



Long-Term Sickness and Mobile Phone Use.

Örjan Hallberg, M.Sc. e.e.
Olle Johansson, Assoc. Professor

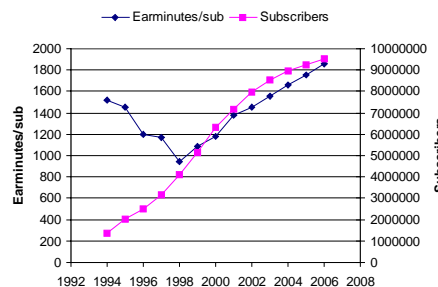
The number of people unable to work due to long-term sickness is drastically increasing in Sweden ... It was concluded that future long-term absence rates will continue to increase as long as the annual number of ear-heating minutes per year is increasing.

Abstract

The number of people unable to work due to long-term sickness is drastically increasing in Sweden. In this paper we take a close look at the development of mobile phone communication to see how it possibly relate to the health impairment of the Swedish population. Official data was collected regarding mobile phone use and long-term absence from work. The co-variation between those data sets was used to estimate future development of long-term absence rates under the hypothesis that there is a connection between the two sets of data. It was concluded that future long-term absence rates will continue to increase as long as the annual number of ear-heating minutes per year is increasing.

Mobile phone use

The first mobile phones were using the analogue system called NMT. It was launched as early as in 1981 and gradually came to serve almost a million subscribers in Sweden around 1994. From that time the GSM system was introduced and became very popular. Within a few years over 5,000,000 subscribers in Sweden were registered and in 2003 there were close to 8,000,000 mobile phone subscribers. Figure 1 shows the development in number of subscribers and also the average number of spoken minutes per year and



subscriber including the receiving part in case that also is a mobile phone.

Figure 1. The graph gives the total number of mobile phone subscribers and spoken mobile phone minutes per year and subscriber. Numbers after 2002 are estimates. The high number of ear-minutes per subscriber in 1994 is believed due to mainly work-related use at that time. After 1997 the private use is increasing also per subscriber.

Long-term sickness and early retirement statistics

The number of people who were registered sick in Sweden for more than one year started to increase in 1981 from a record low level of 18,000 people up to around 70,000 in 1992. Then we had a decrease down to 44,000 in 1997 when the curve went sharply upwards and today measures 138,000 sick people that have been absent from work for more than one year. Figure 2 shows this development together with the total number early retirements since 1991.

The number of mobile phone minutes spent since 1981 up to 1994 is an estimate since we have not got detailed information on that, except for the statement that 'there was a rapid roll-out of NMT, much faster than we had anticipated' [1].

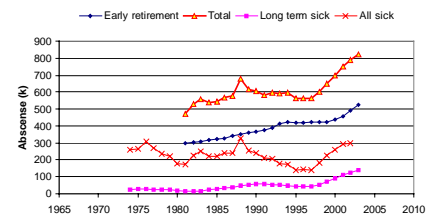


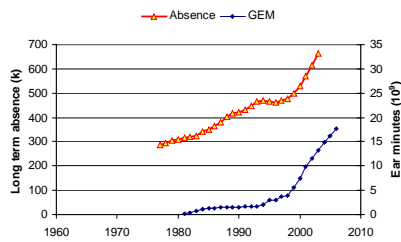
Figure 2. The development of the number of sick and long-term sick people in Sweden together with the number of early retirements show a strong increase after 1997.

Ear-heating minutes

Figure 1 shows that the total number of spoken minutes over mobile phone is drastically increasing after 1997. This is further accelerated by the fact that the number of mobile-to-mobile calls is increasing very fast. Today (2003) over 60% of the mobile phone calls are directed towards another mobile phone in Sweden.

Taking that fact into consideration we were able to calculate the total number of 'ear-heating minutes' due to mobile phone calls. This is shown in Figure 3 together with the total number of people absent from work due to long-term sickness or early retirement.

Figure 3. The graph shows the annual number of minutes spoken into a mobile phone and the total number of people absent from work due to long-term sickness or early retirement. The number of Giga Ear-Minutes (GEM) is estimated for the years 2004 to 2006.



