

Supplementary table 1. Headache, tinnitus and hearing loss at follow-up in relation to amount of call-time at baseline; partly adjusted and fully adjusted results

| Health outcome   | Adjustment  | Mobile phone use (call-time in percentiles) |                     |                     |                      |
|------------------|---|---|---------------------|---------------------|----------------------|
|                  |   | 0-50  | 51-74 <sup>th</sup> | 75-89 <sup>th</sup> | 90-100 <sup>th</sup> |
| Headache, weekly | Age, gender, country*                                     | 1   | 1.06 (0.91-1.23)    | 1.15 (0.97-1.37)    | 1.26 (1.03-1.53)     |
|                  | +depression, painkiller, sleep, SF12 mental and physical* | 1   | 1.04 (0.89-1.21)    | 1.10 (0.92-1.32)    | 1.13 (0.93-1.39)     |
|                  | +education, smoking, alcohol, hypertension, BMI           | 1   | 1.04 (0.89-1.21)    | 1.10 (0.92-1.31)    | 1.13 (0.92-1.38)     |
| Headache, severe | Age, gender, country*                                     | 1   | 1.02 (0.80-1.31)    | 1.03 (0.77-1.38)    | 1.33 (0.97-1.82)     |
|                  | +depression, painkiller, sleep, SF12 mental and physical* | 1   | 0.98 (0.76-1.26)    | 0.91 (0.67-1.24)    | 1.13 (0.82-1.57)     |
|                  | +education, smoking, alcohol, hypertension, BMI           | 1   | 0.98 (0.76-1.26)    | 0.91 (0.67-1.23)    | 1.12 (0.81-1.56)     |
| Headache, daily  | Age, gender, country*                                     | 1   | 1.14 (0.67-1.92)    | 1.27 (0.70-2.31)    | 1.44 (0.74-2.82)     |
|                  | +depression, painkiller, sleep, SF12 mental and physical* | 1   | 1.10 (0.65-1.86)    | 1.18 (0.65-2.15)    | 1.21 (0.68-2.39)     |
|                  | +education, smoking, alcohol, hypertension, BMI           | 1   | 1.09 (0.65-1.86)    | 1.17 (0.64-2.13)    | 1.22 (0.62-2.40)     |
| Tinnitus         | Age, gender, country**                                    | 1   | 1.04 (0.89-1.22)    | 1.11 (0.92-1.34)    | 0.95 (0.75-1.19)     |
|                  | +smoking, education, SF12 mental and physical**           | 1   | 1.06 (0.91-1.24)    | 1.09 (0.91-1.31)    | 0.89 (0.71-1.12)     |
| Hearing loss     | Age, gender, country**                                    | 1   | 1.09 (0.74-1.60)    | 0.83 (0.50-1.39)    | 0.66 (0.33-1.32)     |
|                  | +smoking, education, SF12 mental and physical**           | 1   | 1.12 (0.76-1.65)    | 0.82 (0.49-1.37)    | 0.61 (0.30-1.22)     |

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\*Excluding those with missing data on covariates (education, smoking, alcohol use, BMI or hypertension, with 13,742 participants in the analysis);

\*\*Excluding those with missing data on smoking, education, or SF12 (including 14,045 in analysis of tinnitus and 14,057 in the analysis of hearing loss).

Depression: Self-reported depression at baseline (yes/no); Painkiller: Daily use of painkillers at baseline (yes/no); Sleep: Sleeping difficulty in MOS-Sleep questionnaire at baseline (continuous); SF-12 mental health score (continuous) and SF-12 physical health score (continuous) at baseline; education: primary/secondary/any university; smoking: current smoker vs current non-smoker at baseline; hypertension: self-reported diagnosis (yes/no) at baseline; alcohol: at 24 units per week in men or 16 in women (yes/no); BMI: normal vs overweight or obesity ( $\geq 25$  kg/m<sup>2</sup>)

Supplementary table 2. Alternative analyses of mobile phone call-time by network type (GSM vs UMTS) and headache, adjusted for gender, age group, country, painkiller use, depression, sleep disorders and SF-12 physical and mental score

