Specific Health Symptoms and Cell Phone Radiation in Selbitz (Bavaria, Germany)— Evidence of a Dose-Response Relationship

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In January 2009 the administration of the Bavarian Municipality of Selbitz gathered relevant data from 251 residents as part of a health survey. Subsequently, the data were assessed based on the exposure levels of cell phone radiation.
In a next step, the exposure levels based on residential location and available RF measurements of local cell phone radiation levels were used to classify participants into exposure groups.
The mean radiation exposure level of the highest exposure group in Selbitz (1.2 V/m) was substantially higher than that of the study population in the QUEBEB study (1) of the German Mobile Phone Programme (mean value 0,07 V/m). For such symptoms as sleep problems, depressions, cerebral symptoms, joint problems, infections, skin problems, cardiovascular problems as well as disorders of the visual and auditory systems and the gastrointestinal tract, a significant dose-response relationship was observed in relation to objectively determined exposure levels. The impact of microwave radiation on the human nervous system serves as an explanation.
Carried out without outside funds, the study presented here provides a protocol concept that allows physicians and municipalities to cooperate and assess the potential human health impact of cell phone base stations located within residential areas.

Keywords: symptoms, cell phone radiation, wireless technologies, dose-response relationship

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Deutsche Zusammenfassung

In der bayerischen Stadt Selbitz wurden im Januar 2009 zuerst durch die Gemeinde im Rahmen einer Gesundheitsbefragung relevante Daten von 251 Einwohnern erfasst und anschließend daran nach Belastungsstärken durch Mobilfunkwellen ausgewertet.
Die Belastungswerte wurden in einem zweiten Schritt an hand von Wohnort und vorliegenden Messdaten der örtlichen Mobilfunkstrahlung zur Stratifizierung der Teilnehmer in Belastungsgruppen verwendet.
Die mittlere Strahlenbelastung der höchstbelasteten Gruppen in Selbitz (1,2 V/m) lag deutlich höher als die untersuchte Studienpopulation der QUEBEB-

Studie (1) des Deutschen Mobilfunkforschungsprogramms (Mittelwert DMF O,07V *Im).* Fürdie Beschwerden Schlafstörung, Depressionen, cerebrale Symptome, Gelenkbeschwerden, Infekte, Hautveränderungen, Herz-Kreislauf Störungen sowie Störungen des optischen und akustischen Sensoriums und des Magen-Darm-Traktes besteht eine signifikante dosiswirkungsabhängige Korrelation zu objektiv bestimmten Expositionslagen, die mit dem Einfluss von Mikrowellen auf das Nervensystem des Menschen erklärt wird.
Die vorliegende fremdmittelfrei erstellte Arbeit gibt einen Konzeptentwurf vor, mit dem Ärzte und Gemeindeverwaltungen gemeinsam den gesundheitlich relevanten Einfluss von innerörtlichen Mobilfunksendern abschätzen können.

Introduction

Over the last decades wireless technologies have gained in importance. As a result, however, TV and radio stations are no longer the broadcasting sources that cause the highest exposure levels in residential areas; now it is cell phone base stations. Since 2003 the German Commission on Radiological Protection (SSK) has explicitly pointed out that there is a lack of knowledge about the consequences of these technologies on human health (2).

In Upper Franconian Selbitz, the municipality collaborated with local medical offices[1] whereby two separate data sets—a general health survey and available RF measurements—were used to correlate gathered symptom scores with independently available RF emission measurements of relevant cell phone radiation.

Materials and Methods

Selbitz in Upper Franconia is located in the northeast of Bavaria, Germany, having a total population of 4,644 (2,171 male and 2,473 female) on 31 December 2008 (3).
Cell phone coverage is available across the entire municipality. In the center, cell phone transmitters of two service providers are located in the street *Feldstraße 28* and the installation of a third telecommunication service provider is located in the street *Burgstraße 26a* (4).

Fig. 1:
Cell Phone Transmitters on Top of the Multistory Building at Feldstraße 28, Selbitz, Upper Franconia

As part of a survey in 2009, Selbitz municipality sent standardized health questionnaires by mail to 1,080 persons within the municipality and surrounding areas. The participants were aware that they could receive a questionnaire when they lived within a 400-m radius of the cell phone base station at *Feldstraße 28* or also outside of this radius. There were no personal interviews. A total of 88 sets of information on health symptoms were gathered, using a quantitative scale of zero to five. The symptom groups based on clinical entities were summarized as clusters for the assessment (Table 1).

	Symptom Group	Symptom Number
1	Sleep disorders	1-5
2	Symptoms of depression	6,7,18-23
3	Headaches	8
4	Cerebral affections	8-12
5	Concentration difficulties	24-29
6	Joint problems	30-34
7	Toothaches	35
8	Infections	36-41
9	Skin problems	42-47
10	Dizziness	55
11	Cardiovascular problems	48-52
12	Auditory system, Disturbance of equilibrium	56-61
13	Visual problems	62-67
14	Nosebleed	68
15	Hormonal imbalances	70-74
16	Weight gain	75
17	Weight loss	76
18	Gastrointestinal problems	77-81
19	Bedwetting	85

Table 1: Summary of Symptom Groups Based on Clinical Entities

The cover letter of the invitation to participate stated that participant confidentiality is ensured. The questionnaires could be returned or sent back to Selbitz municipality or the local doctor's offices. After the questionnaires were returned, the personal information form was separately filed from the symptom information form at the doctor's office of Dr. Eger, Naila. The anonymously coded symptom information forms were then passed on for data entry to the administrative staff of Selbitz municipality. The staff of the IT department entered the anonymized data into an Excel table for analysis.
On the personal information form, the existence of a DECT phone in the residence was indicated by a simple checkmark, which was also entered into the data pool.

