**Supplementary Material for Long-term Mobile Phone Use and Acoustic Neuroma Risk**

David Pettersson, Tiit Mathiesen,Michaela Prochazka, Tommy Bergenheim, Rut Florentzson, Henrik Harder, Gunnar Nyberg, Peter Siesjö, Maria Feychting

**Content**

**eAppendix:** Selected sections of the study questionnaire covering key analytic variables

**eTable 1:** Odds ratios for acoustic neuroma according to different characteristics of mobile and cordless phone use stratified on histological confirmation of the tumor

**eTable 2:** Self-reported reasons for changing side of mobile phone use

**eTable 3:** Self-reported time of change of preferred side of mobile phone use in relation to the reference date

## **eAppendix 1. Study questionnaire – selected sections (translated from Swedish)**

## **Information about mobile phone use**

# OBS! By mobile phones we do NOT mean:

* Home cordless telephones
* Fixed car telephones
* Bag telephones with the antenna on the bag
* Satellite telephones

## **69. Have you ever talked on a mobile phone?**

🗆Yes 🗆No, go to question***85***

## **70. Have you ever talked on a mobile phone *regularly*?** *By regularly we mean having made or received calls at least once a week on average, for a period of 6 months or more.*

🗆Yes 🗆No, Go to question***85***

## **71. What year did you start talking on a mobile phone *regularly*?**

Year: |\_\_|\_\_|\_\_|\_\_|

**72. Do you still talk on a mobile phone *regularly*?**

🗆Yes

🗆No When did you stop talking on a mobile phone? Year: |\_\_|\_\_|\_\_|\_\_|

## j0334440

## **73. The following questions address your past and current use of mobile phones.** *If you cannot recall the exact answer, please give your best estimate. Answer each question for every year specified in the question.*

## Average number of calls

## **How many times did you talk on a mobile phone in the following years?**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 1-2 calls  *per* *week* | 3-6 calls  *per* *week* | 1-4 calls  *per* *day* | 5-10 calls  *per* *day* | 10 or more calls *per* *day* | *Not relevant* |
| 1987 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 |
| 1990 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 |
| 1993 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 |
| 1996 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 |
| 1999 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 |
| 2002 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 |
| 2005 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 |
| 2007 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 |

## Average calling time

## **How many minutes did you talk on a mobile phone in the following years?**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Less than 5 minutes  *per* *week* | 5-10 minutes  *per* *week* | 1-10 minutes  *per* *day* | 11-30 minutes *per* *day* | 31-60 minutes  *per* *day* | 60 or more minutes *per day* | *Not relevant* |
| 1987 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 |
| 1990 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 |
| 1993 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 |
| 1996 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 |
| 1999 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 |
| 2002 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 |
| 2005 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 |
| 2007 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 |

## Hands free devices or speakerphone function

## *E.g. use of wired earpieces/headsets, wireless earpieces/headset/Bluetooth, speakerphone function, hands free car kits etc.*

**How often did you use a hands free device with your mobile phone in the following years?**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | Never / almost never | Less than half the time | About half the time | More than half the time | Always / almost always | *Not relevant* |
| 1987 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 |
| 1990 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 |
| 1993 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 |
| 1996 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 |
| 1999 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 |
| 2002 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 |
| 2005 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 |
| 2007 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 |

j0383362

## **Mobile phone-calendar**

We would appreciate if we could have some more detailed information about your mobile phone use. We therefore we ask you to fill out the mobile phone calendar on the next page for the periods you have been using mobile phones regularly (by regularly we mean having made or received calls at least once a week on average, for a period of 6 months or more). In the calendar we would like you to focus on the subscriptions/prepaid cards you have had. After the calendar there are some supplementary questions. If you have difficulties remembering when you started or stopped using a certain subscription/prepaid card it may help to think about different events that may have given you reason to change, for example change to a new phone that came with a subscription/prepaid card in connection with birthdays, change of job, etc.

