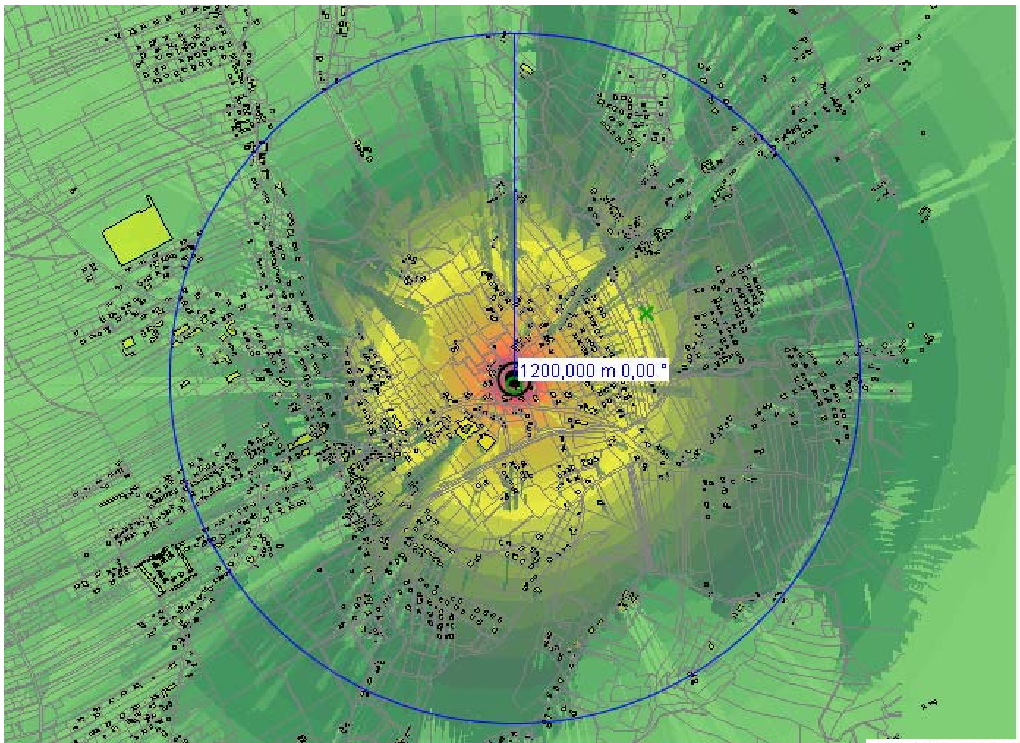
Environmental Epidemiological Study of Cancer Incidence in the Municipalities of Hausmannstätten & Vasoldsberg (Austria)



GRUNDLAGE GIS-STMK

English Executive Summary

Translation by Katharina Gustavs

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Dr. Gerd Oberfeld

Das Land Steiermark

→ Gesundheitsressort

Environmental Epidemiological Study of Cancer Incidence in the Municipalities of Hausmannstätten & Vasoldsberg (Austria)

Commissioned by

Provincial Government of Styria,

Department 8B, Provincial Public Health Office, Graz (Austria)

Conducted by

Dr. Gerd Oberfeld, Salzburg (Austria)

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Executive Summary

It was the study's objective to determine whether cancer cases that became known in the eastern part of Hausmannstätten or Vasoldsberg, respectively, represent a cluster with regard to timing and location as well as whether they might be associated with the mobile phone base station, which operated as a car phone service from 1984 to 1997. The analog mobile phone base station under study was part of the national C-Network, installed by the Austrian post and communications authority and operated according to the Nordic Mobile Telephone 450 (NMT 450) standard. The cell radii of this network were usually up to 30 km.

The area under study was defined as a circle with a 1,200-m radius around the former transmitter. With the help of the provincial government of Styria (GIS Steiermark) and the municipalities of Hausmannstätten and Vasoldsberg, n=2,543 potential study participants could be located and personally invited to participate in the study. By applying limiting exposure conditions such as the assumption of a latency period, an "after-effect period" and a 5-year minimum exposure period, three different case-control samples were compiled. Sample A (67 cases/1242 controls) and B (67 cases/646 controls) included living and deceased cases, sample C (28 cases/56 controls) living cases only.

Based on the selected exposure period limits, the distance assessment for the range from 0 to 200 m around the transmitter in comparison to the area from 201 to 1,200 m showed a significantly increased cancer risk for all three samples, which makes for a distinct incidence with regard to location. The incidence was particularly pronounced for breast and brain tumors.

