

携帯電話使用と頭頸部がんの関連性に関する 疫学研究知見のアップデート

Carcinogenicity of radiofrequency electromagnetic fields

Lancet Oncology July 2011

- Human exposures to RF-EMF (frequency range 30 kHz–300 GHz)
- In view of the **limited evidence in humans and in experimental animals**, the Working Group classified RFEMF as **“possibly carcinogenic to humans” (Group 2B)**. This evaluation was supported by a large majority of Working Group members.

- Although both the INTERPHONE study and the Swedish pooled analysis are susceptible to bias—due to recall error and selection for participation—the Working Group concluded that the findings could not be dismissed as reflecting bias alone, and that a causal interpretation between mobile phone RF-EMF exposure and **glioma** is possible. A similar conclusion was drawn from these two studies for **acoustic neuroma**, although the case numbers were substantially smaller than for glioma. Additionally, a study from Japan found some evidence of an increased risk for acoustic neuroma associated with ipsilateral mobile phone use.
- For **meningioma, parotid-gland tumours, leukaemia, lymphoma, and other tumour types**, the Working Group found the available evidence insufficient to reach a conclusion on the potential association with mobile phone use. Epidemiological studies of individuals with potential occupational exposure to RF-EMF have investigated brain tumours, leukaemia, lymphoma, and other types of malignancy including uveal melanoma, and cancers of the testis, breast, lung, and skin. The Working Group noted that the studies had methodological limitations and the results were inconsistent. In reviewing studies that addressed the possible association between environmental exposure to RF-EMF and cancer, the Working Group found the available evidence insufficient for any conclusion.

**Brain tumour risk in relation to mobile telephone use: results of the
INTERPHONE international case-control study
The INTERPHONE Study Group (2010)**

Overall risks

(1 year lag before diagnosis)

meningioma

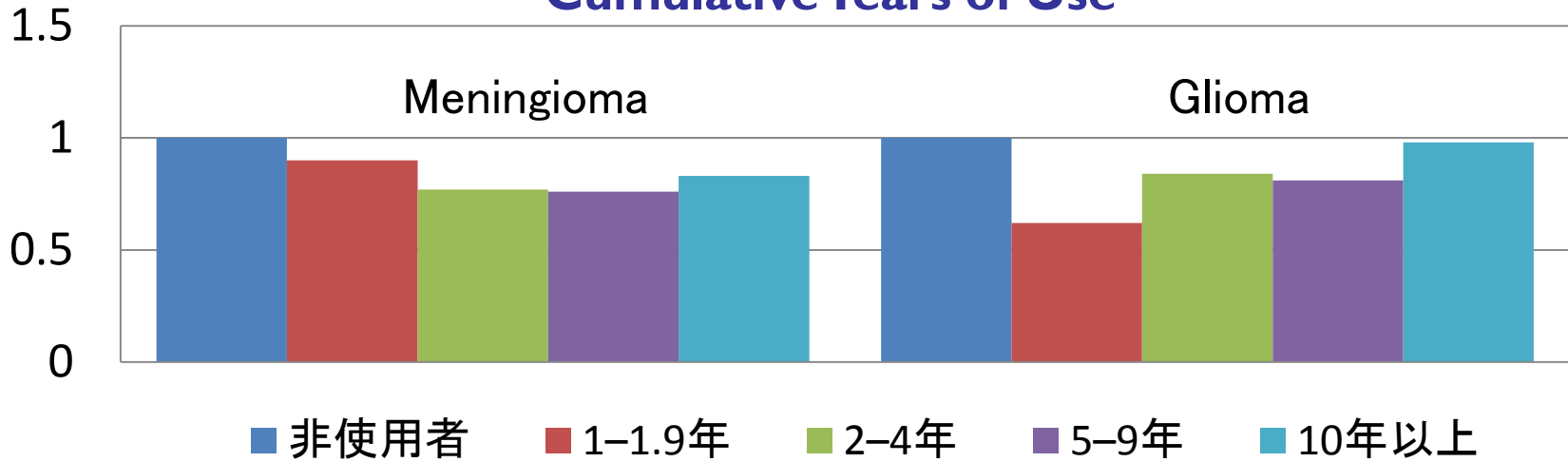
	Case (%)	Control (%)	OR (95%CI)
non-user	1147 (48%)	1174 (44%)	1.00
regular user	1262 (52%)	1488 (56%)	0.79 (0.68 – 0.91)

glioma

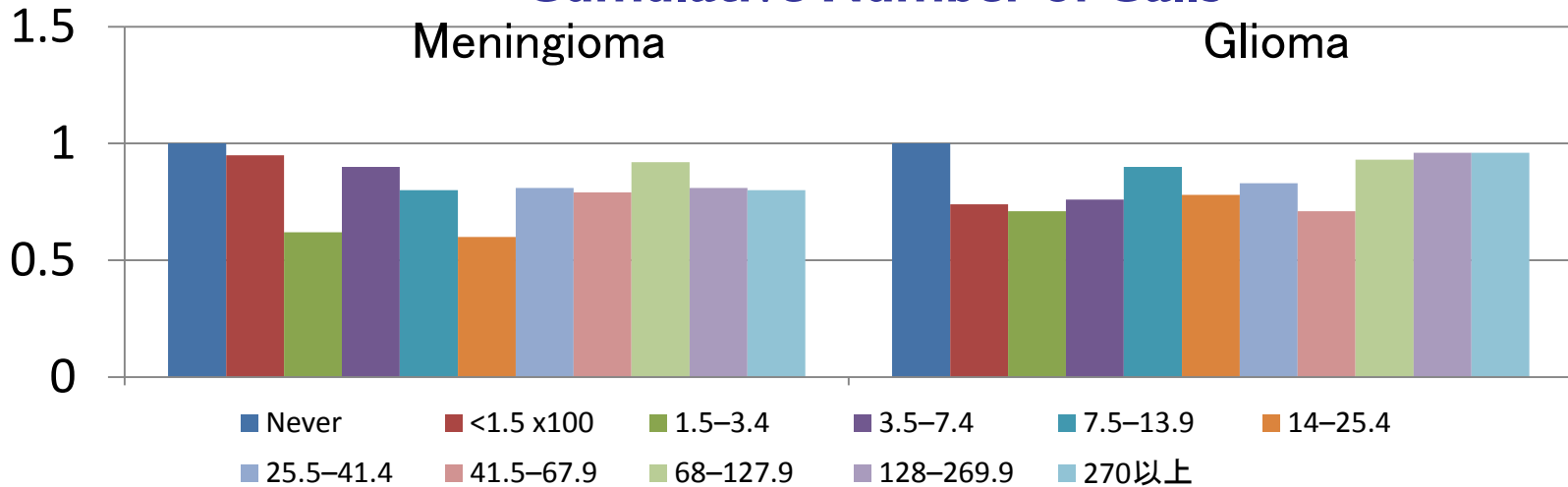
	Case (%)	Control (%)	OR (95%CI)
non-user	1042 (38%)	1078 (36%)	1.00
regular user	1666 (62%)	1894 (64%)	0.81 (0.70 – 0.94)