All participants who returned their questionnaires were classified into groups based on their residential address. The circles drawn in Figure 2 show distances of 100 m, 200 m, 300 m, or 400 m from the two cell transmitters installed on the building of *Feldstraße 28*, identifying the groups 1 to 4. One control group (group 5), which can be classified as low-emission, includes participants outside the 400-m radius directly in Selbitz and also from surrounding areas that are further away from the municipality.

According to the elevation map, the landscape around the transmitter is level toward the west and east, gently rises toward the north, and declines with 7° to 9° toward the south.
The cell phone facilities of the service providers are located at a height of 19.20 m, 20.20 m, and 23.50 m above ground with the actual transmitters at 19.35 m and 22.70 m. The down tilt of the transmitters is given with 8°. The frequency ranges used are at about 940 MHz and 1850 MHz (5).

Under these conditions, the area where the main beam touches the ground is located almost 200 m away from the transmitters. Within the 200-m radius additional side lobes are to be expected.

Fig. 2: The map from the land title office shows in the center of the concentric circles the cell transmitters at Feldstraße 28 in Selbitz. (Source: 5, With kind permission of Selbitz municipality)

Testing Situation and Measurement Results

Based on the testing report by the accredited company ECL, mean exposure values of the cell phone radiation could be assigned to the individual exposure groups (6). For the groups 1 and 2 the mean value is 1.17 V/m, for the groups 3 and 4 0.7 V/m.
The testing results for the area outside the 400-m radius were on average at 0.18 V/m and serve as a reference value. Weidesgrün area showed the lowest measurements with 0.01 V/m.

The analysis is performed by using a two-tailed t-test of two unrelated samples for a total of 19 symptom scores of the individual groups 1 through 5 to test the null hypothesis that the symptom scores of the compared groups are evenly distributed and thus independent of the radiation effect (7).

The comparison of the health-relevant data was carried out based on two concepts:

A) Comparison of the participant groups 1 to 4 within the 400-m radius of the transmitter location to the control group outside the 400-m radius in Selbitz/surrounding areas.
B) Comparison of the participant groups within the 400-m radius of the transmitter location, comparing the highest-exposure groups 1 and 2 to the groups 3 and 4 further away.

Results

A total of 255 persons above the age of 18 participated in the survey; 4 questionnaires could not be evaluated. This corresponds with a response rate of 23% from 1,090 questionnaires sent out. In total, the groups 1 to 4 close to the transmitter had a response rate of 22% and the control group's rate was 27%, thus displaying no significant difference in the response rate (Table 2).

For all participants the gender ratio of 43% male and 57% female applies, which roughly corresponds with the ratio of the statistically registered inhabitants of Selbitz with 47% male and 53% female (Table 3).

For groups 1 through 4, the control group 5, and persons in Selbitz from the age of 18, the average age is 54.5, 52.0, and 53.5 years.
The age distribution in 5-year increments corresponds with the total population in Selbitz (Table 3, Figure 3a-e). The survey participants, thereby, represent an age-representative sample of the total population of all inhabitants of Selbitz from age 18.

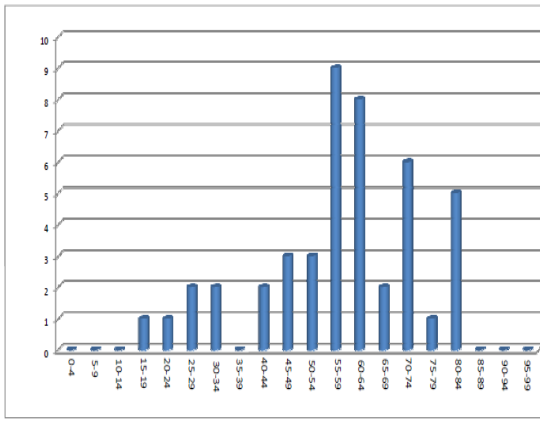
Within the 400-m radius around the transmitter, a higher symptom rate could be documented for 14 out of 19 symptom groups in the highest exposure groups 1 and 2 close to the transmitter compared to groups 3 and 4 further away from the transmitter (Table 4). The difference is statistically significant.

	Mailouts	Responses Number/(Percent)	Nonresponses Number/(Percent)	Comparison of Responses/Nonresponses incl. Control Group 5 (chi-square test)
Groups				
1	125	45 (36.0%)	80 (64.0%)	n.s.**
2	144	37 (25.7%)	107 (74.3%)	n.s.
3	281	60 (21.4%)	221 (78.6%)	n.s.
4	273	38 (14.0%)	235 (86.0%9	$p < 0.01$ (chi^2)
Control Group 5	254	71 (28.0%)	183 (72.0%)	
Sum	1077*	251	826	

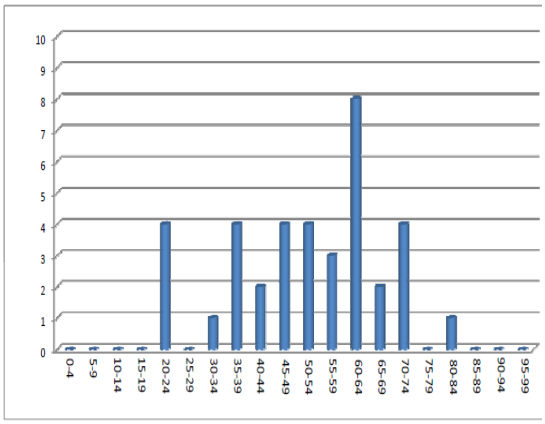
Table 2: Distribution of Questionnaires in Groups 1 to 4 and Control Group 5 according to Responses and Nonresponses.
With the exception of the low response rate in group 4, the differences between the responders/nonresponders of the individual groups and the control group 5 are not statistically significant.
*Three persons of the 1,080 surveys sent out could not be assigned.
** n.s. = not significant