The exposure assessment with regard to the analog transmitter (NMT450) was conducted on an individual basis for all three samples (A, B, C), using calculations based on NIRView and CORLA software products. Taking into account the antenna characteristics, natural terrain and built environment, the transmitter input power was based on 25 watts for a continuously

transmitting calling channel. The respective power density level was determined for a total of 1,309 individuals.

It was a question whether to determine the exposure level of a continuously transmitting calling channel only or the calling channel plus (probably) three traffic channels. From a precautionary point of view, the exclusive consideration of the calling channel is desirable, which was done in this assessment.

Furthermore, 25 m to the east of the original transmitter site (NMT450), a simulated transmitter was installed with the same antenna height (8 m above ground) and the actively transmitting test signal (434.2 MHz) was measured at the selected frequency in the bedrooms of 84 study participants (sample C only). In addition, participants of this sample also answered an extensive questionnaire on cancer risk factors and protective factors in a personal interview. The analysis of this data revealed that these factors could not explain the local incidence we found or the relationship with the RF radiation exposure.

The essential assessment focused on the relationships between the RF radiation exposure levels from the transmitter and cancer risk. The risk (odds ratio=OR) was assessed for the exposure categories 10-100 $\mu W/m^2$, 100-1000 $\mu W/m^2$ and greater than 1000 $\mu W/m^2$ (1 mW/m^2) in relation to the reference category less than 10 $\mu W/m^2$, all of which apply to outdoor levels.

For all models, the analysis revealed significantly increased risk ratios. Compared to the reference category (<10 $\mu W/m^2$), the cancer risk for all cancer sites in the highest exposure category (>1000 $\mu W/m^2$) was 5 to 8 times higher, depending on the sample. Similar to the distance assessment, the cancer cases were again most pronounced for the cancer sites breast and brain.

In comparison to the reference category (<10 μW/m²), the cancer risk in the highest exposure category (>1000 μW/m²) of sample A was 23 times higher for breast cancer and 121 times higher for brain tumors. For all three endpoints under study (all sites, breast, brain) significant exposure-effect relationships (p for the trend) were observed.

Detailed results for sample A are summarized in the chapter below, called "Summary of the Risk Calculations for Sample A". With its higher number of controls, sample A has an advantage over sample B because its statistical power is slightly higher. In addition, sample-A participants are taken mainly from the registry and therefore rather independent of their willingness to participate.

In summary, based on the selected exposure period limits, the study showed a significant cancer incidence with regard to timing and location in the area around the transmitter as well as significant exposure-effect relationships between RF radiation exposure and the incidence of breast cancers and brain tumors.

This case-control study is the first worldwide to investigate the relationship between cancer risk and a mobile phone base station by means of a special calculation software as well as historically simulated measurements. For various reasons, the study of NMT base stations makes sense. For example, the antenna characteristics are adequately known. Generally speaking, all that is required to simulate exposure levels is information about the site and the antenna height. Furthermore, in the exposure time period from 1984 to 1997, RF radiation exposures were still rather straightforward, a fact that makes the research on health impacts from these new technologies increasingly more difficult.

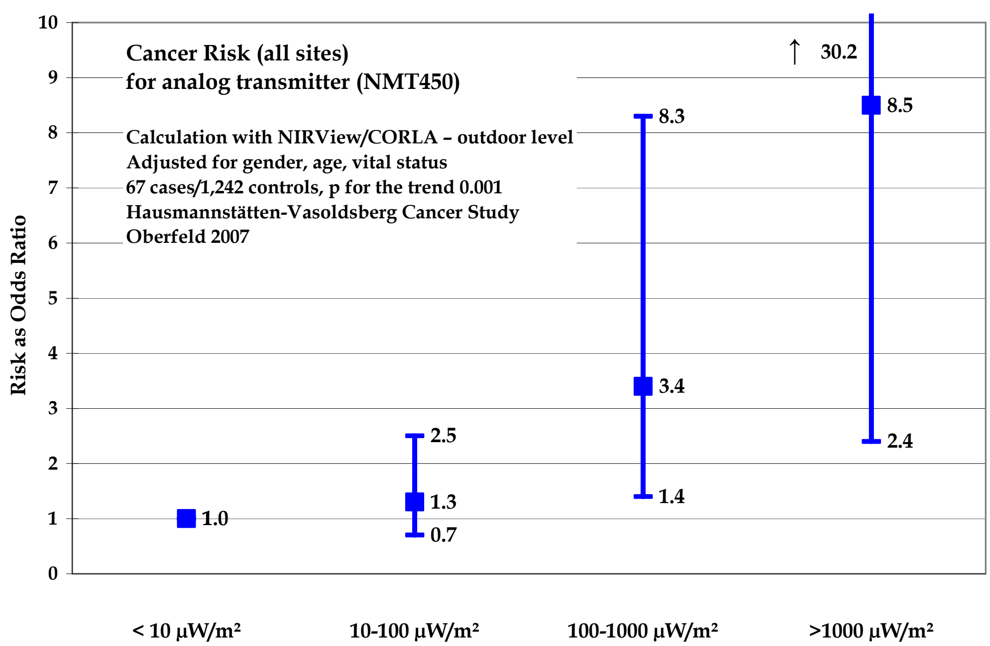
Summary of Risk Calculations for Sample A