Brain tumor risks of regular mobile phone users:

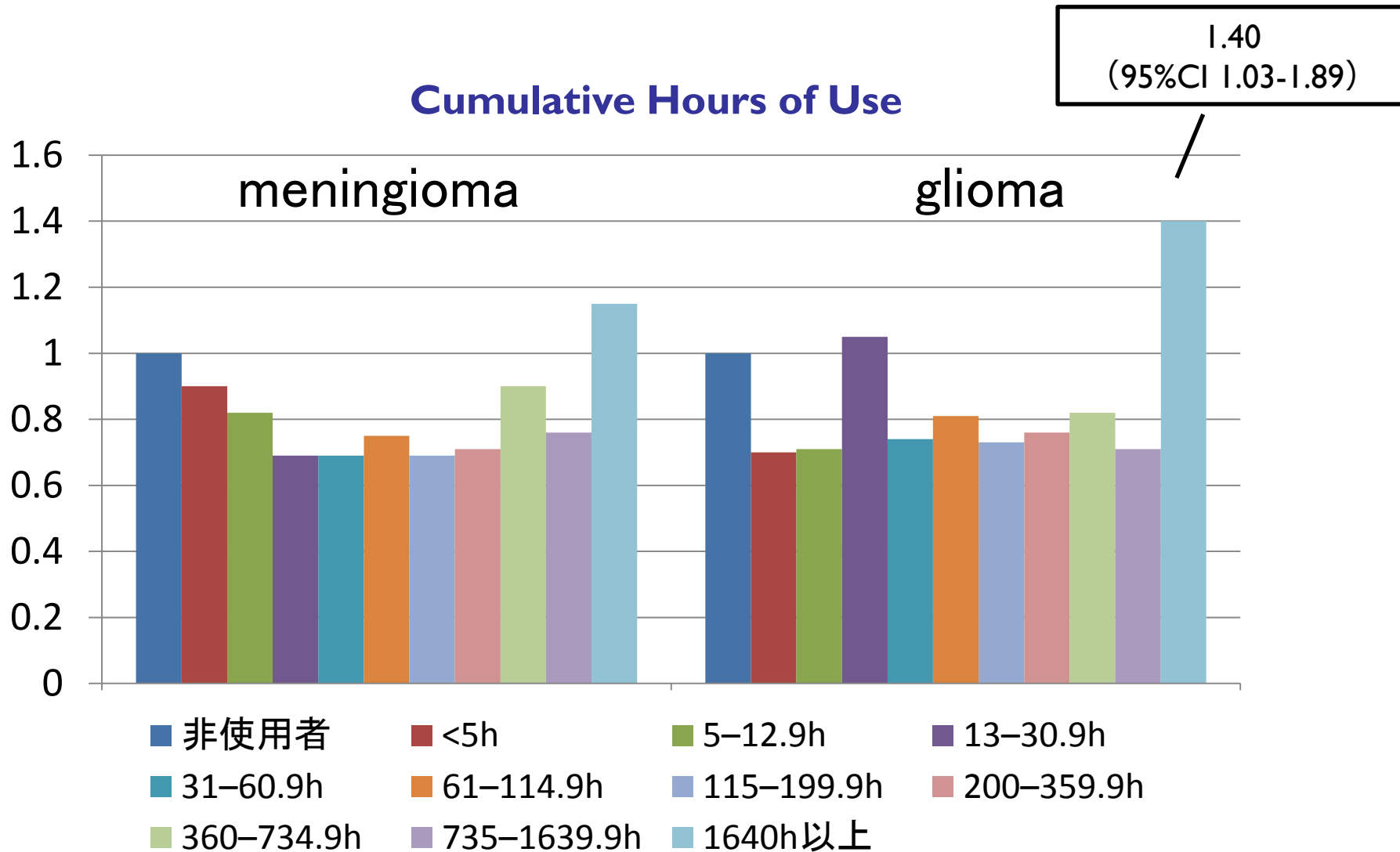
Cumulative Years of Use



Cumulative Number of Calls



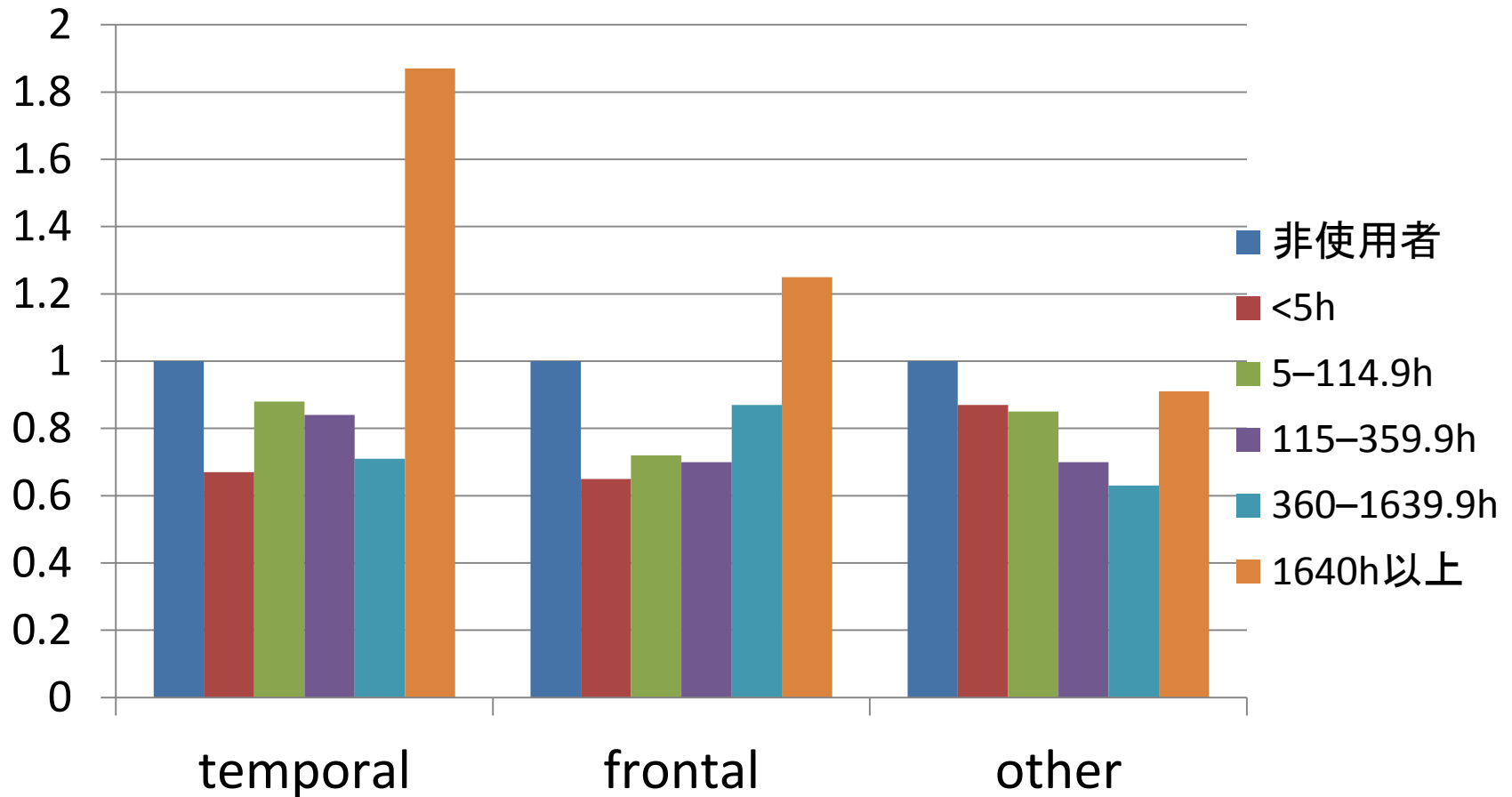
Brain tumor risks of regular mobile phone users:



Brain tumor risks of regular mobile phone users:

Glioma:

Location of tumor and Cumulative Hours of Use



Summary of the study results

- 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), possibly reflecting participation bias or other methodological limitations.
- No elevated OR was observed 10 years after first phone use (glioma: OR 0.98; 95% CI 0.76–1.26; meningioma: OR 0.83; 95% CI 0.61–1.14).
- ORs were <1.0 for all deciles of lifetime number of phone calls and nine deciles of cumulative call time. In the 10th decile of recalled cumulative call time, ≥ 1640 h, the OR was 1.40 (95% CI 1.03–1.89) for glioma, and 1.15 (95% CI 0.81–1.62) for meningioma; but there are implausible values of reported use in this group.
- ORs for glioma tended to be greater in the temporal lobe than in other lobes of the brain, but the CIs around the lobe-specific estimates were wide.
- ORs for glioma tended to be greater in subjects who reported usual phone use on the same side of the head as their tumour than on the opposite side.

Conclusion

- Overall, no increase in risk of glioma or meningioma was observed with use of mobile phones.
- There were suggestions of an increased risk of glioma at the highest exposure levels, but biases and error prevent a causal interpretation.
- The possible effects of long-term heavy use of mobile phones require further investigation.

Pooled analysis of case-control studies on malignant brain tumours and the use of mobile and cordless phones including living and deceased subjects Hardell et al. (2011)

- Pooled analysis of two case-control studies with 1,251 cases (diagnosed during 1997-2003) and 2,438 controls
- The risk increased with latency period and cumulative use in hours for both mobile and cordless phones.
- Highest risk was found for the most common type of glioma, astrocytoma, yielding in the >10 year latency group for mobile phone use odds ratio (OR) = 2.7, 95% confidence interval (CI) = 1.9-3.7 and cordless phone use OR = 1.8, 95% CI = 1.2-2.9.
- In conclusion, an increased risk was found for glioma and use of mobile or cordless phone. The risk increased with latency time and cumulative use in hours and was highest in subjects with first use before the age of 20.

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

The INTERPHONE Study Group (2011)

- 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.

