Web appendix: Statistical methods and supplementary data

We fitted an age-period-registry-gender model which estimated the brain cancer rate in the period 1992-1996 and then in separate years from 1997 onwards. Specifically, we assumed that in the stratum with age group a, calendar year period y, registry r, gender s the expected number of cases was given by:

$$PY_{ayrs} \exp\left[\alpha_a + \beta_{\max(y,1996)} + \gamma_r + \delta_s\right] \qquad \text{(A1)}$$

PY_{ayrs} is the number of person years of follow-up in that stratum and $\alpha_a, \beta_y, \gamma_r, \delta_s$ are the fitted adjustments for age, calendar year period, registry and gender. In order to obtain an identifiable set of parameters, we constrained $\alpha_{60-64} = \gamma_{Los\ Angeles} = \delta_{male} = 0$. Subject to this constraint, model (A1) predicts that the risk (per year) for males aged 60-64 in calendar year group y in the Los Angeles registry is given by $\exp\left[\beta_{\max(y,1996)}\right]$. However, the model predicts glioma rates for all genders, age groups, and registries, and takes all data into account, not simply the baseline category (Los Angeles males aged 60-64). So, for example, the expected number of cases for females in age group 55-59 in the Connecticut registry in 2008 is $PY_{55-59,2008,Connecicut,\,female} \exp\left[\alpha_{55-59} + \beta_{2008} + \gamma_{Connecticut} + \delta_{female}\right]$, and similarly for the many other subgroups. The age group 60-64 was used as the baseline adjustment category for age because it contained the median number of cases. The categories Los Angeles registry and male gender were used as the baseline for the respective adjustments because these groups had the largest numbers of cases. In analysis of trends in rates (reported in Table 7) a very similar model was fitted in which $\beta_{\max(y,1996)}$ was replaced by $\beta_0 + \beta_1(y - 2000)$ in expression (A1). Model (A1) was fitted by Poisson maximum likelihood [27] using Epicure [28]. Confidence intervals are Wald-based (derived from the Fisher information matrix) [27], with quasi-likelihood type variance-inflation factors (the ratio of deviance to degrees of freedom) applied [27].

The 1992-1996 fitted rates ($\exp[\beta_{1996}]$) from model (A1) were combined with the per-capita mobile-phone-usage prevalence, CP_y, estimated as described in the Methods, and the relative risks, RR_{kl}, of the Swedish study [10] and the Interphone study [4] for various periods of latency, k ($k=1$(1-4 years), $k=2$ (5-9 years), $k=3$ (≥10 years)) and cumulative hours of usage, l, and assuming that the distribution of cumulative hours of usage within each latency class is as for the controls in the Swedish study [10] and the Interphone study [4], as given in Tables 2-3. Both studies provided estimates of relative risk for gliomas; the Swedish study [10] also provided estimates for astrocytoma specifically, which were used in projections relating to that endpoint (Figure 3, Table 4). Although detailed results are not given for temporal lobe gliomas, supplementary information [39] suggests that the patterns of risk by latency for this tumour subtype are similar to those for glioma as a whole, justifying use of the relative risks for glioma to be applied to this endpoint. If p_{kl} is the proportion of controls in latency class k in cumulative hours of usage class l (so that $\sum_{l=1}^{L} p_{kl}=1$) then the cancer rate for year y (≥1997) is:

$$\exp\left[\beta_{1996}\right]\left[\begin{array}{l} 1+\left(CP_{y-1}-CP_{y-5}-CP_{y-10}\right)\sum_{l=1}^{L} p_{1l}\left(RR_{1l}-1\right) \\ +\left(CP_{y-5}-CP_{y-10}\right)\sum_{l=1}^{L} p_{2l}\left(RR_{2l}-1\right) \\ +CP_{y-10}\sum_{l=1}^{L} p_{3l}\left(RR_{3l}-1\right) \end{array}\right] \qquad \text{(A2)}$$

The rationale for the first term inside the brackets [] is that $\left(CP_{y-1}-CP_{y-5}-CP_{y-10}\right)$ is an estimate of the proportion of the population in year y that first used mobile phones 1-5 years before, which is multiplied by the sum of the proportion of controls in this latency class (1) and cumulative hours of use group l, p_{1l}, multiplied by the associated excess relative risk in this group, $(RR_{1l}-1)$; there is a similar decomposition for the second and third terms in this

expression. So for example for the Interphone study the projected risks for year y ($\geq$1997) are:

$$\exp\left[\beta_{1996}\right]\left[\begin{array}{l} 1+\left(CP_{y-1}-CP_{y-5}-CP_{y-10}\right)\left[\dfrac{182(0.68-1)+533(0.82-1)+154(0.74-1)+95(0.75-1)+8(3.77-1)}{182+533+154+95+8}\right] \\ +\left(CP_{y-5}-CP_{y-10}\right)\left[\dfrac{13(0.86-1)+208(0.86-1)+192(0.71-1)+204(0.72-1)+73(1.28-1)}{13+208+192+204+73}\right] \\ +CP_{y-10}\left[\dfrac{2(1.13-1)+25(0.63-1)+42(0.89-1)+90(0.91-1)+73(1.34-1)}{2+25+42+90+73}\right] \end{array}\right] \quad \text{(A3)}$$