In the tables and graphs below, the results of the multivariate risk calculations for sample A adjusted for age, gender and vital status can be found.

All Cancer Sites

Exposure (outdoor)	Controls	Cases	OR	95 % CI	p-value	p-trend
<10 µW/m²	837	39	1.0	-	-	0.001
10-100 µW/m²	313	17	1.3	0.7-2.5	0.454	
100-1000 µW/m²	76	7	3.4	1.4-8.3	0.008	
>1000 µW/m²	16	4	8.5	2.4-30.2	0.001	

Table 1: Sample A – All Cancer Sites: Results of logistic regression for exposure variables (exposure calculation - outdoor) adjusted for age, gender and vital status. Exposure-effect relationship

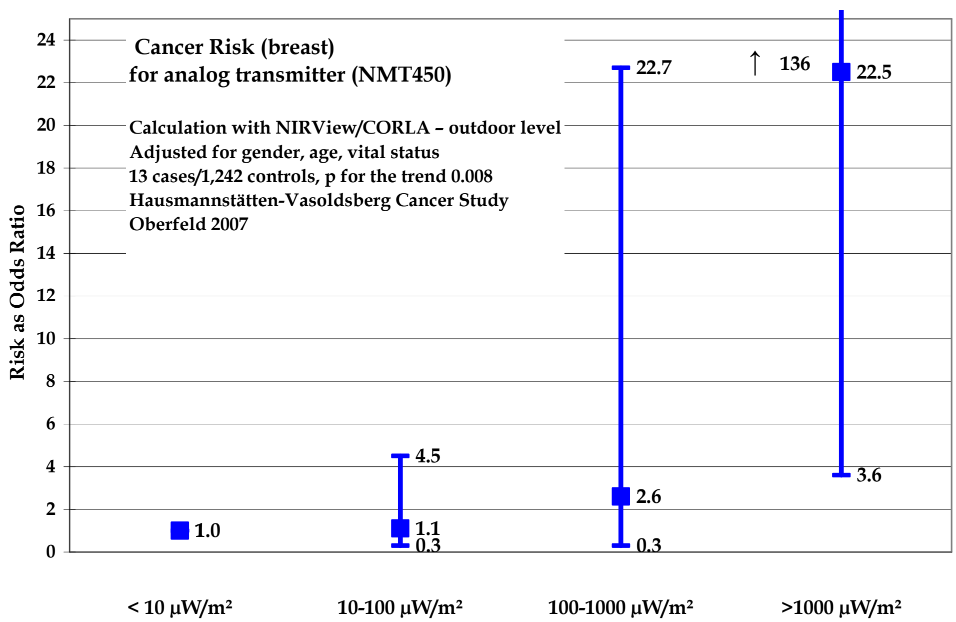


Graph 1: Sample A – All Cancer Sites: Results of logistic regression for exposure variables (exposure calculation - outdoor) adjusted for age, gender and vital status. Exposure-effect relationship

Cancer Site: Breast

Exposure (outdoor)	Controls	Cases	OR	95 % CI	p-value	p-trend
<10 µW/m²	837	7	1.0	-	-	0.008
10-100 µW/m²	313	3	1.1	0.3-4.5	0.881	
100-1000 µW/m²	76	1	2.6	0.3-22.7	0.394	
>1000 µW/m²	16	2	22.5	3.6-136.6	0.0007	

Table 2: Sample A – Cancer Site Breast: Results of logistic regression for exposure variables (exposure calculation - outdoor) adjusted for age, gender and vital status. Exposure-effect relationship

