# Health Baseline Report

Prepared for:

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# 1 Summary Report Regarding Health Baseline

## 1.1 Acute Diseases in Rosia Montana as Compared to Other Areas

### *1.1.1 Acute respiratory diseases*

The population groups from Rosia Montana as compared to other localities with large population groups have been recorded significant either Odds Ratio (OR) or Relative Risk for acute respiratory diseases (for all the categories consisting of acute respiratory diseases; see the methodology). A similar trend has been found out for the localities with small population groups when again acute respiratory diseases (for all the categories consisting of acute respiratory diseases) are significantly higher in Rosia Montana as against as the above mentioned locations. There are also some particularities:

A. either the OR or the RR is higher in Rosia Montana for some of the small population groups localities, but for some cases only as a trend not necessarily statistically significant.

B. there are some cases which pointed out higher risks in the small population groups as compared to Rosia Montana, however this is characteristic for few locations as against as to most of them when situation is rather other way round, and on the other hand it is always as a trend not being statistically significant.

C. two localities Bucium and Certege compared to Rosia Montana revealed higher significant OR and RR for the acute respiratory diseases (for all the categories consisting of acute respiratory diseases). A similar situation is recorded for the population living in Campeni city but only for some acute diseases while for most of them, as described above, the risks are higher in Rosia Montana, and for the population from Gura Rosiei with higher OR then Rosia Montana but not statistically significant.

### *1.1.2 Acute digestive diseases*

When comparing the population groups from Rosia Montana to those from the other investigated localities (see the methodology) we have found out a similar trend as with the one presented for the acute respiratory diseases. This trend pointed out higher risks to develop acute digestive diseases for the population living in Rosia Montana, even sometimes statistical significance it is not powerful enough, but the trend is recorded by higher OR and/or RR.

### *1.1.3 Acute ocular diseases*

Again, the trend recorded for the respiratory and digestive acute diseases for the population groups living in the Rosia Montana is very similar to that of acute ocular diseases showing significant OR and/or RR in Rosia Montana. There is one exception which characterize the inhabitants from Certege as being exposed to higher risks to develop acute ocular diseases then those from Rosia Montana, situation similar to the one expressed for acute respiratory diseases.

### *1.1.4 Acute skin diseases*

For acute skin diseases higher risks were identified for the population groups living in Rosia Montana as compared as both, Abrud and Campeni.

### 1.1.5 Acute genitourinary system diseases

Again, the acute genitourinary diseases have been recorded a similar trend to the other above mentioned disease categories pointed out higher risks in Rosia Montana then in the rest of the investigated localities. Slightly higher values of OR and RR have been noticed for the population of Bucium in comparison to Rosia Montana.

## 1.2 Chronic Diseases in Rosia Montana as Compared to Other Areas

### 1.2.1 Chronic respiratory diseases

Higher risks (categorized as in the methodology) have been found out for chronic respiratory diseases within the population living in Rosia Montana compared to inhabitants from Abrud and Campeni. A similar trend has been recorded for localities with smaller population groups. Meanwhile there are few exceptions in the case of some localities such as Cercetege which pointed out higher risks then Rosia Montana (no statistical significance), and Bucium this time statistically significant, even only for bronchial chronic obstructive diseases.

### 1.2.2 Chronic cardiovascular diseases

For the chronic cardiovascular diseases (for all the categories as mentioned in the methodology) the OR and RR is most of the cases significant higher within the population from Rosia Montana compared to the people living in the investigated localities both, those with large and small numbers in terms of inhabitants.

As with the case of acute and some other chronic diseases the population from Certege showed higher risks for all the cardiovascular diseases categories as those from Rosia Montana. A similar trend was pointed out for the people living in Bucium, though this time is only for one chronic cardiovascular disease group, while for the rest risks are higher for people from Rosia Montana

### 1.2.3 Chronic digestive diseases

The chronic digestive diseases have pointed out higher risks, either significant or not significant, either in Rosia Montana versus the investigated localities or in some investigated localities versus Rosia Montana. Therefore, there is no specific trend of the risk to develop chronic digestive diseases as such as those which have been stated for either acute or chronic diseases mentioned above.