Fill out the mobile phone-calendar according to the following instructions and examples:

* Start with the oldest subscription/prepaid card.
* Specify the year you started using the subscription/prepaid card. If it is difficult to remember the exact year, you can state an approximate interval, for example: 1995-1996.
* State the year or approximate years you stopped using the subscription/prepaid card. If you still use the subscription/prepaid card, then enter the current year.
* Name the operator that was used, for example Telia, Comviq/Tele2, Europolitan, Vodafone, Telenor, 3 (Tre), Djuice.
* Specify the phone number.
* Specify the type of phone that was used with the subscription/prepaid card – that is, if it was an NMT, GSM or 3G phone:

- NMT phone numbers starts with 01

- GSM phone numbers starts with 07

- 3G (third generation mobile phones) phone numbers starts with 07, but central features are also streamed video and video calls.

⇨ Then answer the supplementary questions for the subscriptions/prepaid cards you have had.

***Example:***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Subscription** | **Start year** | **Stop year** | **Operator** | **Phone number** | **NMT/GSM/3G** |
| **1** | **1989-1990** | **1993** | **Telia** | **010-111 11 11** | **NMT** |
| **2** | **1993** | **1995** | **Europolitan** | **073-222 22 22** | **GSM** |
| **3** | **1995** | **2005** | **Tele2/Comviq** | **073-333 33 33** | **GSM** |
| **4** | **2005** | **2007** | **Comviq** | **073-444 44 44** | **3G** |

***Mobile phone-calendar***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Subscription** | **Start year** | **Stop year** | **Operator** | **Phone number** | **NMT/GSM/3G** |
| **1** |  |  |  |  |  |
| **2** |  |  |  |  |  |
| **3** |  |  |  |  |  |
| **4** |  |  |  |  |  |
| **5** |  |  |  |  |  |
| **6** |  |  |  |  |  |
| **7** |  |  |  |  |  |
| **8** |  |  |  |  |  |
| **9** |  |  |  |  |  |
| **10** |  |  |  |  |  |
| **11** |  |  |  |  |  |
| **12** |  |  |  |  |  |

**74. Were any of these subscriptions/prepaid cards *not* held in your name?**

🗆Yes, which of them? Specify the number/numbers (1-10) from the calendar above:

🗆No, they were all held in my name

**75. What proportion of the total calling time was *outgoing calls*, that is, calls that you made; estimate an average for all subscriptions/prepaid cards you have had?**

🗆Only a small proportion (less than 20%)

🗆Less than half the time (20-39%)

🗆About half the time (40-59%)

🗆More than half the time (60-79%)

🗆Most of the called time (80% or more)

**76. Did *anyone else* use your subscription/prepaid card more than once a week on average?**

🗆Yes, which of them? Specify the number/numbers from the mobile phone calendar (1-10):

🗆No, *go to question* ***78***

**77. What proportion of the total calling time *did you* use these subscriptions/prepaid cards?** Estimate an average proportion if it concerns more than one subscription/prepaid card.

🗆Only a small proportion (less than 20%)

🗆 Less than half the time (20-39%)

🗆 About half the time (40-59%)

🗆 More than half the time (60-79%)

🗆 Most of the called time (80% or more)

## **General information about mobile phone use**

## **78. On which side of the head do you usually use a mobile phone, right or left side?** *Please give an answer even if you use a hands free device.*

🗆Always or almost always right ear

🗆More frequently the right ear

🗆Both sides equally

🗆More frequently the left ear

🗆Always or almost always left ear

**79. Have you ever changed the side of the head you usually use when talking on a mobile phone?**

🗆Yes

🗆No, *go to question* ***83***

**80. When did this change occur?**  *If you cannot remember precisely, please give your best estimate.*

Year: |\_\_|\_\_|\_\_|\_\_|

**81. On which side did you use the mobile phone before?**

🗆 Always or almost always right ear

🗆 More frequently the right ear

🗆 Both sides equally

🗆 More frequently the left ear

🗆 Always or almost always left ear

**82. Why did you change side?**

🗆Practical reasons (e.g. started using the mobile phone while writing)