Estimating future sick numbers

Figure 3 shows that the number of long-term absent people started to increase from 1984 to level off around 1995 and then accelerate strongly from 1998 and onwards. From 1998 there is also a strong increase in the number of ear-heating minutes per year.

It is possible to design a mathematical function to express the likelihood of causing a case of long-term illness from a certain amount of ear-heating minutes. If that expression is optimized to give the best fit between measured and calculated data, then this can also be used to estimate future outcome as a function of expected amount of ear-heating minutes.

This process is quite simple to run by the help of an Excel-software described in ref. [2]. The result from this exercise is shown in Figure 4 based on an optimized fit to the measured data between 1981 to 2003. Since we had long-term sick people and early retirements also before 1981 the difference between the measured level in 1980 and later measurements was used as input data.

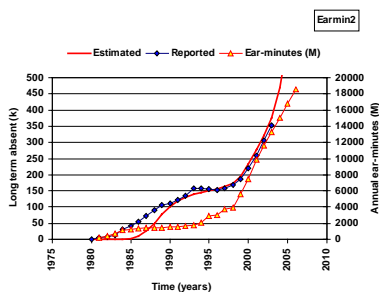


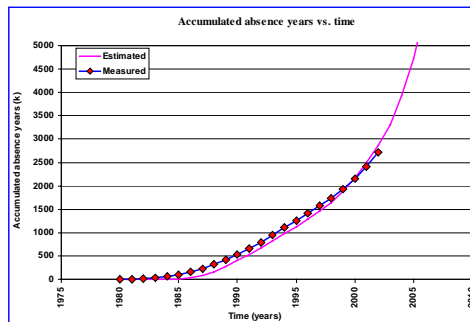
Figure 4. The graph gives measured and calculated numbers of long-term absent people in Sweden to give best fit based on the annual ear-heating minutes since 1981. The absent numbers are the numbers in excess of the reading in 1980 (310,000).

Discussion

Figure 1 shows a clear-cut trend break in 1998 regarding annual ear-minutes per subscriber. In combination with increasing numbers of mobile phone subscribers this gives a strong increase of total spoken mobile phone minutes per year from the same time. If the long-term absence number is related to the increasing volume of mobile phone radiation exposure, then we should expect a continuously increasing number of long-term sick people as well as applications for early retirement.

Figure 5 gives the measured and calculated accumulated number of long-term absence years since the start of the mobile era in 1981. If one absence-year corresponds to a society cost of 200,000 SEK the extra cost for enjoying this technology so far amounts to 410 BSEK. Since we today totally have spoken 66 billion mobile phone minutes each minute should have had a health care tax of 6.2 SEK.

Figure 5. The graph shows the measured and calculated number of accumulated long-term absence years since 1981 above a 'normal'



level of 310,000 long-term absent people per year.

Conclusions

This short report points at the strong similarity between increased mobile phone use and health degradation in Sweden. Other investigations [3] have shown a strong correlation between mobile system transmitter coverage and health including recovery times from accidents and surgery operations. All in all we can only conclude that it is now time to reconsider the benefit of handheld radiating devices, nowadays being marketed also towards innocent children.

In the short term the mobile phone operators will have to set aside a minimum of SEK 6.2 per each spoken mobile phone minute to cover costs for our long-term absence from work. This amount should probably be increased substantially to cover also for short-term illness and other health care expenses likely to be caused by mobile phone and transmitter radiation.

References

1. Private communication, Telia-Sonera, Ronny Törnqvist, 2003-09-15
2. Oscarsson P and Hallberg Ö, "EriView 2000 - A Tool For The Analysis Of Field Statistics", Proc. ESREL 97, Lisbon, June 1997, ISBN 0-08-042835-5.
3. Hallberg Ö and Johansson O "Mobile handset output power and health", to be published

Experimental Dermatology Unit, Department of Neuroscience, Karolinska Institute, S-171 77 Stockholm, Sweden

Reprint requests and correspondence to: Örjan Hallberg, e-mail: oerjan.hallberg@swipnet.se