[See Table 3.] The resulting estimated rates for each year from 1997 onwards are compared with the (observed) age-registry-gender estimated rates ($\exp[\beta_y]$) in Figures 3-4 and Table 4.

Appendix Table A1. Relative risk (RR)/ odds ratio (OR) for various types of glioma (or all brain tumours) in relation to ever use of a mobile phone.

Study	Endpoint	RR/OR (95% CI)
Muscat *et al.* [1]	All brain cancer	0.74 (0.50 to 1.10)
Inskip *et al.* [2]	Glioma	0.8 (0.6 to 1.2)
	All brain cancer	0.8 (0.6 to 1.1)
Auvinen *et al.* [6]	Glioma	1.5 (1.0 to 2.4)
	All brain tumours	1.3 (0.4 to 4.7)
Schüz *et al.* [3]	Glioma	1.01 (0.89 to 1.14)[a]
	All brain: male	0.96 (0.87 to 1.05)[a]
	All brain: female	1.03 (0.82 to 1.26)[a]
Interphone study [4]	Glioma: 1-1.9 year latency	0.62 (0.46 to 0.81)
	Glioma: 2-4 year latency	0.84 (0.70 to 1.00)
	Glioma: 5-9 year latency	0.81 (0.60 to 0.97)
	Glioma: ≥10 year latency	0.98 (0.76 to 1.26)
Interphone study (Appendix 2) [4]	Glioma: 2-4 year latency	1.68 (1.16 to 2.41)[b]
	Glioma: 5-9 year latency	1.54 (1.06 to 2.22)[b]
	Glioma: ≥10 year latency	2.18 (1.43 to 3.31)[b]
Hardell *et al.*[8]	All malignant brain	2.7 (1.6 to 4.7)[c]
	High grade astrocytoma	3.9 (2.1 to 7.6)[c]
Hardell *et al.* [10 d]	All malignant brain: 1-4 year latency	1.1 (0.9 to 1.4)
	All malignant brain: 5-9 year latency	1.2 (0.9 to 1.5)
	All malignant brain: ≥10 year latency	2.5 (1.8 to 3.3)
	Glioma: 1-4 year latency	1.1 (0.9 to 1.4)
	Glioma: 5-9 year latency	1.3 (0.99 to 1.6)
	Glioma: ≥10 year latency	2.5 (1.8 to 3.3)
	Astrocytoma: 1-4 year latency	1.2 (0.9 to 1.5)

	Astrocytoma: 5-9 year latency	1.4 (1.04 to 1.8)
	Astrocytoma: ≥10 year latency	2.7 (1.9 to 3.7)
	Oligodendroglioma: 1-4 year latency	1.4 (0.8 to 2.4)
	Oligodendroglioma: 5-9 year latency	1.3 (0.7 to 2.6)
	Oligodendroglioma: ≥10 year latency	1.4 (0.9 to 2.3)
Johansen *et al*.[40]	Glioma: total	0.94 (0.72 to 1.20)
	Glioma: cerebrum	0.86 (0.48 to 1.42)
	Glioma: frontal lobe	1.11 (0.67 to 1.75)
	Glioma: temporal lobe	0.86 (0.42 to 1.54)
	Glioma: parietal lobe	0.48 (0.15 to 1.11)
	Glioma: occipital lobe	1.79 (0.58 to 4.17)
	Glioma: cerebellum	1.67 (0.04 to 9.29)
	Glioma: other & unspecified location	1.10 (0.52 to 2.02)
Frei *et al*.[5]	Glioma: male	1.08 (0.96 to 1.22)
	Glioma: female	0.98 (0.69 to 1.40)
	Glioma: male cerebrum	0.90 (0.67 to 1.22)
	Glioma: male frontal lobe	1.13 (0.89 to 1.45)
	Glioma: male temporal lobe	1.13 (0.86 to 1.48)
	Glioma: male parietal lobe	0.73 (0.50 to 1.05)
	Glioma: male occipital lobe	1.47 (0.87 to 2.48)
	Glioma: other & unspecified location	1.35 (1.05 to 1.75)

[a]evaluated from SIR
[b]risks are relative to risks among those 1-1.9 years since start of regular use.
[c]risks are for analog and digital mobile phones combined.
[d]all results presented are for mobile phones only; the cases living at interview in this study coincide with those of Hardell *et al*.[9].