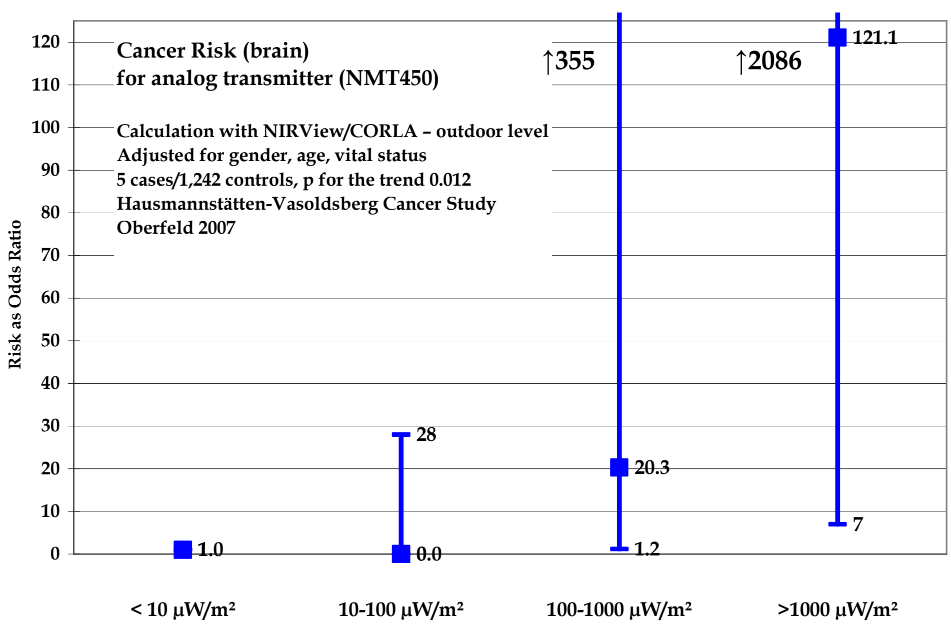


Graph 2: Sample A – Cancer Site Breast: Results of logistic regression for exposure variables (exposure calculation - outdoor) adjusted for age, gender and vital status. Exposure-effect relationship

Cancer Site: Brain

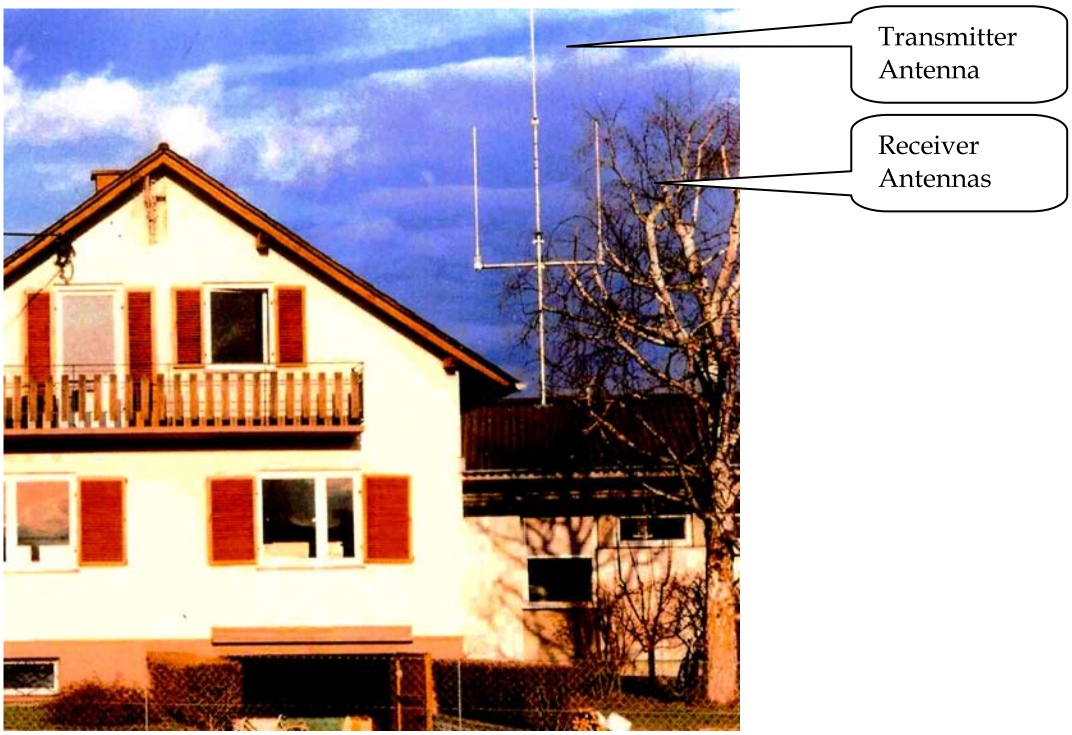
Exposure (outdoor)	Controls	Cases	OR	95 % CI	p-Wert	p-trend
<10 µW/m²	837	1	1.0	-	-	0.012
10-100 µW/m²	313	0	0.0	0.0-2E+28	0.867	
100-1000 µW/m²	76	2	20.3	1.2-355.2	0.039	
>1000 µW/m²	16	2	121.1	7.0-2086.0	0.001	