Overall risks of acoustic neuroma among regular users

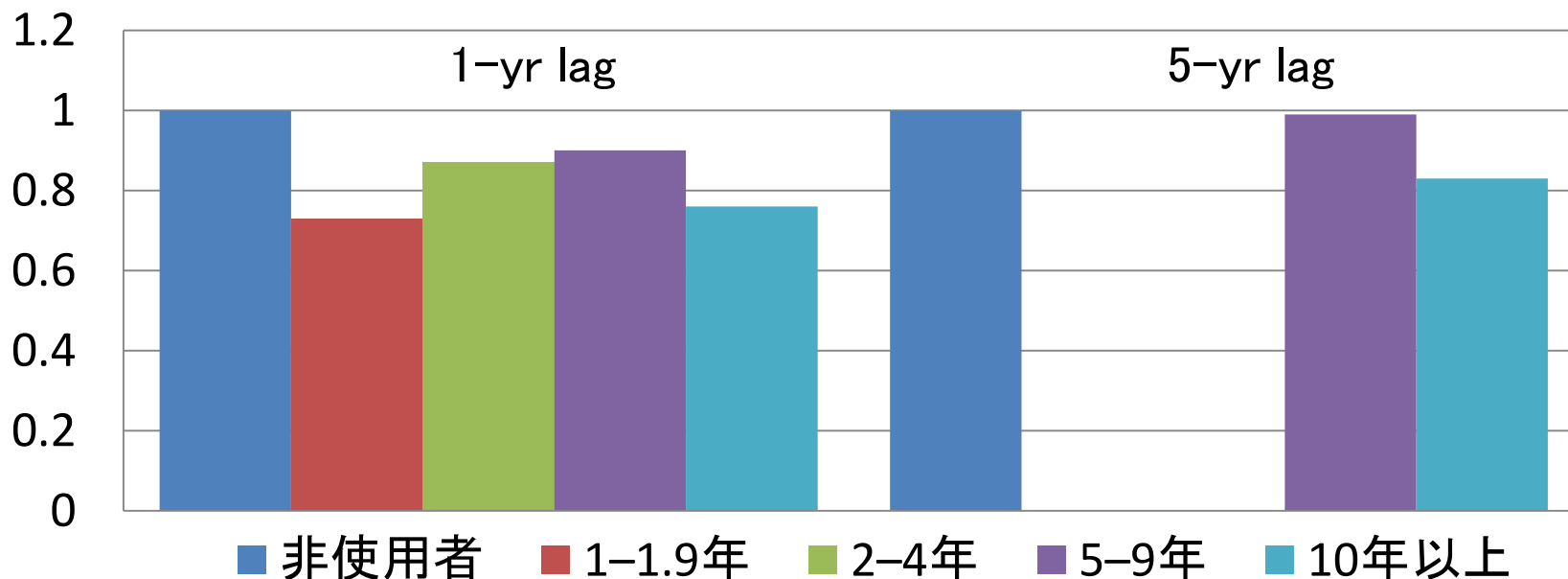
1-yr lag before diagnosis

	Case (%)	Control (%)	OR (95%CI)
non-user	462 (%)	837 (%)	1.00
regular user	643 (%)	1308 (%)	0.85 (0.69 – 1.04)

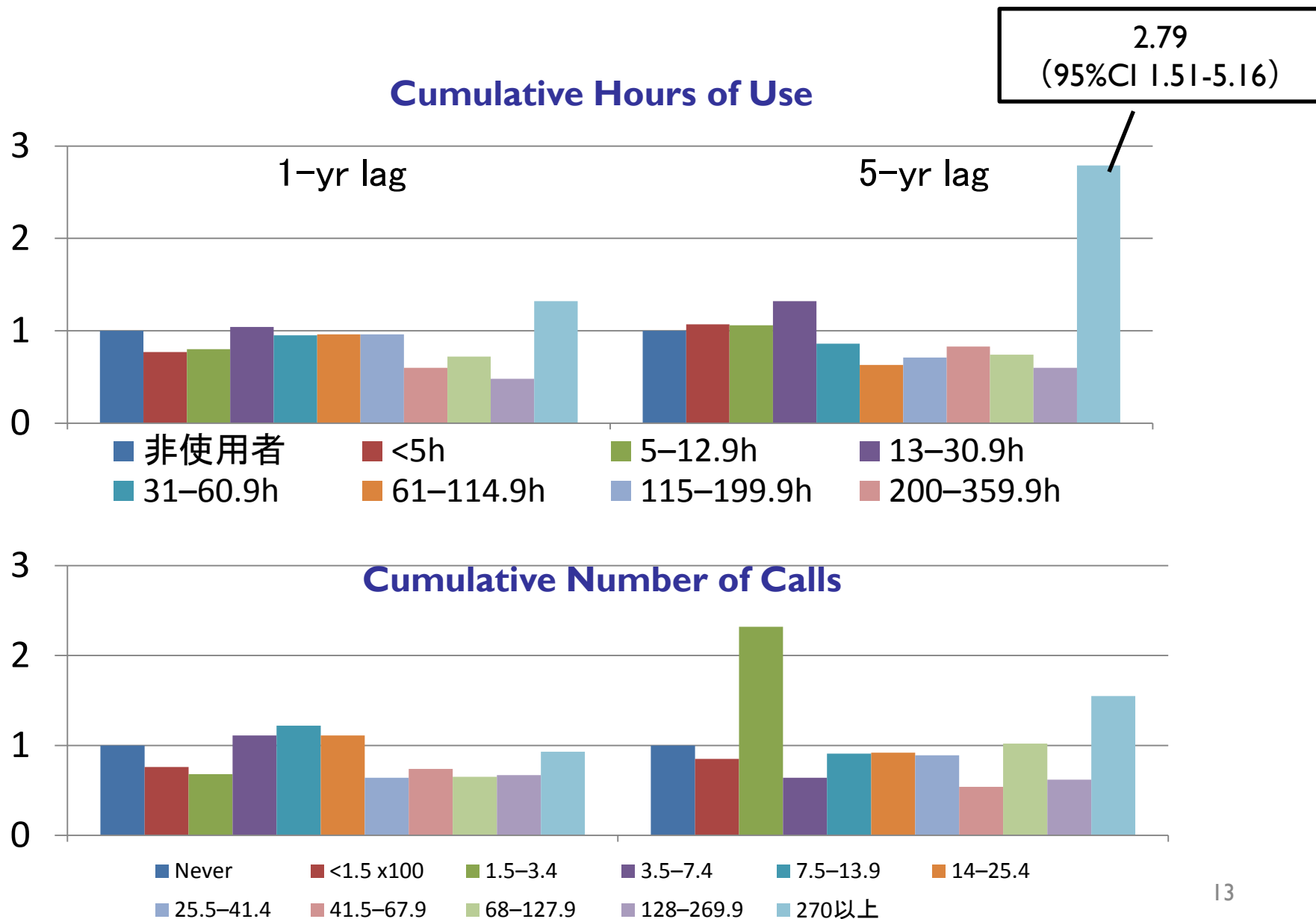
5-yr lag before diagnosis

	Case (%)	Control (%)	OR (95%CI)
non-user	801 (%)	1560 (%)	1.00
regular user	304 (%)	585 (%)	0.95 (0.77 – 1.17)