Appendix Table A2. Numbers of glioma cases and person-years at risk for non-Hispanic whites, by age and gender, in SEER 12-registry data, 1992-2008.

	Male		Female	
Age group	Cases	Population	Cases	Population
18-19	116	4.64423×10^6	60	4.46800×10^6
20-24	349	1.18530×10^7	273	1.14279×10^7
25-29	466	1.29793×10^7	365	1.25961×10^7
30-34	601	1.44749×10^7	414	1.39320×10^7
35-39	757	1.55534×10^7	553	1.50344×10^7
40-44	991	1.56718×10^7	641	1.53514×10^7
45-49	1080	1.48811×10^7	729	1.47274×10^7
50-54	1358	1.29116×10^7	876	1.29920×10^7
55-59	1497	1.04644×10^7	920	1.06983×10^7
60-64	1490	8.20386×10^6	998	8.66353×10^6
65-69	1453	6.74153×10^6	1084	7.62261×10^6
70-74	1464	5.77362×10^6	1284	7.14301×10^6
75-79	1302	4.65571×10^6	1184	6.49727×10^6
80-84	804	3.07574×10^6	800	5.08710×10^6
85+	401	2.11516×10^6	503	5.10789×10^6
Total	14,129	1.43999×10^8	10,684	1.51349×10^8

Appendix Table A3. Numbers of glioma cases and person-years at risk for non-Hispanic whites, by registry, in SEER 12-registry data, 1992-2008.

Registry	Cases	Population
San Francisco-Oakland SMSA	2527	2.87147×10^7
Connecticut	3154	3.54647×10^7
Detroit (Metropolitan)	3063	3.61302×10^7
Hawaii	288	3.86791×10^6
Iowa	3021	3.51570×10^7
New Mexico	895	1.11706×10^7
Seattle (Puget Sound)	3641	4.25557×10^7
Utah	1597	2.27414×10^7
Atlanta (Metropolitan)	1455	2.01236×10^7
San Jose-Monterey	1294	1.51792×10^7
Los Angeles	3816	4.34009×10^7
Rural Georgia	62	8.42879×10^5
Total	24,813	2.95349×10^8

Appendix Table A4. STROBE [29] Statement—Checklist of items that should be included in reports of cross-sectional studies.

	Item No	Recommendation	Met	Where met and described, or if not met, reasons why not
Title and abstract	1	(*a*) Indicate the study's design with a commonly used term in the title or the abstract	Yes	**See the Abstract "Objective" section.**
		(*b*) Provide in the abstract an informative and balanced summary of what was done and what was found	Yes	**See the Abstract "Design", "Setting" and "Results" sections.**
Introduction				
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported	Yes	**See paras 1+2 of the Introduction.**
Objectives	3	State specific objectives, including any prespecified hypotheses	Yes	**See Introduction para 3, sentence 1.**
Methods				
Study design	4	Present key elements of study design early in the paper	Yes	**See Methods "Data" section paras 1+2 for a description of the structure of the SEER glioma incidence data and CTIA mobile-phone subscriptions data used, and the "Statistical Methods" section para 2 for a description of the method of analysis, and estimation of projected rates (also described in more detail in**

				Appendix A).
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection	Yes	**The SEER registries used, and the dates of follow-up, are detailed in the Methods "Data" section, para 1 sentence 3 (and in the Abstract "Setting" section).**
Participants	6	(*a*) Give the eligibility criteria, and the sources and methods of selection of participants	Yes	**See Methods "Data" section para 1 sentence 2 for the selection criteria for the underlying population (non-Hispanic whites) and para 1 sentence 6 for the selection of the endpoint (glioma) to be studied.**
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable	Yes	**See Methods "Data" section para 1 sentence 6 for the definition of the endpoint (glioma) to be studied. See "Data" section para 2 for a description of the main exposure (that due to mobile-phone use) to be considered. Given the cross-sectional population-based data that is being used, age and registry are potentially serious confounders of crude glioma rates. There is little information available on potential confounders or effect modifiers other than these (and gender); age, registry and gender are adjusted for in the analysis (see "Statistical methods" section sentence 1, and in more detail in Appendix A). Diagnostic criteria are in accordance with current WHO guidelines, as detailed in the "Data" section para 1, sentences 4-6.**
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe	Yes	**See the Methods "Data" section paras 1-3 for a description of the SEER glioma incidence data used, and of the CTIA mobile-phone subscriptions data employed.**