	Number	Gender Male/Female (in %)	Age in 5-year Increments** Mean/Median	Distance from Transmitter at Feldstraße	Mean Exposure Levels of Cell Phone Radiation in V/m
Groups					
1	45	47/53	57.5/57	0-100 m	1.17 V/m
2	37	41/59	52.0/52	100-200 m	
3	60	40/60	55.0/57	200-300 m	0.70 V/m
4	38	42/57	53.5/52	300-400 m	
5	71	44/56	52.0/52	> 400 m	0.18 V/m
Selbitz*	4644	47/53	53.5/52		

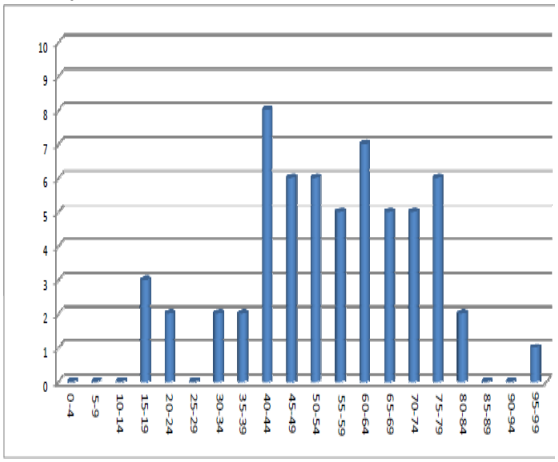
Table 3: Overview of Investigated Groups Based on Gender, Age, Residential Location, and Exposure Level. Groups 1-4 with a total of 180 participants are located within the 400-m radius of the transmitter. The 71 participants of control group 5 are further away than 400 m. Both the gender distribution as well as the comparison of age groups does not statistically differ from the total population of Selbitz.
* For the comparison of the mean age only persons above the age of 18 were chosen from the Selbitz population. Total population of Selbitz: 4,644; Inhabitants above age 18: 3,890.
** Age values are given within 5-year groups.



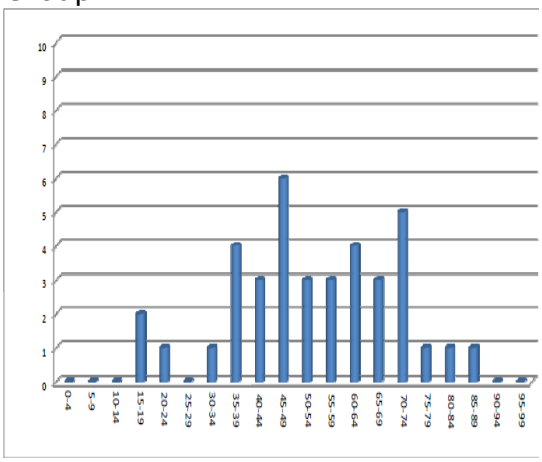
Group 1



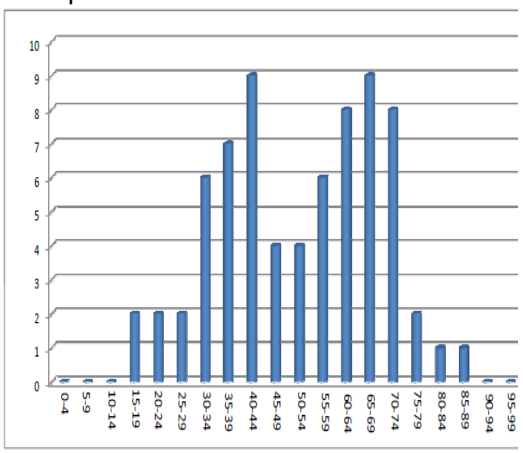
Group 2



Group 3



Group 4



Control Group 5

Fig. 3a-e: Age Distribution in Groups 1-4 and Control Group 5 in 5-year Increments

	A Comparison of Groups 1 to 4 (0-400 m/n=180) to control group 5 (> 400 m/n=71)	B Comparison of Groups 1 and 2 (0-200m/n=82) to groups 3 and 4 (200-400 m/n=98)
Symptoms	**Significance level p (t-test)**	**Significance level p (t-test)**
1 Sleep problems	0.001	0.001
2 Symptoms of depression	0.001	0.001
3 Headaches	n.s.	0.001
4 Cerebral affections	0.001	0.001
5 Concentration difficulties	n.s.	0.001
6 Joint problems	0.01	0.001
7 Toothaches	n.s.	n.s.
8 Infections	0.01	0.001
9 Skin problems	0.001	0.001
10 Dizziness	n.s.	0.01
11 Cardiovascular problems	0.001	0.001
12 Auditory system Disturbance of equilibrium	0.01	0.001
13 Visual problems	0.01	0.001
14 Nosebleed	n.s.	0.01
15 Hormonal imbalances	0.05	n.s.
16 Weight gain	n.s.	n.s.
17 Weight loss	n.s.	n.s.
18 Gastrointestinal problems	0.01	0.001
19 Bedwetting	n.s.	n.s. = not significant

Table 4: Specific Symptoms of Study Participants in Relation to Distance from Emission Source

A) Comparison of participant groups 1 to 4 around the transmitter to control group outside 400-m radius in Selbitz/surrounding areas

B) Comparison of participant groups within 400-m radius of transmitter. Groups 1 and 2 with the highest exposure are compared to groups 3 and 4 with a lower exposure level further away from the transmitter. Exposure levels for groups 1 and 2 were 1.17 V/m, for groups 3 and 4 0.7 V/m, and for control group 5 0.18 V/m.