### 1.2.4 Chronic blood and blood forming organs diseases

The risks to develop chronic blood and blood forming organs diseases have been noticed to be higher at the population from Rosia Montana compared to that from Abrud, but for the majority of the cases risks have been lower at the population living in Rosia Montana as against people from the investigated localities, recorded literarily a complete different trend as with the previous situations. In the same pattern (as a complete different behavior with regard to Rosia Montana vs. Certege case) the risks of chronic blood and blood forming organs diseases is significant higher in Rosia Montana then in Certege.

### 1.2.5 Chronic skin diseases

Significant higher risks of chronic skin diseases were found out within the population groups from Rosia Montana versus those from Abrud.

### 1.2.6 Chronic endocrine diseases

The risks of some chronic endocrine diseases such as diabetes are higher in Rosia Montana then in Abrud and Campeni, otherwise a similar trend to the chronic digestive diseases is observed, meaning higher risks, either significant or not significant, either in Rosia Montana versus the investigated localities or in some investigated localities versus Rosia Montana. Therefore, it is not possible to establish a clear trend for this group of diseases in terms of spatial distribution, except diabetes.

### 1.2.7 Chronic musculoskeletal and connected tissues diseases

In general higher risks of chronic musculoskeletal and connected tissues diseases have been noticed for the people of Rosia Montana as against as those living in the investigated locations. As a different result two localities Bucium and Certege (which also made the difference couple of times previously) showed higher risks then Rosia Montana.

### 1.2.8 Chronic nervous system diseases

For these group of diseases the risks can not be characterized in terms of spatial distribution, neither specific trend nor specific situations between locations being noticed after data analysis.

### 1.2.9 Chronic genitourinary system diseases

Chronic genitourinary system diseases pointed out higher risks within the population groups living in Rosia Montana compared to the rest of the investigated locations, sometimes not of statistical relevance, but most of the cases with statistical significance.

# 2 Introduction

Rosia Montana is situated in the Central-West part of Romania, Nord-West of Alba county. It is entirely located in the mountain area on the Nord-West side of Meridional Carpathians, within Apuseni Mountains, 80 km far from Alba Iulia, 11 km far from Abrud and 15 km far from Campeni.

The most important demographic indicators for the period 2002-2004, show a lower natality rate as compared to the Romanian average and to the major locations in the area: Abrud, Campeni and Bistra. Lifetime expentancy is lower in Rosia Montana as against the Romanian average and other important localities in the area, as well. A similar trend was pointed out for the mortality, in the same time periode, which is the highest one compared to both, Romanian and area localities average.

# 3 Demographic Data

## 3.1 General Demographic and Health Data in Rosia Montana Area as Compared to Alba County and Romania

**Live-birth rate, average life expectancy and mortality in Rosia Montana area as compared to Alba County and a few towns from Alba County and Romania.**

**Table 3-1. Live births, rate per 1000 inhabitants**

| | 2002 | 2003 | 2004 |
|---|---|---|---|
| Abrud | 7.6 | 8.1 | 8.8 |
| Campeni | 7.1 | 10.9 | 8.7 |
| Bistra | 10.4 | 11 | 9.4 |
| Bucium | 6.6 | 5.6 | 6.4 |
| Rosia Montana | 9.2 | 7.6 | 6.9 |
| Romania | 9.8 | 9.7 | 9.8 |