		comparability of assessment methods if there is more than one group		
Bias	9	Describe any efforts to address potential sources of bias	Yes	**The potential confounding effect of age group, registry and gender were taken into account by adjusting for them in the statistical model – see "Statistical methods" section para 1. Possible selection bias consequent on choosing to study white non-Hispanics was addressed by examining separately the Hispanic white population, blacks, Asians, and males and females, separately – see the Results para 4 penultimate sentence (this did not suggest any material difference). Other sorts of bias (e.g., ecological bias) are more difficult to address in this dataset, but we assess them in the "Strengths and limitations of the study" section of the Discussion.**
Study size	10	Explain how the study size was arrived at	Yes	**The study size (numbers of person years, numbers of cases) are straightforwardly derived from the 1992-2008 SEER dataset, and are given in Table 1 and Appendix Tables A2, A3.**
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why	Yes	**Appendix A para 1 details how the quantitative variables (age group, calendar year group, registry, gender) were handled in the analysis of the SEER data for the period 1992-2008, and para 2 describes how the fitted adjusted age-specific rates derived from this analysis were used, together with CTIA mobile-phone usage data, to project rates from the period 1992-1996 to 1997-2008. Sentences 8-9 in para 1 detail why the particular age groups (60-64 years), registry (Los Angeles) and gender (male) were chosen as the baseline adjustment category.**

Statistical methods	12	(*a*) Describe all statistical methods, including those used to control for confounding	Yes	**The statistical methods are described in the "Statistical methods" section of the main paper and in much more detail in Appendix A. The potential confounding effect of age group, registry and gender were taken into account by adjusting for them in the statistical model – see "Statistical methods" section para 1.**
		(*b*) Describe any methods used to examine subgroups and interactions	Yes	**Subgroup analyses were performed on the Hispanic white population, blacks, Asians, quinquennial age groups in the range 40-69, and also males and females, separately (Tables A5-A10).**
		(*c*) Explain how missing data were addressed	Yes	**The only missing data in these datasets are for CTIA mobile-phone subscriptions for the period 1982-1984, which were estimated via log-linear regression from the data from 1985-1990: see "Data" section para 3 sentences 3-4.**
		(*d*) If applicable, describe analytical methods taking account of sampling strategy	N/A	
		(*e*) Describe any sensitivity analyses	Yes	**Two different models were used, based on the relative risks derived from the study of Hardell *et al* (2011) and Interphone (2010), and as above subgroup analyses were also performed for gender, Hispanic whites, blacks, Asians, and by quinquennial age group in the range 40-69, also using various baseline periods (1992-5, 1992-6, 1992-7) (see Results para 4 last two sentences).**
Results				

Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analysed	Yes	**We detail the numbers of person/years studied and the total number of cancers in Table 1 and Appendix Tables A2 and A3.**
		(b) Give reasons for non-participation at each stage	N/A	**This is not relevant for this study (all potentially available persons were included in the analysis).**
		(c) Consider use of a flow diagram	N/A	**This is not relevant for this study (all potentially available persons were included in the analysis).**
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders	Yes	**We provide two tables showing numbers of cancers by age and sex (Appendix Table A2), and by registry (Appendix Table A3). We show the aggregate proportions of persons using mobile phones by year in Figure 1.**
		(b) Indicate number of participants with missing data for each variable of interest	N/A	**There is no missing data, other than the CTIA mobile-phone connection data for 1982-84, as discussed above.**
Outcome data	15*	Report numbers of outcome events or summary measures	Yes	**We present such data in Tables 1, Appendix Tables A2, A3.**
Main results	16	(*a*) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were	No	**We see no point in presenting estimates unadjusted for age, gender, registry, since these (which take no account of changes in population structure over time) will be seriously biased.**

		adjusted for and why they were included		
		(*b*) Report category boundaries when continuous variables were categorized	Yes	**The only variable for which this applies is age. The category boundaries are given in Appendix Table A2.**
		(*c*) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period	Yes	**All risk estimates (Tables 5, 6, Figures 2-4, Tables A5-A10, Appendix Figure A1) are presented using an absolute risk scale.**
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses	Yes	**Two different models were used, based on the relative risks derived from the study of Hardell *et al* (2011) and the Interphone (2010) study, as also different baseline calendar year groups (1992-1995, 1992-1996, 1992-1997), and subgroup analyses were also performed for gender, Hispanic whites, Asians, blacks, and by quinquennial age group in the range 40-69 (see Results para 4 last two sentences).**
Discussion				
Key results	18	Summarise key results with reference to study objectives	Yes	**Para 1 of the Discussion summarises the results in the light of the study objectives. We reiterate these in the "Conclusions" section of the Discussion, as also in "What this paper adds".**
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any	Yes	**These are assessed in the section "Strengths and Limitations of the Study" of the Discussion.**