🗆Hearing problems

🗆Headache

🗆Cosmetic reasons (e.g. ear piercing)

🗆Other/no particular reason

MCj03971420000[1]

**83. Are you right handed or left handed?**

🗆Right handed 🗆Left handed 🗆Use both hands equally (Ambidextrous)

**84. Considering the whole time you have been using a mobile phone regularly, where did you typically use it?**

🗆Mainly in urban areas

🗆Mainly rural areas

🗆Mainly in small town that were not pure countryside

j0396698

## **Cordless Phones**

# By cordless phones we mean DECT-phones, cordless home and work phones.

# OBS! By cordless phones we do NOT mean:

* Fixed car telephones
* Bag telephones with the antenna on the bag
* Satellite telephones
* Mobile phones

## **85. Have you ever used a cordless phone to make or receive calls, at home or at work?**

🗆Yes 🗆No, *go to question* ***91***

## **86. Have you ever used a cordless phone *regularly*?** *By regularly we mean having made or received calls at least once a week on average, for a period of 6 months or more. The question includes cordless phones both at home and at work.*

🗆Yes 🗆No, *go to question* ***91***

## **87. What year did you start talking on a cordless phone *regularly*?**

Year: |\_\_|\_\_|\_\_|\_\_|

**88. Do you still use a cordless phone *regularly?***

🗆Yes

🗆No When did you stop using cordless phones? Year: |\_\_|\_\_|\_\_|\_\_|

**89. The following questions address your past and current use of cordless phones.** *If you cannot recall the exact answer, please give your best estimate. Answer each question for every year specified in the question. Do not include the time you have spoken in an ordinary, wired telephone.*

## Average number of calls

## **How many times did you talk on a cordless phone in the following years?**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | 1-2 calls  *per* *week* | 3-6 calls  *per* *week* | 1-4 calls  *per* *day* | 5-10 calls  *per* *day* | 10 or more calls *per* *day* | *Not relevant* |
| 1987 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 |
| 1990 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 |
| 1993 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 |
| 1996 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 |
| 1999 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 |
| 2002 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 |
| 2005 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 |
| 2007 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 |

## Average calling time

## **How many minutes did you talk on a cordless phone in the following years?**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | Less than 5 minutes  *per* *week* | 5-10 minutes  *per* *week* | 1-10 minutes  *per* *day* | 11-30 minutes *per* *day* | 31-60 minutes  *per* *day* | 60 or more minutes *per day* | *Not relevant* |
| 1987 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 |
| 1990 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 |
| 1993 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 |
| 1996 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 |
| 1999 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 |
| 2002 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 |
| 2005 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 |
| 2007 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 | 🗆 |

## **90. Do you usually use a hands free device when speaking on a cordless phone?** *By hands-free we mean headset with microphone.*