|  | <i>Average call-time per week (min)</i> |                     |                     |                      | P trend |
|--|---|---------------------|---------------------|----------------------|---------|
|  | 0-50 <sup>th</sup>                      | 50-75 <sup>th</sup> | 75-90 <sup>th</sup> | 90-100 <sup>th</sup> |         |
| <i>Weekly headache, ignoring calls in unknown network</i>                                |   |                     |                     |                      |         |
| GSM (2G)   | 1 (reference)                           | 1.00 (0.86-1.17)    | 0.90 (0.75-1.08)    | 1.04 (0.84-1.28)     | 0.79    |
| UMTS (3G)  | 1 (reference)                           | 0.96 (0.79-1.18)    | 1.22 (0.97-1.53)    | 1.14 (0.87-1.50)     | 0.12    |
| <i>Weekly headache, mutually adjusted (both GSM and UMTS in the same model)</i>          |   |                     |                     |                      |         |
| GSM (2G)   | 1 (reference)                           | 0.94 (0.80-1.11)    | 0.99 (0.80-1.23)    | 0.94 (0.69-1.27)     | 0.69    |
| UMTS (3G)  | 1 (reference)                           | 0.90 (0.76-1.08)    | 1.11 (0.91-1.35)    | 1.16 (0.92-1.46)     | 0.20    |
| <i>Weekly headache, excluding subjects with &gt;20% of call-time in unknown networks</i> |   |                     |                     |                      |         |
| GSM (2G)   | 1 (reference)                           | 0.98 (0.85-1.15)    | 0.98 (0.83-1.17)    | 1.08 (0.90-1.30)     | 0.58    |
| UMTS (3G)  | 1 (reference)                           | 0.88 (0.71-1.09)    | 0.95 (0.74-1.23)    | 1.00 (0.75-1.33)     | 0.74    |
| <i>Daily headache</i>  |   |                     |                     |                      |         |
| GSM (2G)   | 1 (reference)                           | 0.90 (0.56-1.43)    | 1.28 (0.79-2.05)    | 1.06 (0.60-1.89)     | 0.53    |
| UMTS (3G)  | 1 (reference)                           | 1.25 (0.72-2.18)    | 1.38 (0.73-2.59)    | 1.26 (0.58-2.75)     | 0.33    |
| <i>Severe headache</i>   |   |                     |                     |                      |         |
| GSM (2G)   | 1 (reference)                           | 0.98 (0.79-1.22)    | 0.95 (0.73-1.23)    | 1.03 (0.78-1.38)     | 0.99    |
| UMTS (3G)  | 1 (reference)                           | 0.90 (0.67-1.22)    | 1.04 (0.74-1.46)    | 1.27 (0.87-1.84)     | 0.33    |

Supplementary table 3. Drop-out analysis: baseline call-time and symptoms among those eligible for the analysis (complete mobile phone data and both baseline and follow-up questionnaires) versus those excluded due to missing call-time data or follow-up questionnaire.

|  | <b>Sweden</b> |                          |                                |
|--|---------------|--------------------------|--------------------------------|
|  | Included      | Incomplete operator data | Non-respondent<br>at follow-up |
| <i>Call-time, min/wk</i>                 |               |                          |                                |
| Mean, operator data*                     | 136.4         | NA                       | 158.0                          |
| Self-reported#                           |               |                          |                                |
| <30#                                     | 8276 (36.5%)  | 4162 (22.9%)             | 4238 (26.9%)                   |
| 30-59#                                   | 4206 (18.6%)  | 2609 (14.4%)             | 2925 (18.5%)                   |
| 60-179#                                  | 5532 (24.4%)  | 3554 (19.6%)             | 3842 (24.4%)                   |
| ≥180#                                    | 4404 (19.4%)  | 3504 (19.3%)             | 3458 (21.9%)                   |
| Missing                                  | 233 (1.0%)    | 4341 (23.9%)             | 1317 (8.3%)                    |
| <i>Symptoms and concerns at baseline</i> |               |                          |                                |
| Headache weekly                          | 3850 (17.0%)  | 3195 (17.6%)             | 3194 (20.2%)                   |
| Tinnitus, any                            | 3426 (15.1%)  | 2776 (15.3%)             | 2089 (13.2%)                   |
| Hearing loss                             | 2120 (9.4%)   | 1947 (10.7%)             | 1417 (9.0%)                    |
| Concerned about<br>mobile phones         | 1086 (4.8%)   | 1016 (5.6%)              | 892 (5.7%)                     |
| Concerned about<br>base stations         | 1266 (5.6%)   | 1072 (5.9%)              | 876 (5.6%)                     |
| <hr/>                                    |               |                          |                                |
| <b>FINLAND</b>                           |               |                          |                                |
|  | Included      | Incomplete operator data | Non-respondent<br>at follow-up |
| <i>Call-time, min/wk</i>                 |               |                          |                                |
| Mean, operator data*                     | 126.8         | NA                       | 138.8                          |
| Self-reported#                           |               |                          |                                |

|                     |              |             |              |
|---------------------|--------------|-------------|--------------|
| <30 <sup>#</sup>    | 619 (19.8%)  | 251 (12.2%) | 1326 (18.0%) |
| 30-59 <sup>#</sup>  | 773 (24.8%)  | 411 (20.0%) | 1589 (21.5%) |
| 60-179 <sup>#</sup> | 1228 (39.4%) | 780 (37.9%) | 2666 (36.1%) |
| ≥180 <sup>#</sup>   | 495 (15.9%)  | 556 (27.0%) | 1412 (19.1%) |
| Missing             | 5 (0.2%)     | 60 (2.9%)   | 385 (5.2%)   |

*Symptoms and concerns at baseline*

|                                  |             |             |              |
|----------------------------------|-------------|-------------|--------------|
| Headache weekly                  | 489 (15.7%) | 264 (12.9%) | 1157 (15.8)  |
| Tinnitus, any                    | 861 (27.7%) | 537 (26.1%) | 1842 (24.9%) |
| Hearing loss                     | 55 (1.9%)   | 23 (1.1%)   | 125 (1.7%)   |
| Concerned about<br>mobile phones | 143 (4.9%)  | 103 (5.0%)  | 365 (5.0%)   |
| Concerned about<br>base stations | 139 (4.5%)  | 85 (4.2%)   | 371 (5.1%)   |

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\*Mean from operator data, including hands-free use. <sup>#</sup>Self-reported weekly call duration at baseline