		potential bias		
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence	Yes	**We trust that we have provided this, in para 1 of the Discussion, in the "Conclusions" section of the Discussion, and also in "What this paper adds".**
Generalisability	21	Discuss the generalisability (external validity) of the study results	N/A	**The whole point of the paper is to test the applicability of relative risks derived from the studies of Hardell *et al* (2011) or Interphone (2010) to the US population. As such, we do not think that this is entirely relevant.**
Other information				
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based	Yes	**Information on both the funders and their (minimal) role in the study is given in the Acknowledgements.**

Appendix Table A5. Comparison of observed glioma rates for non-Hispanic whites in 2008 and the projected rates for 2008 (from the 1992-1996 base rates), using the relative risks of the Swedish study (Hardell *et al.*)[10] and the Interphone study [4] (as in Tables 2-3). The projected rates were obtained using the relative risks of Hardell *et al.*[10] and the Interphone study[4] incorporating period of latency (1-4 years, 5-9 years, ≥10 years) and cumulative hours of mobile-phone use, using model (A2) in the Statistical Appendix. [1]

		Projected rates 2008 per 10^5 per year (+95% CI)					
Endpoint **Age group**	**Observed rate 2008 per 10^5 per year (+95% CI)**	**Hardell *et al* (2011)**	**Percentage change from observed 2008**	**Interphone (2010)**	**Percentage change from observed 2008**	**Interphone (2010), RR>1**	**Percentage change from observed 2008**
Glioma							
40-44	6.7 (5.2 to 8.5)	9.1 (7.8 to 10.6)	37.0	5.9 (5.1 to 6.9)	-11.3	6.5 (5.6 to 7.6)	-2.2
45-49	8.2 (6.6 to 10.2)	10.9 (9.3 to 12.7)	32.7	7.0 (6.0 to 8.2)	-14.1	7.8 (6.7 to 9.0)	-5.2
50-54	10.7 (8.6 to 13.3)	16.4 (14.1 to 19.1)	53.4	10.6 (9.1 to 12.4)	-0.7	11.7 (10.1 to 13.6)	9.5
55-59	14.8 (12.0 to 18.4)	22.5 (19.3 to 26.1)	51.6	14.5 (12.5 to 16.9)	-1.9	16.0 (13.8 to 18.6)	8.3
60-64	16.2 (13.0 to 20.1)	25.8 (22.2 to 30.0)	59.5	16.7 (14.3 to 19.4)	3.2	18.4 (15.8 to 21.4)	13.9
65-69	17.3 (13.5 to 22.1)	31.6 (27.3 to 36.6)	82.8	20.4 (17.7 to 23.7)	18.3	22.6 (19.5 to 26.1)	30.5
Astrocytoma							
40-44	5.0 (3.8 to 6.6)	7.5 (6.3 to 8.9)	49.1	4.5 (3.8 to 5.3)	-10.9	5.0 (4.2 to 5.9)	-1.7
45-49	6.3 (4.9 to 8.1)	9.9 (8.3 to 11.6)	56.5	5.9 (5.0 to 7.0)	-6.4	6.5 (5.5 to 7.7)	3.2
50-54	8.9 (7.0 to 11.3)	15.2 (12.9 to 17.9)	70.3	9.1 (7.7 to 10.7)	1.9	10.0 (8.5 to 11.8)	12.4
55-59	13.4 (10.6 to 16.9)	22.4 (19.0 to 26.3)	66.9	13.4 (11.4 to 15.7)	-0.2	14.7 (12.6 to 17.3)	10.1
60-64	15.4 (12.3 to 19.5)	26.1 (22.2 to 30.6)	68.7	15.6 (13.3 to 18.3)	0.9	17.2 (14.7 to 20.2)	11.3
65-69	16.8 (13.1 to 21.7)	31.7 (27.1 to 37.0)	88.0	18.9 (16.2 to 22.1)	12.4	20.9 (17.9 to 24.4)	24.0

[1] The 2008 modelled observed rates are estimated using male gender, Los Angeles registry as the baseline categories, using model (A1) in the Statistical Appendix.