Cumulative Years of Use

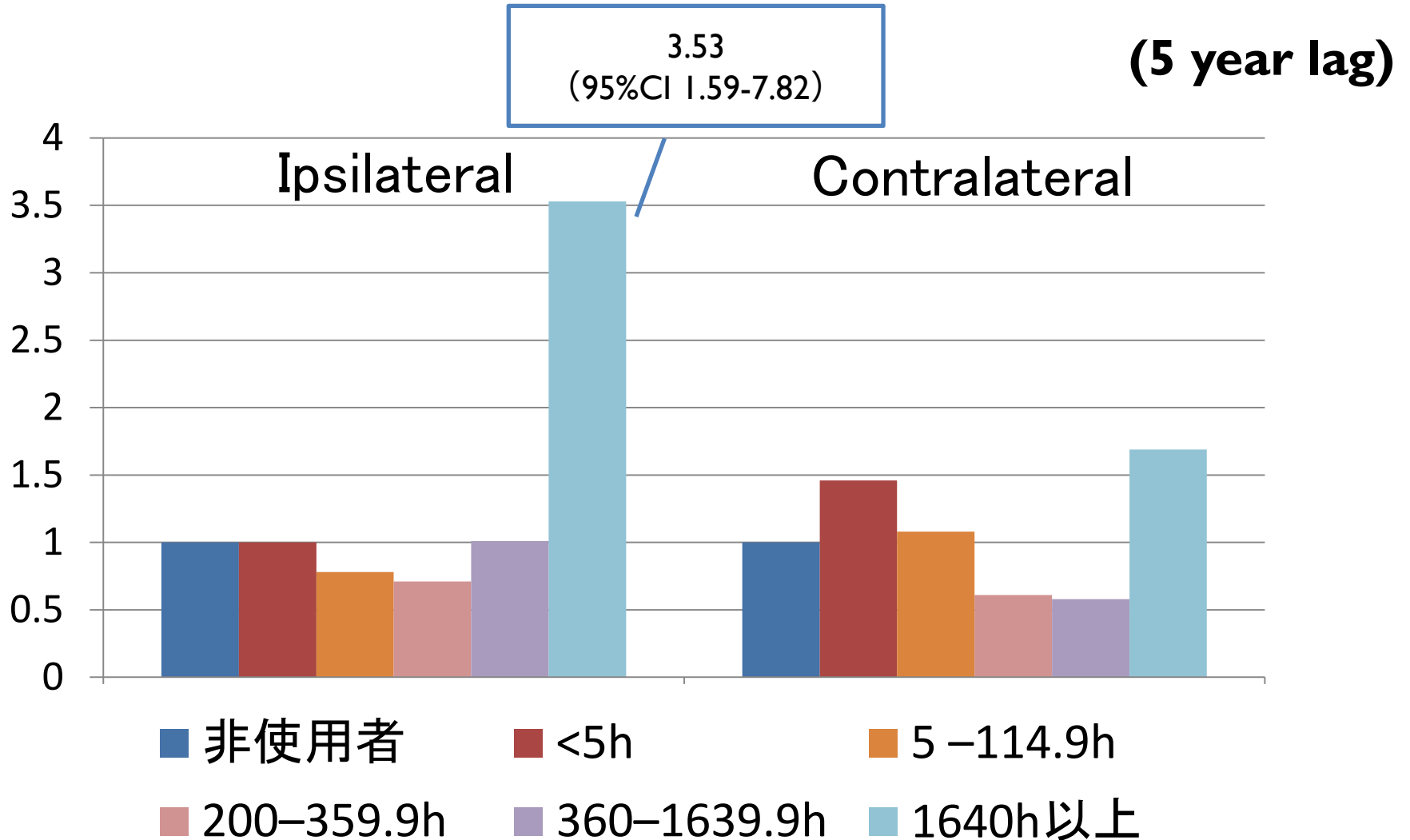


Acoustic neuroma risks of regular mobile phone users



Acoustic neuroma risks of regular users

Side of use & Cumulative Hours of Use



A Case-Case Study of Mobile Phone Use and Acoustic Neuroma Risk in Japan

Sato et al. (2011)

- 787 cases among 1589 cases in 22 hospitals
- The overall risk ratio was 1.08 (95% CI, 0.93 –1.28) for regular mobile phone use until 1 year and 1.14 (0.96–1.40) for regular mobile phone use until 5 years before diagnosis.
- A significantly increased risk was identified for mobile phone use for >20 min/day on average, with risk ratios of 2.74 at 1 year before, and 3.08 at 5 years before diagnosis.
- the possibilities of detection and recall biases
 - Cases with ipsilateral combination of tumor location and more frequently used ear were found to have tumors with smaller diameters,
 - analysis of the distribution of left and right tumors suggested an effect of tumor-side-related recall bias for recall of mobile phone use at 5 years before diagnosis.
- However, we could not conclude that the increased risk was entirely explicable by these biases, leaving open the possibility that mobile phone use increased the risk of acoustic neuroma.

- The Working Group concluded that there is **“limited evidence in humans”** for the carcinogenicity of RFEMF, based on positive associations between glioma and acoustic neuroma and exposure to RF-EMF from wireless phones.
- A few members of the Working Group considered the current evidence in humans **“inadequate”**. In their opinion there was inconsistency between the two case-control studies and a lack of an exposure-response relationship in the INTERPHONE study results; no increase in rates of glioma or acoustic neuroma was seen in the Danish cohort study, and up to now reported time trends in incidence rates of glioma have not shown a parallel to temporal trends in mobile phone use.

IARC: SCIENTIFIC REVIEW AND EVALUATION

The evidence relevant to carcinogenicity from **studies in humans** is classified into one of the following categories:

- **Sufficient evidence of carcinogenicity:** The Working Group considers that a causal relationship has been established between exposure to the agent and human cancer. That is, a positive relationship has been observed between the exposure and cancer in studies in which chance, bias and confounding could be ruled out with reasonable confidence. A statement that there is *sufficient evidence* is followed by a separate sentence that identifies the target organ(s) or tissue(s) where an increased risk of cancer was observed in humans. Identification of a specific target organ or tissue does not preclude the possibility that the agent may cause cancer at other sites.
- **Limited evidence of carcinogenicity:** A positive association has been observed between exposure to the agent and cancer for which a causal interpretation is considered by the Working Group to be credible, but chance, bias or confounding could not be ruled out with reasonable confidence.
- **Inadequate evidence of carcinogenicity:** The available studies are of insufficient quality, consistency or statistical power to permit a conclusion regarding the presence or absence of a causal association between exposure and cancer, or no data on cancer in humans are available.
- **Evidence suggesting lack of carcinogenicity:**