In comparison to the control group, significant ($p < 0.01$, t-test) differences were found for the following symptom groups in the four exposure groups 1 to 4 located close to the transmitter: sleep problems, symptoms of depression, cerebral symptoms, joint problems, infections, skin problems,

cardiovascular problems, disorders of the visual and auditory system as well as hormone system and also gastrointestinal problems. The control symptoms "toothaches" and "bedwetting" were not significant (Table 4).
An overview of the documented mean values for all 19 symptoms or symptom scores is shown in Figure 4. The highest mean values are found mostly in the two highest exposure groups 1 and 2.

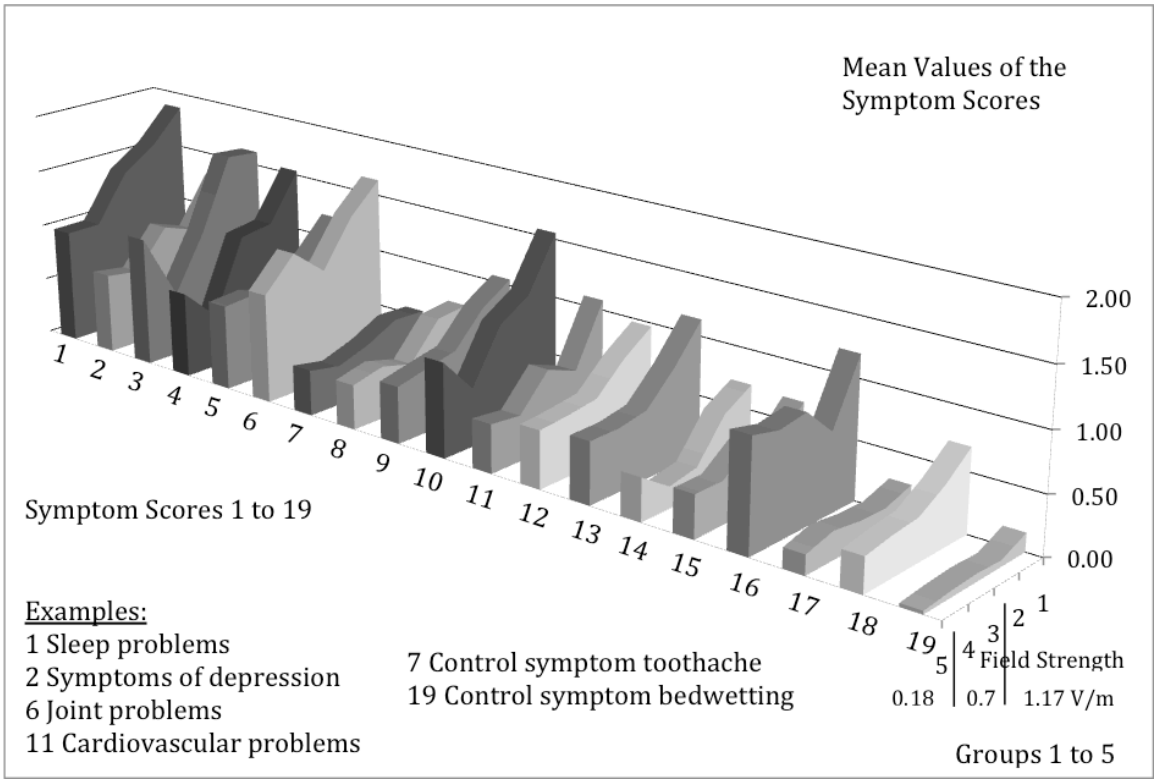


Fig. 4: Comparison of Specific Symptoms to Field Strengths
The spatial representation shows the 19 symptom scores on the y-axis where the mean value of each symptom score is plotted quantitatively. On the z-axis the exposure groups 1 to 5 are shown.

In Figure 5 and 8, the symptom scores for sleep problems, symptoms of depression, joint problems and cardiovascular problems are shown with their mean values and 95% confidence intervals. In a highly visual way, the significant relationships from Table 4 become obvious here.

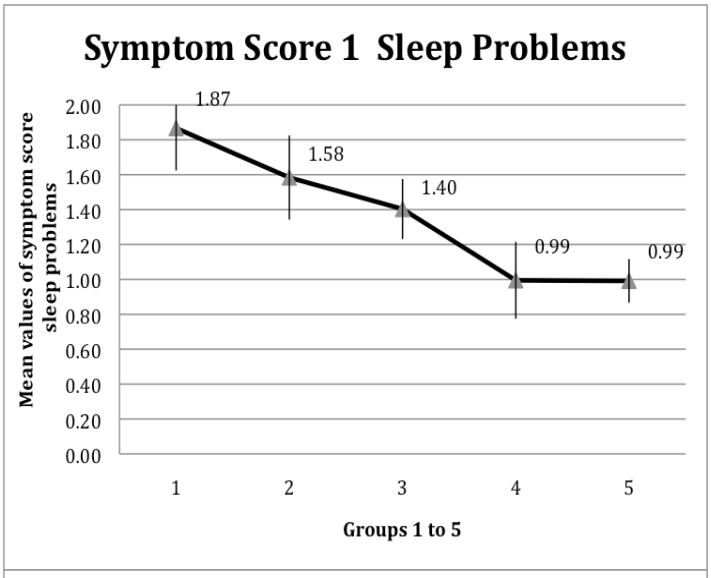


Fig. 5:
Control Symptom Score 1 for Sleep Problems for Groups 1-4 and Control Group 5
On the y-axis the mean values of the symptom scores are shown; the vertical bars at the result points represent the 95% confidence intervals.