Table A6. Comparison of observed glioma rates for Hispanic whites in 2008 and the projected rates for 2008 (from 1992-1996 base rates), using the relative risks of the Swedish study (Hardell *et al.*)[10] and the Interphone study [4] (as in Tables 2-3). The projected rates were obtained using the relative risks of the Swedish study[10] and the Interphone study[4] incorporating period of latency (1-4 years, 5-9 years, ≥10 years) and cumulative hours of mobile-phone use, using model (A2) in the Statistical Appendix.[1]

		Projected rates 2008 per 10^5 per year (+95% CI)					
Endpoint	**Observed rate 2008 per 10^5 per year (+95% CI)**	**Hardell *et al* (2011)**	**Percentage change from observed 2008**	**Interphone (2010)**	**Percentage change from observed 2008**	**Interphone (2010), RR>1**	**Percentage change from observed 2008**
Glioma	10.3 (9.4 to 11.2)	16.3 (15.2 to 17.5)	58.9	10.6 (9.8 to 11.3)	2.9	11.6 (10.8 to 12.5)	13.5
Astrocytoma	8.9 (8.1 to 9.8)	16.6 (15.5 to 17.9)	86.2	9.9 (9.3 to 10.7)	11.4	11.0 (10.2 to 11.8)	22.9
Low grade	1.0 (0.9 to 1.3)	2.3 (1.9 to 2.7)	119.2	1.5 (1.3 to 1.7)	41.9	1.6 (1.4 to 1.9)	56.5
High grade	8.9 (7.8 to 10.0)	12.8 (11.6 to 14.1)	44.4	8.3 (7.5 to 9.1)	-6.5	9.1 (8.3 to 10.1)	3.1
Unknown/other grade	0.6 (0.5 to 0.7)	0.8 (0.7 to 1.0)	47.5	0.5 (0.4 to 0.6)	-4.5	0.6 (0.5 to 0.7)	5.3
Temporal lobe	2.5 (2.1 to 2.9)	3.3 (2.9 to 3.7)	29.7	2.1 (1.8 to 2.4)	-16.1	2.3 (2.0 to 2.6)	-7.4
Other specified location	6.0 (5.2 to 6.9)	8.4 (7.5 to 9.4)	39.2	5.4 (4.8 to 6.1)	-9.9	6.0 (5.3 to 6.7)	-0.6
Poorly specified location	1.7 (1.4 to 2.0)	4.6 (4.1 to 5.2)	173.4	3.0 (2.6 to 3.4)	76.9	3.3 (2.9 to 3.7)	95.2

[1]The 2008 modelled observed rates are estimated using age 60-64, male gender, Los Angeles registry as the baseline categories, using model (A1) in the Statistical Appendix.

Table A7. Comparison of observed glioma rates for blacks in 2008 and the projected rates for 2008 (from 1992-1996 base rates), using the relative risks of the Swedish study (Hardell *et al.*)[10] and the Interphone study [4] (as in Tables 2-3). The projected rates were obtained using the relative risks of the Swedish study [10] and the Interphone study[4] incorporating period of latency (1-4 years, 5-9 years, ≥10 years) and cumulative hours of mobile-phone use, using model (A2) in the Statistical Appendix.[2]

		Projected rates 2008 per 10^5 per year (+95% CI)					
Endpoint	**Observed rate 2008 per 10^5 per year (+95% CI)**	**Hardell *et al* (2011)**	**Percentage change from observed 2008**	**Interphone (2010)**	**Percentage change from observed 2008**	**Interphone (2010), RR>1**	**Percentage change from observed 2008**
Glioma	7.3 (6.6 to 8.2)	11.7 (10.7 to 12.7)	59.5	7.6 (6.9 to 8.2)	3.2	8.3 (7.7 to 9.1)	13.9
Astrocytoma	6.8 (6.1 to 7.6)	12.0 (11.1 to 13.0)	76.4	7.2 (6.6 to 7.8)	5.5	7.9 (7.3 to 8.6)	16.4
Low grade	0.6 (0.5 to 0.8)	1.7 (1.4 to 2.0)	160.1	1.1 (0.9 to 1.3)	68.3	1.2 (1.0 to 1.5)	85.7
High grade	5.8 (5.0 to 6.8)	8.7 (7.7 to 9.8)	49.1	5.6 (5.0 to 6.3)	-3.5	6.2 (5.5 to 7.0)	6.4
Unknown/other grade	0.7 (0.5 to 0.9)	0.8 (0.6 to 0.9)	11.9	0.5 (0.4 to 0.6)	-27.6	0.5 (0.4 to 0.7)	-20.1
Temporal lobe	1.6 (1.3 to 2.0)	2.2 (1.9 to 2.6)	36.3	1.4 (1.2 to 1.7)	-11.8	1.6 (1.4 to 1.8)	-2.7
Other specified location	3.7 (3.1 to 4.4)	4.6 (4.0 to 5.3)	24.4	3.0 (2.6 to 3.4)	-19.5	3.3 (2.8 to 3.8)	-11.2
Poorly specified location	1.6 (1.3 to 2.0)	5.5 (4.8 to 6.2)	247.8	3.5 (3.1 to 4.0)	125.1	3.9 (3.4 to 4.4)	148.3

[2]The 2008 modelled observed rates are estimated using age 60-64, male gender, Los Angeles registry as the baseline categories, using model (A1) in the Statistical Appendix.