**Figure 3.1. Live births, rate per 1000 inhabitants**

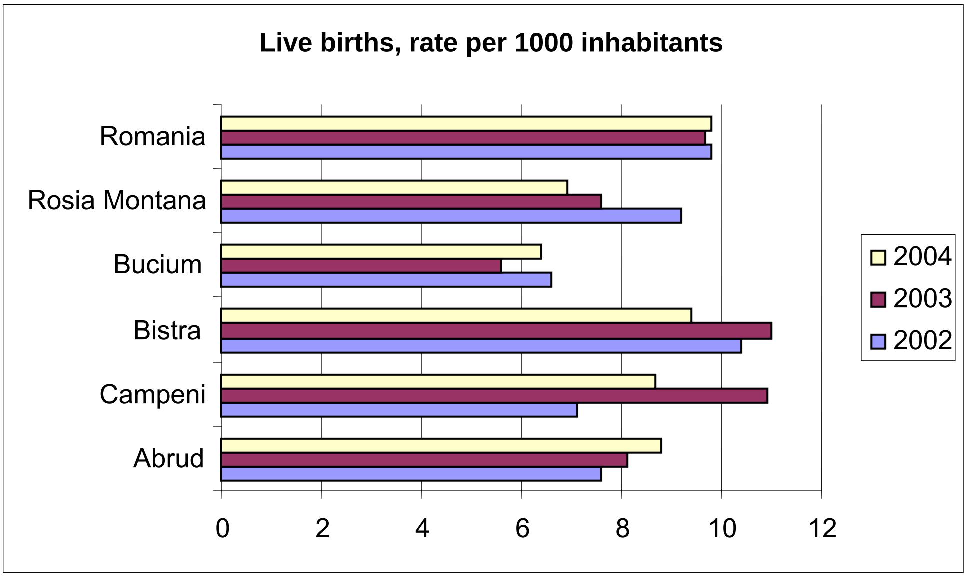



Table 3-1 and Figure 3.1 points out that live-birth rate per 1000 inhabitants is lower in Rosia Montana as compared to the country live-birth rate. It has to be mentioned that in Rosia Montana, the live-birth rate decreased from 9.2 in 2002 to 6.9 in 2004 whereas at the country level, it remained aproximately the same. Among the other investigated localities, Bucium had a lower live-birth rate per 1000 inhabitants as compared to Rosia Montana, with the observation that in 2002, live-birth rate per 1000 inhabitants in Campeni and Abrud was also lower than that one registered in Rosia Montana, but this pattern was changed in the following years (2003, 2004).

## Table 3-2. Average life expectancy

| | | 2004 |
|---|---|---|
| **Abrud** | **Men** | 63 |
| | **Women** | 70 |
| | **Both sexes** | 66.5 |
| **Campeni** | **Men** | 65 |
| | **Women** | 71 |
| | **Both sexes** | 68 |
| **Bistra** | **Men** | 62 |
| | **Women** | 70 |
| | **Both sexes** | 66 |
| **Rosia Montana** | **Men** | 61 |
| | **Women** | 69 |
| | **Both sexes** | 65 |
| **Alba Iulia** | **Men** | 65 |
| | **Women** | 73 |
| | **Both sexes** | 69 |
| **Romania** | **Men** | 67.4 |
| | **Women** | 74.8 |
| | **Both sexes** | 71.1 |