🗆Yes, between which years? |\_\_|\_\_|\_\_|\_\_| - |\_\_|\_\_|\_\_|\_\_|

|\_\_|\_\_|\_\_|\_\_| - |\_\_|\_\_|\_\_|\_\_|

|\_\_|\_\_|\_\_|\_\_| - |\_\_|\_\_|\_\_|\_\_|

🗆No

j0383604

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **eTABLE 1.** Odds ratios for acoustic neuroma according to different characteristics of mobile and cordless phone use stratified on histological confirmation of the tumor | | | | | | | | |
|  | **Cases histologically confirmed** | | |  | **Cases not histologically confirmed** | | |  |
|  | **Cases** | **Controls** | **OR** |  | **Cases** | **Controls** | **OR** | ***P*(difference)a** |
|  | **(n=202)** | **(n=296)** |  | **(n=220)** | **(n=347)** |  |
|  | **No. (%)** | **No. (%)** | **(95% CI)** |  | **No. (%)** | **No. (%)** | **(95% CI)** |  |
| **Mobile phones** | | | | | | | | |
| Frequency of use |  |  |  |  |  |  |  | 0.267 |
| Never or rarelyb | 59 (29) | 86 (29) | 1.00 |  | 61 (28) | 115 (33) | 1.00 |  |
| Regular usec | 143 (71) | 210 (71) | 0.99 (0.65–1.52) |  | 159 (72) | 232 (67) | 1.39 (0.92–2.11) | 0.267 |
| Time since first regular use | | |  |  |  |  |  | 0.677 |
| < 5 years | 46 (23) | 68 (23) | 0.94 (0.56–1.57) |  | 34 (15) | 62 (18) | 1.14 (0.65–2.00) | 0.611 |
| 5 – 9 years | 55 (27) | 75 (25) | 1.11 (0.66–1.86) |  | 64 (29) | 75 (22) | 1.73 (1.05–2.86) | 0.230 |
| ≥ 10 years | 42 (21) | 67 (23) | 0.94 (0.55–1.62) |  | 61 (28) | 95 (27) | 1.29 (0.76–2.16) | 0.417 |
| 10–12 years | 18 (9) | 31 (10) | 0.83 (0.41–1.68) |  | 24 (11) | 36 (10) | 1.40 (0.73–2.68) | 0.287 |
| ≥ 13 years | 24 (12) | 36 (12) | 1.05 (0.54–2.02) |  | 37 (17) | 59 (17) | 1.21 (0.67–2.19) | 0.751 |
| Cumulative hours of used,e | |  |  |  |  |  |  | 0.794 |
| < 38 h | 30 (15) | 46 (16) | 0.97 (0.55–1.71) |  | 40 (18) | 63 (18) | 1.23 (0.70–2.14) | 0.563 |
| 38 – 189 h | 39 (20) | 59 (20) | 0.91 (0.51–1.60) |  | 34 (16) | 50 (14) | 1.39 (0.76–2.55) | 0.311 |
| 190 – 679 h | 34 (17) | 49 (17) | 1.03 (0.57–1.87) |  | 32 (32) | 58 (17) | 1.22 (0.69–2.15) | 0.692 |
| ≥ 680 h | 37 (19) | 51 (51) | 1.14 (0.63–2.07) |  | 52 (24) | 59 (17) | 1.80 (1.04–3.10) | 0.267 |
| Cumulative no. of callsd,e | |  |  |  |  |  |  | 0.792 |
| < 1100 | 33 (17) | 44 (15) | 1.07 (0.61–1.86) |  | 39 (18) | 58 (17) | 1.38 (0.80–2.38) | 0.515 |
| 1100–4400 | 35 (18) | 54 (19) | 0.86 (0.49–1.53) |  | 36 (17) | 54 (16) | 1.32 (0.74–2.38) | 0.306 |
| 4400–13850 | 42 (21) | 56 (19) | 1.08 (0.62–1.90) |  | 37 (17) | 55 (16) | 1.36 (0.79–2.34) | 0.563 |
| ≥ 13850 | 30 (15) | 51 (18) | 0.92 (0.50–1.72) |  | 45 (21) | 63 (18) | 1.50 (0.85–2.63) | 0.256 |
| **Cordless phones** | | | | | | | | |
| Frequency of use |  |  |  |  |  |  |  | 0.397 |
| Never or rarelyb | 62 (31) | 104 (35) | 1.00 |  | 62 (29) | 128 (38) | 1.00 |  |
| Regular usec | 138 (69) | 190 (65) | 1.24 (0.83–1.86) |  | 155 (71) | 213 (62) | 1.58 (1.07–2.33) | 0.398 |
| Time since first regular use | | |  |  |  |  |  | 0.289 |
| < 5 years | 47 (24) | 78 (27) | 1.04 (0.63–1.71) |  | 63 (29) | 87 (26) | 1.56 (0.98–2.48) | 0.245 |
| 5 – 9 years | 64 (32) | 60 (20) | 1.80 (1.09–2.99) |  | 53 (24) | 69 (20) | 1.63 (1.00–2.66) | 0.775 |
| ≥ 10 years | 27 (14) | 52 (18) | 0.90 (0.50–1.62) |  | 39 (18) | 57 (17) | 1.55 (0.91–2.65) | 0.176 |
| Cumulative hours of used,e | |  |  |  |  |  |  | 0.391 |
| < 84 h | 30 (15) | 41 (15) | 1.20 (0.67–2.15) |  | 34 (16) | 55 (17) | 1.26 (0.73–2.17) | 0.910 |
| 84 – 285 h | 31 (16) | 41 (15) | 1.29 (0.70–2.38) |  | 33 (16) | 54 (16) | 1.30 (0.76–2.23) | 0.977 |
| 285 – 900 h | 28 (14) | 50 (18) | 0.97 (0.55–1.70) |  | 42 (20) | 47 (14) | 2.05 (1.18–3.58) | 0.062 |
| ≥ 900 | 44 (23) | 49 (17) | 1.52 (0.87–2.66) |  | 40 (19) | 48 (15) | 1.86 (1.05–3.28) | 0.621 |
| Cumulative no. of callsd,e | |  |  |  |  |  |  | 0.817 |
| < 1140 | 26 (13) | 48 (17) | 0.88 (0.48–1.58) |  | 30 | 50 | 1.27 (0.72–2.22) | 0.373 |
| 1140–3800 | 24 (12) | 40 (14) | 1.08 (0.58–2.00) |  | 32 | 57 | 1.15 (0.67–1.99) | 0.875 |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 3800 –12300 | 51 (26) | 47 (16) | 1.75 (1.05–2.94) |  | 52 | 50 | 2.50 (1.47–4.24) | 0.349 |
| ≥ 12300 | 32 (32) | 48 (17) | 1.11 (0.63–1.95) |  | 36 | 49 | 1.56 (0.90–2.70) | 0.397 |
| aTwo sided *P*-Values for heterogeneity: likelihood ratio tests were used for testing heterogeneity of effects for each exposure characteristic and Wald tests for different levels of exposure.  bReference category  cRegular use is defined as having called or received a call at least once per week on average during six months or more.  dThe total number of exposed does not add up because some regular users entered incomplete data on amount of phone use.  eCut points approximately at the 25th, 50th and 75th percentiles. | | | | | | | | |