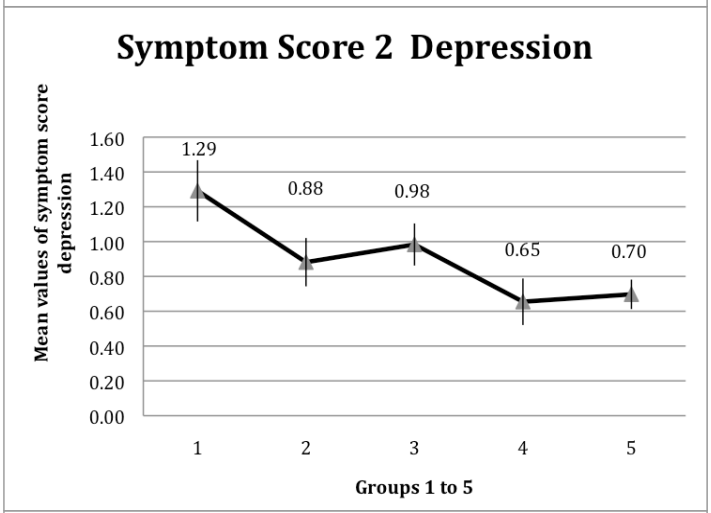


Fig. 6:
Control Symptom Score 2 for Symptoms of Depression for Groups 1-4 and Control Group 5
On the y-axis the mean values of the symptom scores are shown; the vertical bars at the result points represent the 95% confidence intervals.

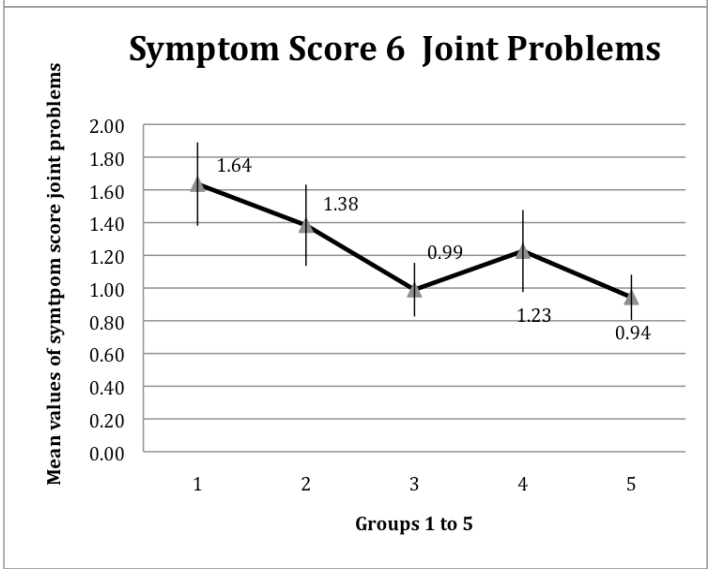


Fig. 7:
Control Symptom Score 6 for Joint Problems for Groups 1-4 and Control Group 5
On the y-axis the mean values of the symptom scores are shown; the vertical bars at the result points represent the 95% confidence intervals.

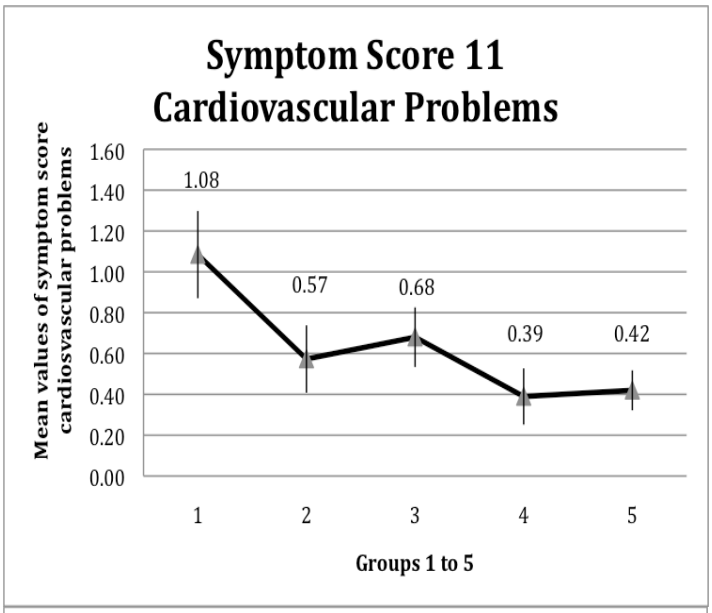


Fig. 8:
Control Symptom Score 11 for Cardiovascular Problems for Groups 1-4 and Control Group 5
On the y-axis the mean values of the symptom scores are shown; the vertical bars at the result points represent the 95% confidence intervals.

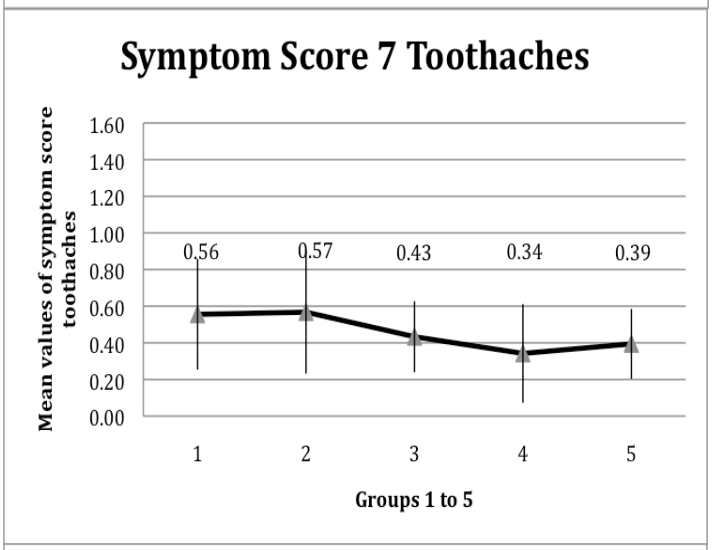


Fig. 9:
Control Symptom Score 7 for Toothaches for Groups 1-4 and Control Group 5
On the y-axis the mean values of the symptom scores are shown; the vertical bars at the result points represent the 95% confidence intervals.