**Figure 3.2. Average life expectancy**

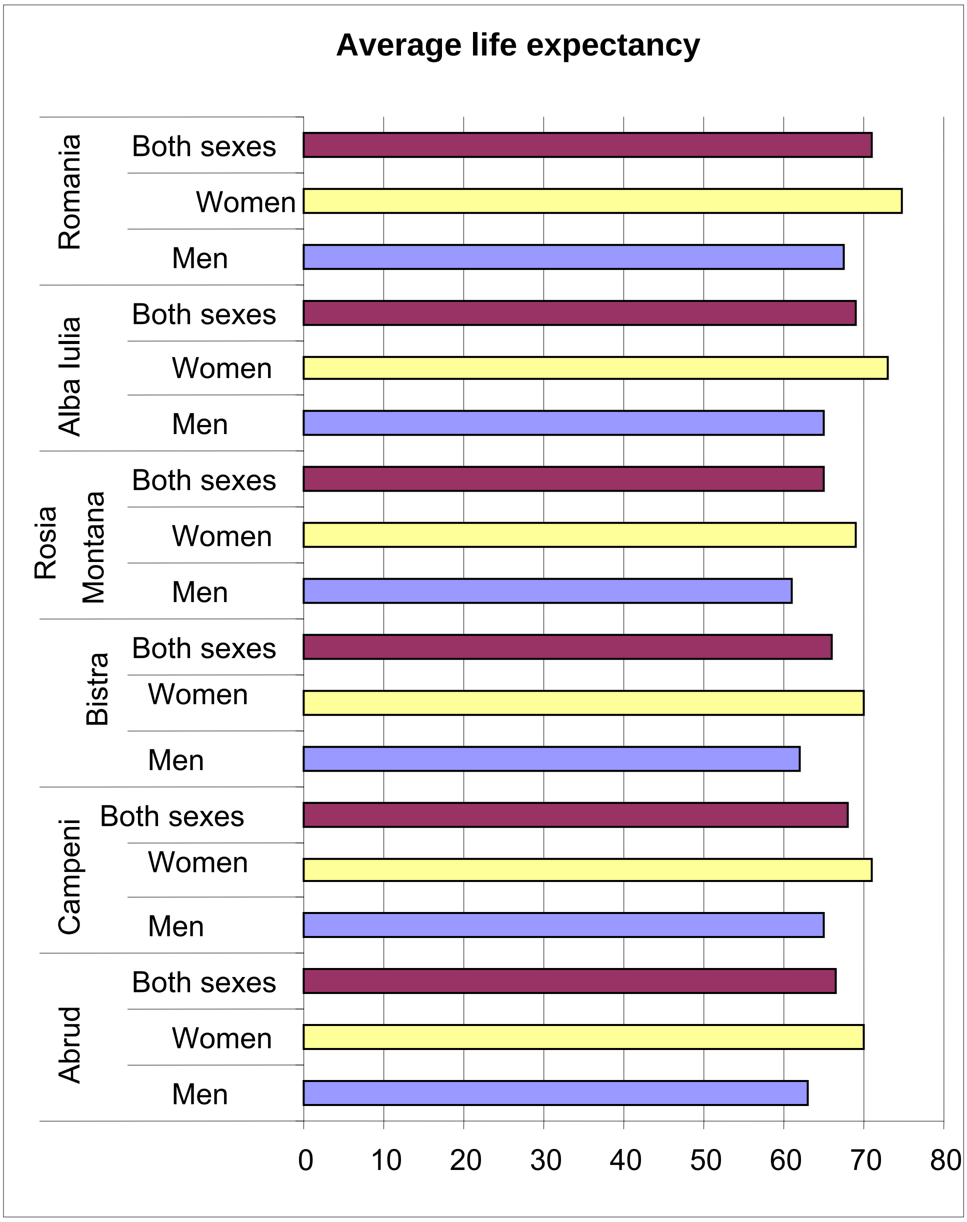



Figure 3.2 shows that the average life expectancy in Rosia Montana is lower as compared to the average life expectancy at the country level (Romania) and at the county level (Alba County) and also as compared to the average life expectancy in Abrud, Campeni and Bistra, and the same pattern is described when the average life expectancy is calculated by gender. At the same time, at the county level (Alba) and for those three localities mentioned above, the average life expectancy and the average life expectancy by gender as compared to the average life expectancy at the country level (Romania). Moreover, for the localities Abrud and Bistra, the average life expectancy and the average life expectancy by gender was lower as compared to the average life expectancy at the county level (Alba). As regards Campeni town, average life expectancy in general and female average life expectancy in particular, were lower as compared to that ones registered at the county level (Alba). The male average life expectancy in Campeni was similar with that one registered at the county level (Alba). Also, it has to be mention that among those three investigated localities in Alba county, Bistra had the lowest average life expectancy and average life expectancy by gender.

**Table 3-3. Deaths, rate per 1000 inhabitants**

| | 2002 | 2003 | 2004 |
|---|---|---|---|
| Abrud | 7.1 | 9.5 | 10.6 |
| Campeni | 9.8 | 9.5 | 11 |
| Bistra | 11.5 | 7.4 | 8.4 |
| Bucium | 6.6 | 5.6 | 7.4 |
| Rosia Montana | 14.3 | 12.5 | 11.5 |
| Romania | 11.6 | 12.4 | 12.3 |