携帯電話使用と頭頸部腫瘍の疫学研究 IARC評価（2011年）以降の文献

PubMed

- ✓ “case-control” or “cohort” or “prospective”
- ✓ “cancer” or “brain tumor”
- ✓ “mobile phone” or “cell phone”
- ✓ 2011年以降（14年7月5日まで）、English・Japanese



- 総説（レビュー） 5編
- 原著
 - Sweden、Örebro groupによる脳腫瘍・シュワン細胞腫の症例対照研究 7編
 - 他のグループによる脳腫瘍・シュワン細胞腫の症例対照研究 3編
 - 脳腫瘍・他のがんの前向き研究 7編
 - 小児の脳腫瘍・他のがんの症例対照研究 2編
- 意見、コメント

Epidemiological evidenceの程度 (limited vs insufficient) に対するdebate

- Swerdlow AJ, Feychting M, Green AC, Kheifets L, Savitz DA; International Commission for Non-Ionizing Radiation Protection Standing Committee on Epidemiology. Mobile phones, brain tumors, and the Interphone Study: where are we now? Environ Health Perspect. 2011 Nov;119:1534-8.

1. INTERPHONE研究の解釈を巡る問題点

- 質問票が電子情報のみ
- 参加率のばらつき
- 携帯ユーザー群でのreduced risk
 - ✓ Non-response bias
 - ✓ prodromal symptomsのある者が使用しない
- ヘビーユーザー群でのrecallの信頼性
(特に、症例群での長期記憶に関するpositive biasとHardellらの研究の問題点の指摘)
- 腫瘍の解剖学的位置との関連性
 - ✓ 同側性/lobe解析とバイアス、量反応性の欠如
 - ✓ 腫瘍位置の曝露レベル解析での関連性の欠如
(含、日本の研究成果)

2. 他のrelevantなエビデンス

- ◆ INTERPHONEと同じinterview-basedの症例対照研究の限界の指摘
- ① 職業曝露あるいは居住環境曝露の疫学研究
- ② 携帯電話使用者データベースとがん登録データベースのリンケージ研究 (症例対照・コホート)
- ③ 脳腫瘍罹患率の時系列トレンド解析

症例対照研究でのrecall bias

- INTERPHONEでの3つの研究
 - J Expo Sci Environ Epidemiol. 2006 Jul;16(4):371-84.
 - Occup Environ Med. Apr 2006; 63(4): 237–243.
 - Recall bias in the assessment of exposure to mobile phones. J Expo Sci Environ Epidemiol. 2009 May;19(4):369-81.
- 6センターの症例212、対照296のインタビューと通信記録を比較
- 5センターは、in/out両方が通信記録に含まれる
- 自己申告の通話時間or回数／記録された時間or回数 比

Table 6. Ratio of self-reported to operator-recorded numbers and duration of calls by time period before interview.より、一部転載

Cases				Controls			P for case/control
years	N	ratio	95%CI	N	ratio	95%CI	
≤1	191	1.35	1.12-1.62	249	1.42	1.21-1.67	0.66
1-2	167	1.47	1.20-1.80	258	1.41	1.21-1.65	0.81
2-3	108	1.79	1.37-2.34	197	1.36	1.14-1.63	0.07
3-4	56	2.05	1.36-3.08	107	1.44	1.11-1.87	0.11
>4	36	2.16	1.30-3.61	57	1.57	1.18-2.08	0.21
trend P<0.001				trend P=0.60			

Figure 2. Bland–Altman plot: ratio of self-reported to recorded duration of calls against mean duration of calls (log transformed); lines indicate the mean ratio, the 95% limits of agreement ($\pm 2 \times SD$), and the regression line; for (a) cases and (b) controls.
を転載

Conclusion

- Interphone is an impressively large study with multiple indices of exposure. However, it has some methodological deficits, **largely inevitable in recall-based case-control studies**, which limit interpretation of its findings. Such evidence as it provides, combined with the results of biological and animal studies, other epidemiologic studies, and brain tumor incidence trends, suggest that within the first 10–15 years after first mobile phone use there is unlikely to be a material increase in risk of adult brain tumors resulting from mobile phone use. At present there are no data on risk of childhood tumors.
- The deficiencies of exposure measurement, because of recall misclassification in studies such as Interphone, and because of misidentification of users in records-based studies such as the published cohorts, leave it doubtful that either study type could reliably detect a small effect, if one existed. Both for this reason and because research cannot in principle prove the complete absence of an effect but only place limits on its possible magnitude, there is bound to remain some uncertainty for many years to come. The limited duration of data yet available, which is mainly for up to 10 years of exposure and to a lesser extent for a few years beyond this, also leave uncertainty because of the potential for long lag period effects, especially for meningioma, which is generally slower growing than glioma. The possibility of a small or a longer-term effect thus cannot be ruled out. Nevertheless, although one cannot be certain, the trend in the accumulating evidence is increasingly against the hypothesis that mobile phone use causes brain tumors.

研究結果のheterogeneityを巡る議論

Susanna Lagorio, Martin Roosli. Mobile Phone Use and Risk of Intracranial Tumors: A consistency analysis. *Bioelectromagnetics* 35:79-90 (2014)

- 2012年までに出版された頭蓋内腫瘍と携帯電話使用の疫学研究のメタ解析
- 22論文の47の結果（神経膠腫17、髄膜腫15,聴神経鞘腫 15)
- 5つの組み合わせでそれぞれ計算した10年以上使用の統合相対危険度は、神経膠腫1.19～1.40、髄膜腫0.98～1.11,聴神経鞘腫 1.14～1.33で、神経膠腫と聴神経鞘腫には、高いheterogeneityが認められた。
- Heterogeneityは、“studygroup”（US、Finnish, Örebro, INTERPHONE-国別, INTERPHONE-全体, Danish cohort）

Repacholi MH, et al. Systematic review of wireless phone use and brain cancer and other head tumors. *Bioelectromagnetics*. 2012 Apr;33(3):187-206.