Table 3: Sample A – Cancer Site Brain: Results of the logistic regression for exposure variables (exposure calculation - outdoor) adjusted for age, gender and vital status. Exposure-effect relationship

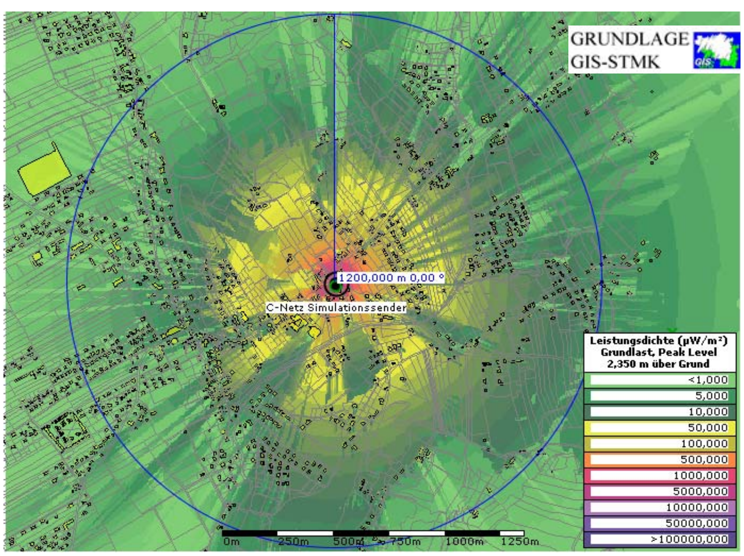


Graph 3: Sample A – Cancer Site Brain: Results of logistic regression for exposure variables (exposure calculation - outdoor) adjusted for age, gender and vital status. Exposure-effect relationship

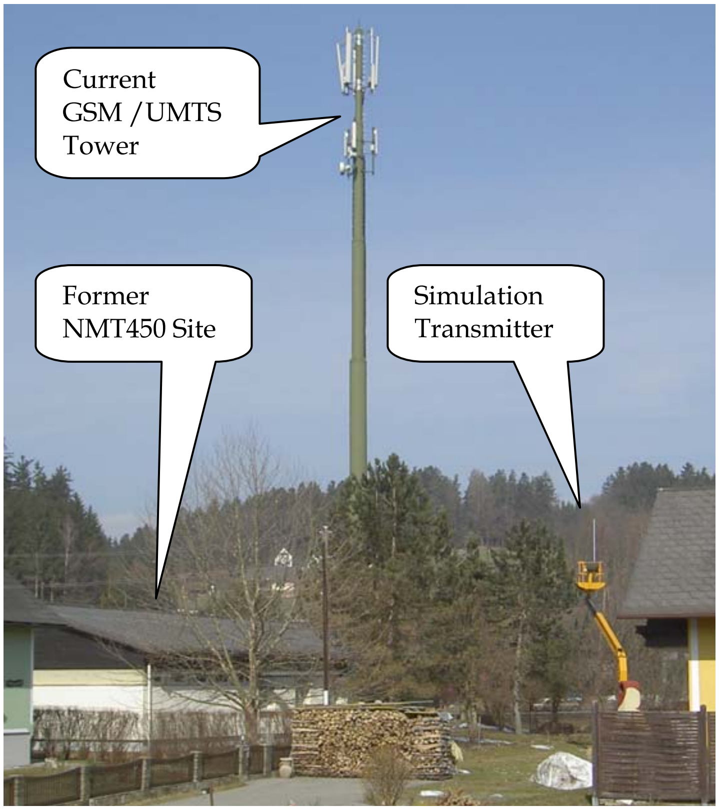
Illustrations



Right Side of the Picture: Telephone Exchange Center with C-Network Transceiver (NMT 450), 8071 Hausmannstätten, Property No. 865, KG Hausmannstätten, 1994. Source: W. Sabutsch.



Immission Calculation – CORLA (Building Model) for C-Network Transmitter at the 2.35-m Layer above Ground, data basis GIS-STMK.



General View of Former Roof Site of NMT450 (C-Network) Telephone Exchange Center, Site of Simulated C-Network Transmitter and Current Mobile Phone Tower GSM/UMTS, March 2006

Simulated C-Network Transmitter Installed at Mobile Stacking Truck, March 2006