Table A8. Comparison of observed glioma rates for Asians in 2008 and the projected rates for 2008 (from 1992-1996 base rates), using the relative risks of the Swedish study (Hardell *et al.*)[10] and the Interphone study [4] (as in Tables 2-3). The projected rates were obtained using the relative risks of the Swedish study (Hardell *et al.*)[10] and the Interphone study[4] incorporating period of latency (1-4 years, 5-9 years, ≥10 years) and cumulative hours of mobile-phone use, using model (A2) in the Statistical Appendix.[3]

		Projected rates 2008 per 10^5 per year (+95% CI)					
Endpoint	**Observed rate 2008 per 10^5 per year (+95% CI)**	**Hardell *et al* (2011)**	**Percentage change from observed 2008**	**Interphone (2010)**	**Percentage change from observed 2008**	**Interphone (2010), RR>1**	**Percentage change from observed 2008**
Glioma	5.5 (5.0 to 6.1)	8.7 (8.0 to 9.5)	57.5	5.6 (5.2 to 6.1)	1.9	6.2 (5.7 to 6.8)	12.4
Astrocytoma	5.1 (4.6 to 5.7)	8.8 (8.1 to 9.6)	72.1	5.3 (4.8 to 5.7)	2.9	5.8 (5.3 to 6.3)	13.6
Low grade	0.9 (0.8 to 1.2)	1.8 (1.5 to 2.1)	89.3	1.2 (1.0 to 1.4)	22.5	1.3 (1.1 to 1.5)	35.2
High grade	4.1 (3.5 to 4.8)	6.3 (5.6 to 7.2)	55.2	4.1 (3.6 to 4.6)	0.5	4.5 (4.0 to 5.1)	10.8
Unknown/other grade	0.4 (0.3 to 0.5)	0.5 (0.4 to 0.6)	17.9	0.3 (0.3 to 0.4)	-23.7	0.3 (0.3 to 0.4)	-15.8
Temporal lobe	1.0 (0.8 to 1.2)	1.2 (1.0 to 1.4)	21.4	0.8 (0.7 to 0.9)	-21.5	0.9 (0.7 to 1.0)	-13.3
Other specified location	3.2 (2.8 to 3.8)	4.9 (4.3 to 5.6)	51.7	3.2 (2.8 to 3.6)	-1.8	3.5 (3.1 to 4.0)	8.3
Poorly specified location	1.2 (1.0 to 1.5)	2.5 (2.2 to 2.9)	105.9	1.6 (1.4 to 1.9)	33.3	1.8 (1.6 to 2.1)	47.0

[3]The 2008 modelled observed rates are estimated using age 60-64, male gender, Los Angeles registry as the baseline categories, using model (A1) in the Statistical Appendix.

Table A9. Comparison of observed glioma rates for male non-Hispanic whites in 2008 and the projected rates for 2008 (from 1992-1996 base rates), using the relative risks of the Swedish study (Hardell *et al.*)[10] and the Interphone study [4] (as in Tables 2-3). The projected rates were obtained using the relative risks of the Swedish study [10] and the Interphone study[4] incorporating period of latency (1-4 years, 5-9 years, ≥10 years) and cumulative hours of mobile-phone use, using model (A2) in the Statistical Appendix.[4]