- 2010年11月13日までに出版された頭蓋内腫瘍と携帯電話使用の疫学研究（と動物実験）96論文のメタ解析

	RR (95%CI)
time since start use (alone)	1.13 (0.95-1.35)
Study group	
US studies	0.75 (0.37-1.50)
Örebro series	1.68 (0.87-3.23)
INTERPHONE	0.68 (0.38-1.24)
DK cohort	0.84 (0.46-1.55)
time since start use	1.06 (0.94-1.18)

IARC評価後のSweden、Örebro group(Hardell et al.)の論文

1. Hardell L, Carlberg M, Söderqvist F, Mild KH. Case-control study of the association between malignant brain tumours diagnosed between 2007 and 2009 and mobile and cordless phone use. *Int J Oncol*. 2013 Dec;43(6):1833-45.
2. Hardell L, Carlberg M, Söderqvist F, Mild KH. Pooled analysis of case-control studies on acoustic neuroma diagnosed 1997-2003 and 2007-2009 and use of mobile and cordless phones. *Int J Oncol*. 2013 Oct;43(4):1036-44.
3. Carlberg M, Söderqvist F, Hansson Mild K, Hardell L. Meningioma patients diagnosed 2007--2009 and the association with use of mobile and cordless phones: a case--control study. *Environ Health*. 2013 Jul 19;12(1):60.
4. Hardell L, Carlberg M, Hansson Mild K. Use of mobile phones and cordless phones is associated with increased risk for glioma and acoustic neuroma. *Pathophysiology*. 2013 Apr;20(2):85-110.
5. Hardell L, Carlberg M. Use of mobile and cordless phones and survival of patients with glioma. *Neuroepidemiology*. 2013;40(2):101-8.
6. Carlberg M, Hardell L. On the association between glioma, wireless phones, heredity and ionising radiation. *Pathophysiology*. 2012 Sep;19(4):243-52.
7. Hardell L, Carlberg M, Hansson Mild K. Re-analysis of risk for glioma in relation to mobile telephone use: comparison with the results of the Interphone international case-control study. *Int J Epidemiol*. 2011 Aug;40(4):1126-8.

Hardell L, Carlberg M, Söderqvist F, Mild KH. Case-control study of the association between malignant brain tumours diagnosed between 2007 and 2009 and mobile and cordless phone use. *Int J Oncol.* 2013 Dec;43(6):1833-45.

- スウェーデンで2007-2009年に新たに診断された悪性脳腫瘍症例1334例から死亡例520等を除いた683例のうち593例に電話インタビュー。対照1368例は、population registryから性・年齢をマッチ（参加率85%）
- 曝露は、アナログ、デジタル（2G、3G）、コードレス等に分類して解析
- This study confirmed previous results of an association between mobile and cordless phone use and malignant brain tumours. (latencyを25年まで考慮)

Hardell L, Carlberg M, Söderqvist F, Mild KH. Pooled analysis of case-control studies on acoustic neuroma diagnosed 1997-2003 and 2007-2009 and use of mobile and cordless phones. *Int J Oncol.* 2013;43(4):1036-44.

- スエーデンで、1997-2003年に一部地域で診断された聴神経鞘腫症例（年齢20-80歳）と2007-09年に全国で診断された聴神経鞘腫症例（18-75歳）を合わせた316例（93%）、および性、年齢、地域をマッチした対照3530例（87%）をpopulation registryから。
- 曝露情報は電話インタビューし、アナログ、デジタル（2G、3G）、コードレス等に分類して解析。

Pettersson D, Mathiesen T, Prochazka M, Bergenheim T, Florentzson R, Harder H, Nyberg G, Siesjö P, Feychting M. Long-term mobile phone use and acoustic neuroma risk. *Epidemiology*. 2014 Mar;25(2):233-41.

- 2002～07年にスウェーデン全国で新たに診断された聴神経鞘腫(20-69歳)451例(83%)と、population registryから性、年齢、地域をマッチして選んだ対照1095例(65%)。
- 郵送質問票により情報を収集、Non-responder調査も実施
- 携帯使用者のOR1.18 (95%CI 0.88-1.59)
- 10年超使用のOR1.11(0.76-1.61)、腫瘍と同側性使用のOR0.98 (0.68-1.43)、ヘビーユーザー(≥680h)のOR1.46(0.98-2.17)
- 組織学的診断あり症例のみの解析では、すべてのORが1に近づき、ヘビーユーザーでは1.14 (0.63-2.07)。コードレス電話でも同様の結果
- 聴力損失など聴神経鞘腫による症状に起因する携帯使用側の変更を考慮した解析では、対側使用のリスクが上昇し、著明なバイアスの可能性を示唆。
- The findings do not support the hypothesis that long-term mobile phone use increases the risk of acoustic neuroma. The study suggests that phone use might increase the likelihood that an acoustic neuroma case is detected and that there could be bias in the laterality analyses performed in previous studies.

Coureau G, Bouvier G, Lebailly P, Fabbro-Peray P, Gruber A, Leffondre K, Guillamo JS, Loiseau H, Mathoulin-Pélissier S, Salamon R, Baldi I. Mobile phone use and brain tumours in the CERENAT case-control study. *Occup Environ Med.* 2014; ;71:514–522.

- フランス4地域での携帯電話使用と成人(16歳+)の神経膠腫253例、髄膜腫194例の症例対照研究(2004–06)。
- 対照は、選挙人名簿から性・年齢をマッチした892例
- 参加率：症例73%、対照45%
- 携帯電話使用は、インタビューで収集
- 携帯電話使用者と非使用者全体の比較では、神経膠腫のオッズ比1.24(95% CI 0.86-1.77)、髄膜腫のOR=0.90(0.61-1.34)
- 推定生涯使用時間を用いたヘビーユーザー(≥896h)では、神経膠腫OR=2.89(1.41-5.93)、髄膜腫OR=2.57(1.02 -6.44)
- 推定生涯コール数を用いたヘビーユーザー(≥18360)では、神経膠腫OR=2.10(1.03-4.31)、髄膜腫OR=1.73(0.64-4.63)
- These additional data support previous findings concerning a possible association between heavy mobile phone use and brain tumours.

Frei P, et al. Use of mobile phones and risk of brain tumours: update of Danish cohort study. *BMJ*. 2011 ;343:d6387.

Schüz J, et al. Long-term mobile phone use and the risk of vestibular schwannoma: a Danish nationwide cohort study. *Am J Epidemiol*. 2011 ;174:416-22.