**Figure 3.3. Deaths per 1000 inhabitants**

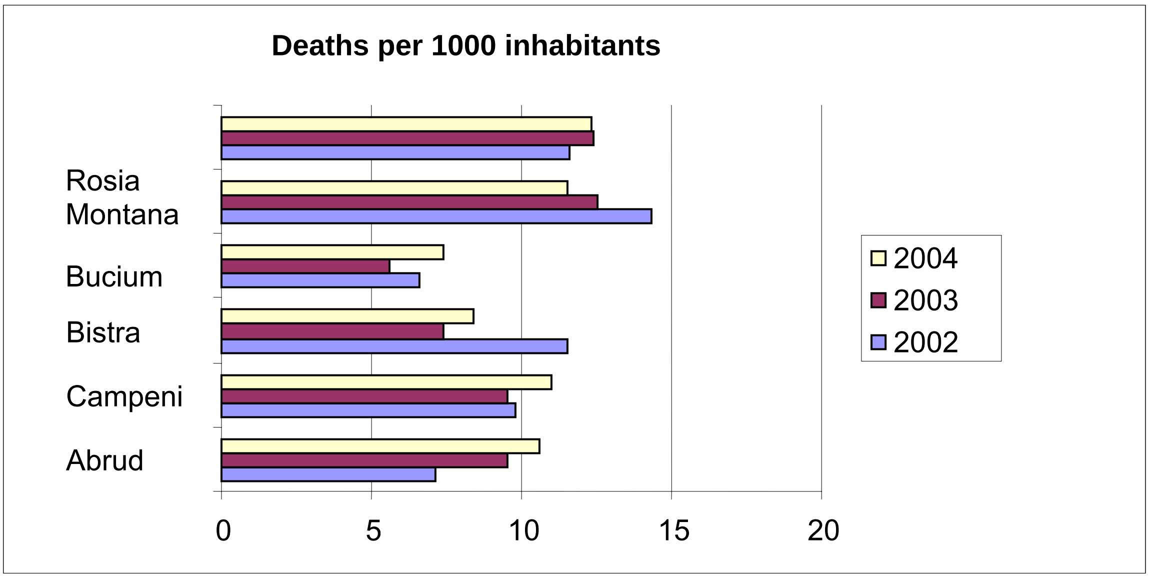


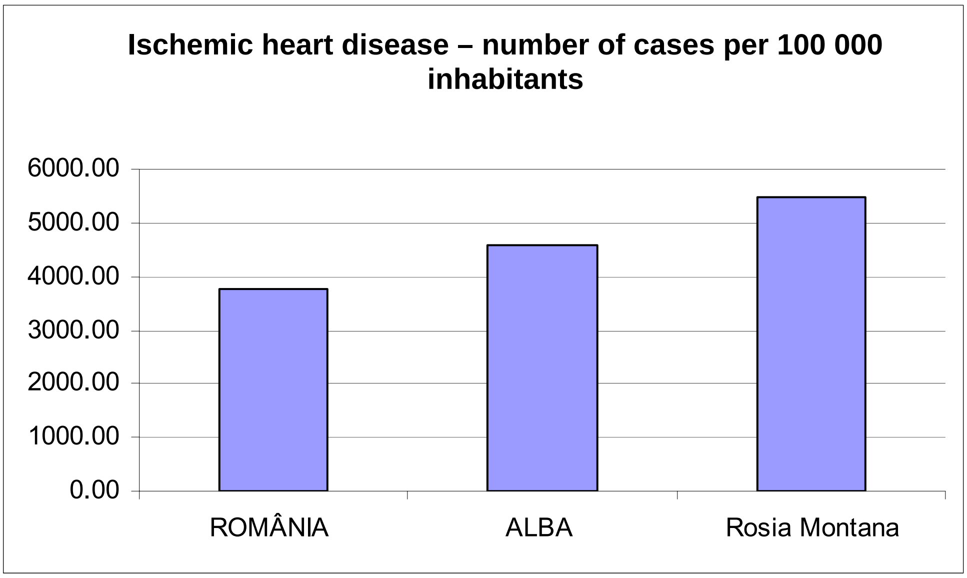

Table 3-3 and Figure 3.3 points out that, the number of deaths per 1000 inhabitants is higher in Rosia Montana as comapred to the number of deaths per 1000 inhabitants at the country level (Romania) in 2002. In 2003, in Rosia Montana, the number of deaths per 1000 inhabitants was aproximately the same with the one registered at the country level and in 2004 the number of deaths per 1000 inhabitants in Rosia Montana decreased as compared to the number of deaths per 1000 inhabitants registered at the country level. With regard to the other investigated localities (Bucium, Bistra, Campeni, Abrud), the number of deaths per 1000 inhabitants is lower than the one registered in Rosia Montana, the same pattern being found throughout the three years time interval.