		Projected rates 2008 per 10^5 per year (+95% CI)					
Endpoint	Observed rate 2008 per 10^5 per year (+95% CI)	Hardell *et al* (2011)	Percentage change from observed 2008	Interphone (2010)	Percentage change from observed 2008	Interphone (2010), RR>1	Percentage change from observed 2008
Glioma	17.9 (16.3 to 19.8)	26.3 (24.4 to 28.3)	46.6	17.0 (15.8 to 18.3)	-5.1	18.8 (17.4 to 20.2)	4.7
Astrocytoma	17.0 (15.3 to 18.8)	26.8 (24.8 to 29.0)	57.5	16.0 (14.8 to 17.3)	-5.8	17.7 (16.3 to 19.1)	3.9
Low grade	1.8 (1.5 to 2.2)	4.1 (3.5 to 4.8)	126.0	2.7 (2.3 to 3.1)	46.2	2.9 (2.5 to 3.4)	61.3
High grade	15.4 (13.9 to 17.1)	20.6 (19.0 to 22.4)	34.0	13.4 (12.3 to 14.5)	-13.3	14.7 (13.6 to 16.0)	-4.3
Unknown/other grade	1.0 (0.8 to 1.3)	1.2 (1.0 to 1.5)	24.2	0.8 (0.7 to 1.0)	-19.6	0.9 (0.7 to 1.1)	-11.3
Temporal lobe	4.4 (3.7 to 5.2)	5.7 (5.0 to 6.5)	29.8	3.7 (3.2 to 4.2)	-16.0	4.1 (3.6 to 4.7)	-7.3
Other specified location	8.9 (7.7 to 10.3)	12.2 (10.9 to 13.7)	36.8	7.9 (7.1 to 8.9)	-11.4	8.7 (7.8 to 9.8)	-2.3
Poorly specified location	4.5 (3.8, 5.4)	8.6 (7.5, 9.7)	90.8	5.5 (4.9, 6.3)	23.5	6.1 (5.4, 6.9)	36.2

[4]The 2008 modelled observed rates are estimated using age 60-64, male gender, Los Angeles registry as the baseline categories, using model (A1) in the Statistical Appendix.

Table A10. Comparison of observed glioma rates for female non-Hispanic whites in 2008 and the projected rates for 2008 (from 1992-1996 base rates), using the relative risks of the Swedish study (Hardell *et al.*)[10] and the Interphone study [4] (as in Tables 2-3). The projected rates were obtained using the relative risks of the Swedish study [10] and the Interphone study[4] incorporating period of latency (1-4 years, 5-9 years, ≥10 years) and cumulative hours of mobile-phone use, using model (A2) in the Statistical Appendix.[5]

		Projected rates 2008 per 10^5 per year (+95% CI)					
Endpoint	Observed rate 2008 per 10^5 per year (+95% CI)	Hardell *et al* (2011)	Percentage change from observed 2008	Interphone (2010)	Percentage change from observed 2008	Interphone (2010), RR>1	Percentage change from observed 2008
Glioma	11.4 (10.3 to 12.7)	16.2 (14.9 to 17.6)	41.9	10.5 (9.7 to 11.4)	-8.2	11.6 (10.7 to 12.5)	1.3
Astrocytoma	10.2 (9.1 to 11.4)	16.2 (14.9 to 17.6)	59.6	9.7 (8.9 to 10.6)	-4.6	10.7 (9.8 to 11.6)	5.3
Low grade	1.4 (1.1 to 1.7)	2.8 (2.4 to 3.3)	104.5	1.8 (1.6 to 2.2)	32.3	2.0 (1.7 to 2.4)	46.0
High grade	9.4 (8.3 to 10.6)	12.2 (11.1 to 13.5)	30.8	7.9 (7.2 to 8.7)	-15.3	8.7 (8.0 to 9.6)	-6.6
Unknown/other grade	0.8 (0.6 to 1.0)	0.9 (0.8 to 1.2)	21.0	0.6 (0.5 to 0.7)	-21.7	0.7 (0.5 to 0.8)	-13.6
Temporal lobe	2.4 (1.9 to 2.9)	3.1 (2.7 to 3.7)	32.5	2.0 (1.7 to 2.4)	-14.3	2.2 (1.9 to 2.6)	-5.4
Other specified location	6.5 (5.6 to 7.6)	8.2 (7.2 to 9.2)	25.4	5.3 (4.7 to 6.0)	-18.8	5.8 (5.1 to 6.6)	-10.5
Poorly specified location	2.5 (2.0 to 3.0)	5.0 (4.3, 5.7)	102.3	3.2 (2.8, 3.7)	30.9	3.5 (3.1, 4.1)	44.4

[5]The 2008 modelled observed rates are estimated using age 60-64, female gender, Los Angeles registry as the baseline categories, using model (A1) in the Statistical Appendix.

Appendix Figure A1 Observed and projected malignant glioma and astrocytoma rates (and 95% CI) by histologic type among non-Hispanic whites by age group. The projected rates were obtained using the relative risks of the Swedish study (Hardell *et al.* 2011)[10] and of the Interphone study (2010)[4] incorporating period of latency (1-4 years, 5-9 years, ≥10 years) and cumulative hours of mobile-phone use, using model (A2) in the Statistical Appendix. (The observed rates are estimated using males, Los Angeles registry as the baseline categories, using model (A1) in the Statistical Appendix.)