- デンマークの住民登録をベースに、1925年生まれ以降で30歳以上の国民全員を対象
- 1982-95年の携帯電話利用のデータベースとリンケージし、追跡。
- 国民がん登録データとマッチしてがん罹患を把握
- 社会経済因子を含む要因を把握し、log linear Poisson回帰モデルで、年齢、暦年、教育、収入を調整
- 追跡期間1990-2007年で、358403人の携帯電話利用者、計380万人年から、10729例の中枢神経系腫瘍が発生。携帯使用による罹患リスクは、男女とも、ほぼ1.0であった。また、13年以上の携帯利用者に限定した解析では、罹患率比は、男性1.03(95%CI:0.83-1.27)、女性0.91(0.41-2.04)
- 神経膠腫については、10年以上使用の罹患率比が男性1.04(0.85-1.26)、女性1.04(0.56-1.95)、髄膜腫は、それぞれ、0.90(0.57-1.42)、0.93(0.46-1.87)
- 使用年数や腫瘍の位置による関連性は認めなかった
- 聴神経鞘腫では、11年以上と未満使用の罹患率比が男性0.87(0.52-1.46)であった（女性は11年以上使用の腫瘍発生なし、期待値1.6）。

Deltour I, Auvinen A, Feychting M, Johansen C, Klaeboe L, Sankila R, Schüz J. Mobile phone use and incidence of glioma in the Nordic countries 1979-2008: consistency check. *Epidemiology*. 2012; 23:301-7.

- デンマーク、フィンランド、ノルウェー、スエーデンで1979年～2008年に原発性の神経膠腫と診断された症例数（年齢20-79歳）を、各国のがん登録データベースから入手。男女別に、10万人年あたりの年平均年齢調整罹患率を計算。
- 35250例が期間中に診断され、年平均の神経膠腫の数は、1700万人に対して1175（年齢20-79）。スエーデンで約40%、他は20%づつ。
- 年齢調整罹患率（10万人年あたり）は、男性8.6、女性6.0で、年齢とともに上昇。
- 著明な時系列変化は認められず、高齢層で緩やかな増加、若い層で1980年代後半以降減少（フィンランドとノルウェーは減少なし）。

Benson VS, Million Women Study Collaborators. Mobile phone use and risk of brain neoplasms and other cancers: prospective study. *Int J Epidemiol*. 2013;42:792-802.
Benson VS, et al. Authors' response to: the case of acoustic neuroma: comment on mobile phone use and risk of brain neoplasms and other cancers. *Int J Epidemiol*. 2014;43:275.

- 英国で、1996-2001年に130万人の中年女性をリクルートして実施された乳がん検診プログラムMillions Women study（前向きコホート研究）の参加者のうち、791710人を対象。
- 1999年と2005年に、携帯電話使用の有無について質問し、Cox回帰分析を実施
- 7年間の追跡期間中に、51680例の（invasive）がん罹患、1261例の頭蓋内中枢神経腫瘍罹患があった
- 携帯電話使用の有無による比較で、頭蓋内中枢神経腫瘍罹患のリスクは、RR1.01(95%CI 0.90–1.14,)であり、腫瘍の種類や位置別でも、リスクの上昇はなかった
- 10年以上使用のリスクは、神経膠腫 0.78, 95% CI.0.55–1.10、髄膜腫:1.10, 95% CI.0.66–1.84) 。
- 聴神経鞘腫については、この段階での解析では、10年以上使用の RR.2.46（95% CI.1.07–5.64, P.0.03）であったが、その後の期間を延長した解析で、1.17（0.60-2.27）であった。

Aydin D, Feychting M, Schüz J, Tynes T, Andersen TV, Schmidt LS, Poulsen AH, Johansen C, Prochazka M, Lannering B, Klæboe L, Eggen T, Jenni D, Grotzer M, Von der Weid N, Kuehni CE, Rösli M. Mobile phone use and brain tumors in children and adolescents: a multicenter case-control study. *J Natl Cancer Inst.* 2011;103:1264-76.

- デンマーク、スウェーデン、ノルウェイ、スイスで実施された症例対照研究（CEFALO研究）で、2004-08年に脳腫瘍と診断された7-19歳の小児と青年が対象
- 352症例（参加率83%）と646対照（71%）とその両親にインタビューを実施。症例は、がん登録データベース＋臨床医からの報告、対照は、population registriesから、年齢・性・地域をマッチして選定
- 携帯電話使用のOR 1.36(95%CI 0.92-2.02)で、少なくとも5年以上使用していても、非使用者と比較したリスクの上昇なし（OR 1.26, 95% CI 0.70-2.28)
- 事業者の記録を得られた者での解析では、使用期間、累積コール時間、コール数との関連は認められなかったが、契約期間がもっとも長い群でのORの有意な増加があった
- The absence of an exposure–response relationship either in terms of the amount of mobile phone use or by localization of the brain tumor argues against a causal association

現在進行中の国際疫学プロジェクト

COSMOS研究

This international cohort study on mobile phone use and health (COSMOS) is a long term project to investigate possible health effects associated with long term mobile phone use. COSMOS is an international consortium of five European countries (UK , Denmark , Sweden , Finland , and the Netherlands) which together will characterize the mobile phone use (through operator traffic records and a self-reported questionnaire) and follow the health of at least 200,000 mobile phone users (over 18 years of age) for 20 to 30 years. Health outcomes to be studied include risk of cancers, benign tumors, neurological and cerebro-vascular diseases, as well as changes in occurrence of specific symptoms over time, such as headache and sleep disorders.

<http://www.thecosmosproject.org/>

Mobi-Kids研究

The overall objective of the MOBI-KIDS project is to assess the potential link between the risk of brain tumors and environmental risk factors, including use of communication devices. Over a period of five years, nearly 1.000 young people aged 10 to 24 years with brain tumours and about 2.000 healthy persons will be invited to participate in the study. Participants will be asked information (by questionnaire) about personal risk factors (such as age and gender), residential history, history of environmental exposures, use of communication technologies and personal and family health information. MOBI-KIDS is now underway in 14 countries. Case ascertainment is expected to finish at the end of 2014. Results will be available in 2015/2016.

<http://www.crealradiation.com/index.php/en/mobi-kids-home>