|  |  |  |  |
| --- | --- | --- | --- |
| **eTABLE 2.** Self-reported reason for changing side of mobile phone use, regular users. Changes both before and after the reference date are included. | | | |
|  | **Cases** | **Controls** |
|  | **No. (%)** | **No. (%)** |
| **Totala** | **169** | **40** |
| Practical reason | 6 (4) | 16 (40) |
| Hearing problem | 154 (91) | 11 (27) |
| Headache | 2 (1) | 4 (10) |
| Other/No particular reason | 9 (5) | 8 (20) |
| No reason entered | 1 (1) | 2 (5) |
| aNumbers do not add up because four participants have given two reasons for changing side. | | | | |

|  |  |  |  |
| --- | --- | --- | --- |
| **eTABLE 3.** Self-reported time of change of preferred side of mobile phone use in relation to the reference date. | | | |
|  | **Cases** | **Controls** |
|  | **No. (%)** | **No. (%)** |
| **Total** | **169** | **40** |
| After the reference date | 58 (34) | 13 (32) |
| 0 - 1 years before reference date | 44 (26) | 5 (13) |
| 1 - 2 years before reference date | 16 (9) | 0 (0) |
| 2 - 3 years before reference date | 9 (5) | 1 (2) |
| 3 - 4 years before reference date | 4 (2) | 2 (5) |
| 4 - 5 years before reference date | 5 (3) | 4 (10) |
| 5 - 9 years before reference date | 22 (13) | 4 (10) |
| >10 years before reference date | 6 (4) | 5 (12) |
| Incomplete data | 5 (3) | 6 (15) |