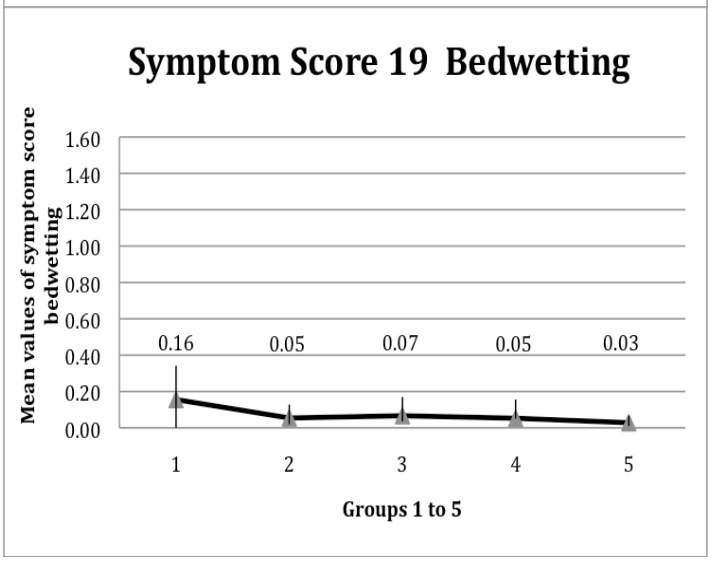


Fig. 10:
Control Symptom Score 19 for Bedwetting for Groups 1-4 and Control Group 5
On the y-axis the mean values of the symptom scores are shown; the vertical bars at the result points represent the 95% confidence intervals.

The symptoms "toothaches" and "bedwetting" served as controls in order to validate with these radiation-independent symptoms the plausibility of the participants' responses. There were no significant differences found for groups 1 and 2 in comparison to groups 3 and 4 or to control group 5, respectively (Table 4).

In a second step, we investigated if, within the 400-m radius, documented symptom scores are related to the distance or measured exposure level.

In Figure 11 the mean values are shown, comparing group 1 and 2 (upper black line) to group 3 and 4 (lower gray line).

Except for the symptoms toothache, hormone imbalance, weight gain, weight loss, and bedwetting, significant differences were found ($p < 0.01$; t-test).

Among the study participants a significant dose-response relationship was found between the theoretically calculated or measured exposure level and the symptom score levels.

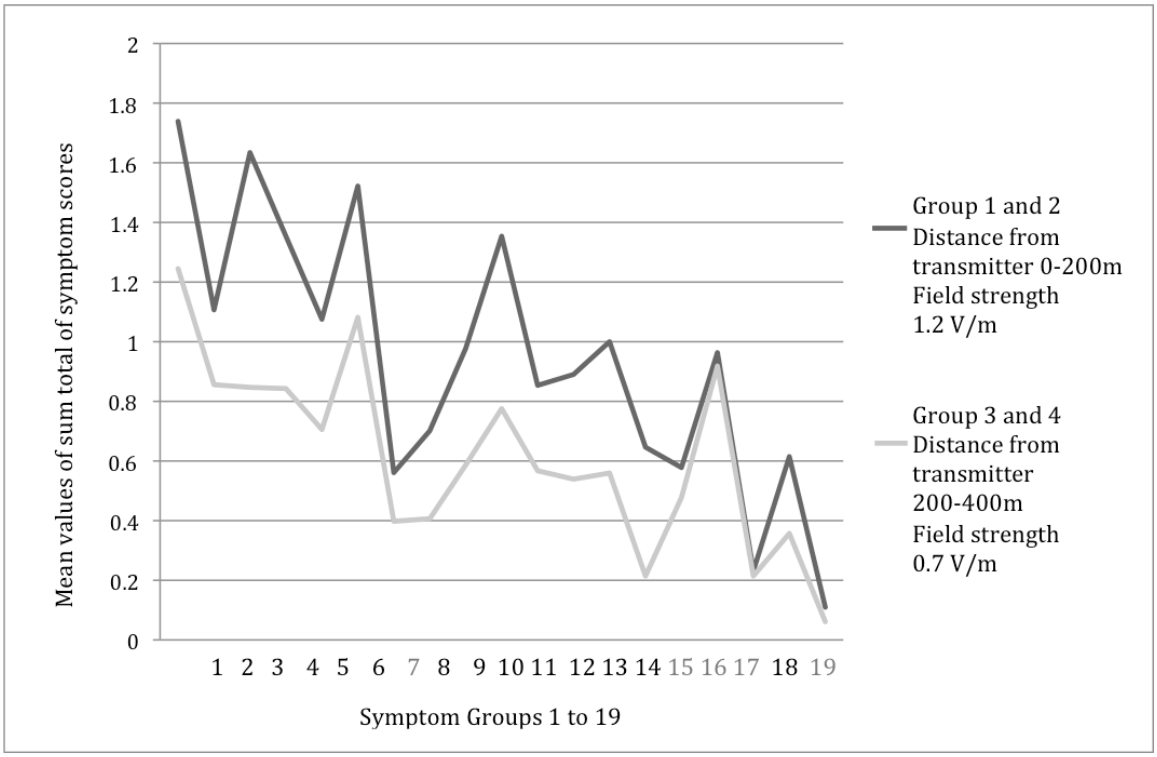


Fig. 11: Comparison of Groups 1 and 2 near the Transmitter to Groups 3 and 4 further away within the 400-m Radius
The numbers a shade lighter represent the nonsignificant symptom groups.

