al, AJE, 2017)	30-59	self-reported lifetime cumulative mobile phone conversations >558 hours	2.0	1.2 to 3.4	Not compatible for 40-59 years
Interphone international study (13 countries) (IJE, 2010)	30-59	self-reported lifetime cumulative mobile phone conversations ≥ 1640 hours	1.4	1.03 to 1.89	Not compatible for 40-59 years Compatible when assuming risk only related to GSM MP generation

Diskussion

Zeitliche Trends in der Gliom-Inzidenz widersprechen einem Einfluss durch Mobilfunk:

- Anstieg bei 70-84-Jährigen vor der weiten Verbreitung Mobilfunk
- Anstieg bei 60-69-Jährigen zu konstant für Einfluss Mobilfunk
- Kein oder fast kein Anstieg bei den Jüngeren

Zeitliche Trends bei Männern und Frauen zu ähnlich, was Einfluss durch Mobilfunk widerspricht

Überprüfung mit epidemiologischen Studien zeigen dass die in den Fallkontrollstudien beobachteten Risikoerhöhung nicht mit den tatsächlichen Inzidenzen an Gliomen bei Männern kompatibel sind

- Ausnahme: Interphone 13-Länder-Studie wenn nur Risikoerhöhung durch NMT/GSM Technologien angenommen aber nicht ab UMTS oder Risiko wurde überschätzt

Latenzzeiten >20 Jahre, Risiken nur in Subgruppen oder kleine Risiken (<10%) sind mit einem derartigen ökologischen Analyse-Ansatz nicht auszuschließen

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The Cancer Registries of the Nordic countries

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IARC ENV Activities on RF



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Cohort Study of Mobile Phone Users:

300,000+ MP Users followed up for various outcomes in Denmark, Finland, Sweden, The Netherlands, the UK and in France (by IARC); 1st Cancer FU in 2022

INTER-CAL

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Modelling Study of INTERPHONE:

Is the J-shape relationship between MP use and glioma a result of an interplay of various biases?; final report June
Consistency check; publication under review

GliMoRi

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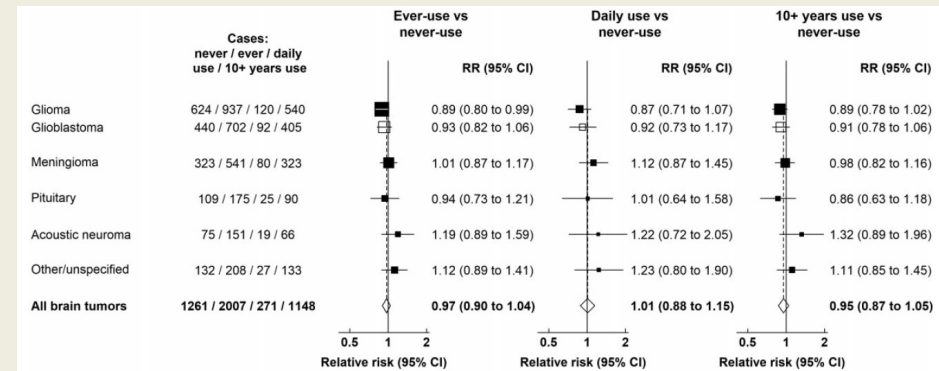


Update of the
UK Million Women
Cohort Study:
No association;
Published March

Cellular Telephone Use and the Risk of Brain Tumors: Update of the UK Million Women Study

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Full length article

Time trends in mobile phone use and glioma incidence among males in the Nordic Countries, 1979–2016

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