Data Gathering of DECT Phone Use

In the personal information form, participants could checkmark whether they have a DECT phone in their household. Out of 251 participants, 171 said they owned such a device and 80 said no. The average age of DECT phone users was with 50.5 years significantly lower than for those participants without a DECT phone (t-test, $p < 0.001$) so that no comparison group existed for individual relationships.

Discussion

The presented results show a significant relationship between mean exposure levels of the study participants and reported health symptoms.
For the highest exposure group, the mean microwave exposure is given with a field intensity of 1.2 V/m. An additional question concerning the use of DECT phones at home revealed an additional background exposure level in all participating households.
The graphs show clear trends for decreasing symptom scores in relation to decreasing mean exposure levels caused by cell phone transmitter emissions.

The comparison with the national and international research to classify these results provides additional arguments for nonrandom relationships.

Within the framework of the German Mobile Phone Programme (DMF), the QUEBEB study also investigated if health symptoms in the population could be associated with cell phone base stations and measured microwave radiation levels.
This study did not show any significant relationships because the highest measurement is given with 1 volt per meter, whereby 99% of the measurements are below 0.34 V/m. The mean exposure level was at 0.07 V/m with a 95% percentile at 0.17 V/m (1).

While less than 1% of the participants of the DMF study were exposed above 0.34 V/m, 82 out of the 251 study participants in Selbitz belonged to a high-exposure group above 0.7 V/m, that is, 32.7%.
High exposure groups as found in Selbitz did basically not occur in the samples of the German Mobile Phone Programme. To a certain degree, this has to do with the method of random sampling and leads to a systematic underestimation of the risk for population groups with higher exposures. Thus the finding of the QUEBEB study that found no correlation applies only to low-exposure groups and does in no way contradict the findings in Selbitz.

In Germany where complete cell phone coverage is provided, the Federal Office for Radiation Protection (BfS) has received highly important information about the health problems affecting residents living next to cell phone base stations. In a meeting on 2 August 2006 in Neuherberg, strongly worded official medical reports were quoted that document problem situations in particularly highly exposed households (17-19).

It has become known to industry that the health of their technicians is damaged (20,21).
There are already efforts under way to explore possibilities of how the electromagnetic pollution in wireless networks could be reduced. The reasoning for a patent filed in 2003 explicitly quotes evidence of damage in human DNA (22).

Since the 1960s long-term, nonthermal effects on the human central nervous system have been causally linked to microwaves, ultrashort waves, and shortwaves in several studies.

As part of a dissertation, Wenzel studied the health status of radio personnel in East German military forces (NVA) and summarized his results in a report that was confidential until 1989. In comparison to a nonexposed group, he observed an increase in headaches, sleep problems, general fatigue, eye pain, stabbing pain in the chest, declining mental power, irritability, dizziness, tendency to sweat, and visual problems. As a result of his findings, the inadequacy of the current exposure limits had already been pointed out in 1967 (9).

The review of occupational surveys in the Soviet Union between 1960 and 1996, which had been carried out by Prof. Hecht on behalf of the Federal Office for Telecommunications, revealed causal links for microwave radiation as a stressor of the central nervous system (26).

In 1960 Iranyi et al. from Hungary reported for the first time in the *Munich Medical Weekly Journal* about a substantially increasing number of health problems in radio personnel of "modern" radio stations that had been validated by measurements and confirmed by medical doctors, including headaches, dizziness, tiredness, sleep problems, tremors, and other symptoms. The symptoms occurred from field intensities above 3.8 V/m. There was no indication of simulated complaints. Because the symptoms occurred during their working hours and were associated with the number of years of employment, the authors concluded that there is a causal link between symptoms and exposure levels (10).

In 1962 Miro found increasing cases of pain, dizziness, nausea, personality changes, weight loss, fever attacks with chilling and sweating, and general fatigue in French radar personnel. The RF radiation exposure was at ca. 5 V/m (8).

In 1996 a study by the Swiss Federal Office of Energy around the shortwave transmitter at Schwarzenburg in Switzerland documented highly significant health problems in the civilian population regarding sleep problems, headaches, joint pain, fatigue, and other symptoms. In a blinded follow-up study, symptoms started to improve one day after the transmitter was turned off (11-13).

In 2002 Santini et al. had also demonstrated a clear dose-response relationship for the following symptoms in the vicinity of French cell phone base stations: sleep problems, tiredness, fatigue, irritability, depression, and other symptoms. As a conclusion, it was recommended back then to install this type of transmitter no closer to residences than 300 m (14).

Similar findings were revealed in the work by Navarro et al. with the follow-up measurements by Oberfeld (Government of Land Salzburg, Health Department), in which case the measured exposure levels were highly significantly correlated with major health problems. Three groups showed the following field intensity distribution: group 1 – 0.02-0.04 V/m, group 2 – 0.05-0.22 V/m, and group 3 – 0.25-1.29 V/m (15).

In 2007 the paper by Abdel-Rassoul et al. showed significant problems of the central nervous system (headaches, memory problems, dizziness, tremors, symptoms of depression, sleep problems) in an exposed population compared to the control group. The measured field intensity of the group classified as exposed was 3 V/m (16).

The survey presented here included specific control questions to verify the credibility of the participants' responses. From the number of described symptoms, for example, it was possible to see that the questionnaires had not been filled out randomly. Thus the control question for "toothaches," a disease mainly caused by caries, showed no difference between the exposed and unexposed groups.
As was to be expected, the control symptom "bedwetting" occurred only in a very small percentage and also showed no difference between exposed and unexposed groups.

The relationship between the question "weight gain" and "weight loss" corresponded with the known clinical reality. The obesity prevalence (body mass index BMI > 30) in the population is on average at 20%, which corresponds with a value of 1 (20% of maximum value 5) in our symptom scores. Underweight is found only in ca. 1-6% of the German population, which is reflected in the low symptom score for weight loss at 0.2 in our study (28).
A trend toward voting behavior in terms of symptom aggravation could thus be ruled out.

The occurrence of the symptom groups sleep problems, depression, cerebral symptoms, infections, skin problems, cardiovascular problems, problems of the visual and auditory system as well as the gastrointestinal tract proved to be consistently and significantly higher in the exposed groups. As can be seen from the literature review, it has been known since the 1960s that RF electromagnetic fields and microwaves can trigger these symptoms (8-10).

Equally significant were differences for the scores of joint problems, which again replicated already published findings of the Schwarzenburg study, Switzerland (11-13).

The results presented here were statistically validated by the t-test (7). The often stereotypically quoted criticism of too small case numbers for a validation of an association was mathematically refuted by the application of this statistical test and its significant results.

Considerably more crucial is the limitation of the gathered data because of the noticeable self-selection of the participants compared to the total number of the survey sample, which is reflected in the low response rate to the questionnaires. However, neither the response rates of the entire 400-m radius around the transmitter nor the highest exposure area do significantly differ from the response rate of control area 5, which again suggests a homogenous response behavior and speaks against an overselection of allegedly sick persons (Table 2).

The approached participants, including persons from the 400-m radius around the cell phone transmitter at the *Feldstraße* as well as Selbitz residents from further away, did not know that they would be classified into groups based on their residential location and exposure level. Thus it was not possible for the participants to classify themselves into groups 1 to 5.
In follow-up studies one should try to increase the response rate by phone calls or personal interviews instead of relying on a single mailout as was done in this study.

In Selbitz municipality, there are proponents as well as critics of wireless technologies and also persons who are indifferent to it so that each group had the same opportunity to respond. The number of study participants who considered their health affected by cell phone radiation was 12% in Selbitz and, therefore, falls below the participation rate of 23%. This corresponds with a percentage of 9% as found in the DMF. Thus a selection bias was not detected.

The participating individual groups did not differ based on age or gender, respectively; the plausibility of the responses was validated within the study. It is therefore assumed that the documented results reflect the actual distribution of the health problems.
International definitions stipulate that adverse health effects caused by microwave radiation can only be regarded as verified if the explanation for a plausible effect mechanism is provided, studies are independently replicated several times, and no contradictions exist in other studies (23).

With the paper presented here, these conditions are met so that the ongoing demand for evidence has been met once again. When taking the low exposure levels into account, the negative results of the German Mobile Phone Programme are consistent.

Conclusions

Until 2009 the official protocol for the investigation of health problems in residents living next to transmitters amounted to nothing more than measuring exposure levels in affected households instead of on-site monitoring with transmitter shutdowns to investigate causal links.
From the compliance with the currently valid exposure limits, it was concluded without any further investigation—using the logic of reductionism—that below these exposure limits no health effects could occur because, first, the exposure limits have already been met and, second, no scientifically accepted studies are available. The latter statement is not up to the current state of science.

According to the *Federal Immission Control Act* (§ 22 BImSchG) as well as the German constitution (art. 2, para. 2 GG), during the operation of technical facilities health hazards to a third party must indisputably be ruled out.
With the *Federal Immission Control Ordinance* (26. BImSchV), the federal regulation maker establishes exposure limit regulations for electromagnetic fields whose specifications are required by acts and the constitution. But as the presented paper shows once more, a clearly increasing incidence of disease is already taking place far below legally binding exposure guideline limits.
Even if in legal terms, this is not yet proof for an individual-specific evidence of damage, the presented investigations make it clear that the conclusions drawn by the federal regulation maker from the results of the German Mobile Phone Programme, according to which no health risk is to be expected below the exposure limits of the 26. BImSchV, are scientifically and legally unjustifiable.

From a legal perspective, it should be noted here that the current exposure limit regulations basically do not provide sufficient protection against health risks. Insofar as official agencies still suggest that the exposure limits of the 26. BImSchV would be precautionary limits, these limits are now disproven—among others—through our investigation, as it showed a significantly increased health risk in the vicinity of cell phone base stations.

As has already been demanded by the European Parliament, current exposure guidelines need to be urgently reviewed. Because of the documented relationship between exposure and health symptoms, there is also an urgent need for further research to elucidate the detailed relationships of health symptoms.

It is a physician's responsibility—not bound by directives—to work towards the preservation of the natural basis of life regarding human health (24).
As representatives of public health agencies, state offices such as the Public Health Department, the State Office for the Environment, and the Bavarian Ministry of the Environment as well as higher-ranking government levels

such as the Federal Ministry of the Environment and the European Union are invited to specify the cause of this possible slow poisoning.

After shutting down the respective transmitters for half a year, a portion of the health symptoms reported by the study participants in Selbitz should become normalized. The significant clinical relevance of the observed results has been discussed.

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Note:
Upon request, the anonymized raw data can be provided by Selbitz municipality to scientific institutions.

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