## 3.2 The Prevalence of Some Significant Diseases in Rosia Montana As Compared To Alba County and Romania

### The prevalence of certain groups of diseases per 100000 inhabitants presented in Rosia Montana in comparison with the national level and county level (Alba county) data

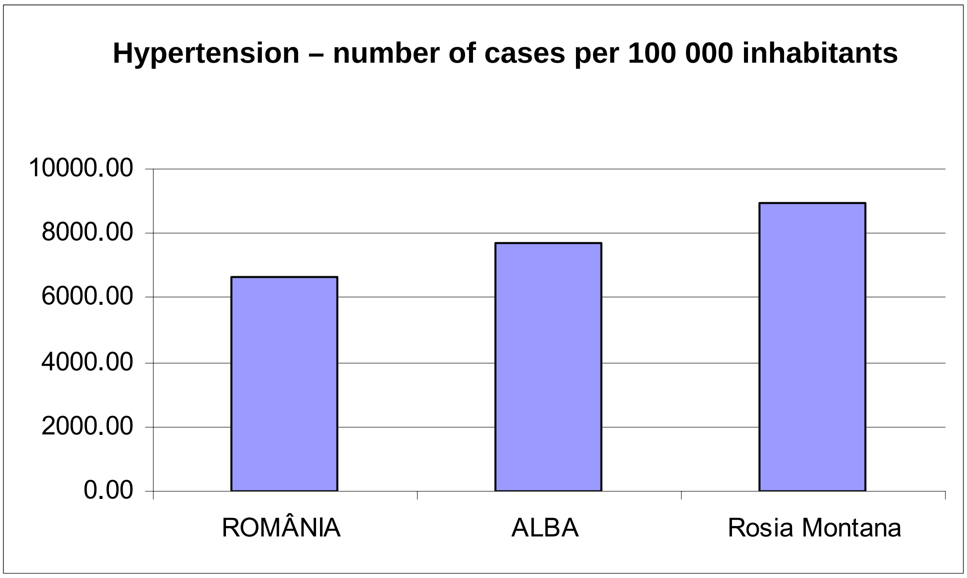
The health data at the county and national level are from 2004 health reports published by the Romanian Ministry of Health on their website. Health data for Rosia Montana are gathered from the local family doctors.

**Figure 3.4. Ischemic heart disease – number of cases per 100 000 inhabitants**



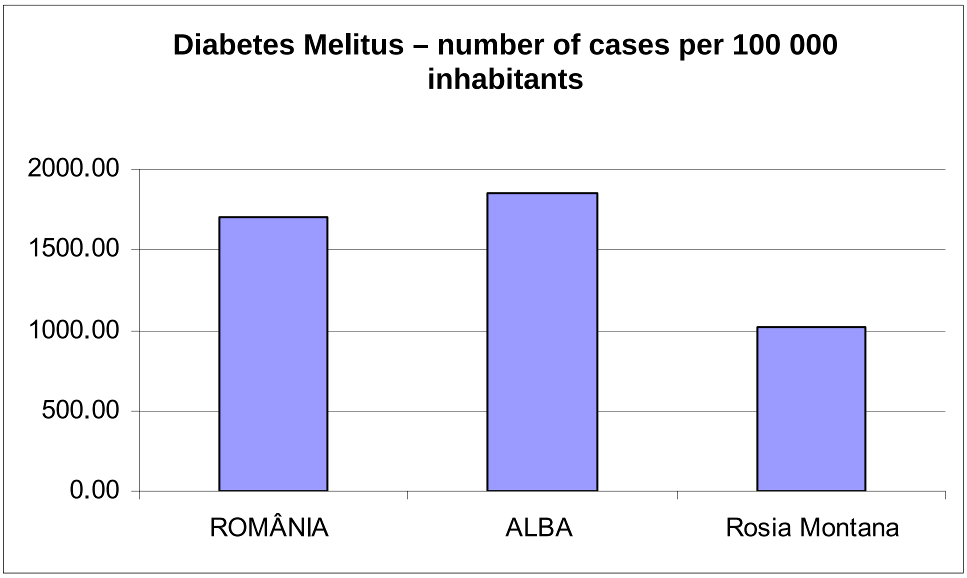

The prevalence of ischemic heart disease per 100000 inhabitants in Rosia Montana (see Figure 3.4) is higher than the one registered in Alba County and at the country level (Romania) It has to be mentioned that the prevalence in Alba County is also higher than the one registered at the country level.

**Figure 3.5. Hypertension – number of cases per 100 000 inhabitants**



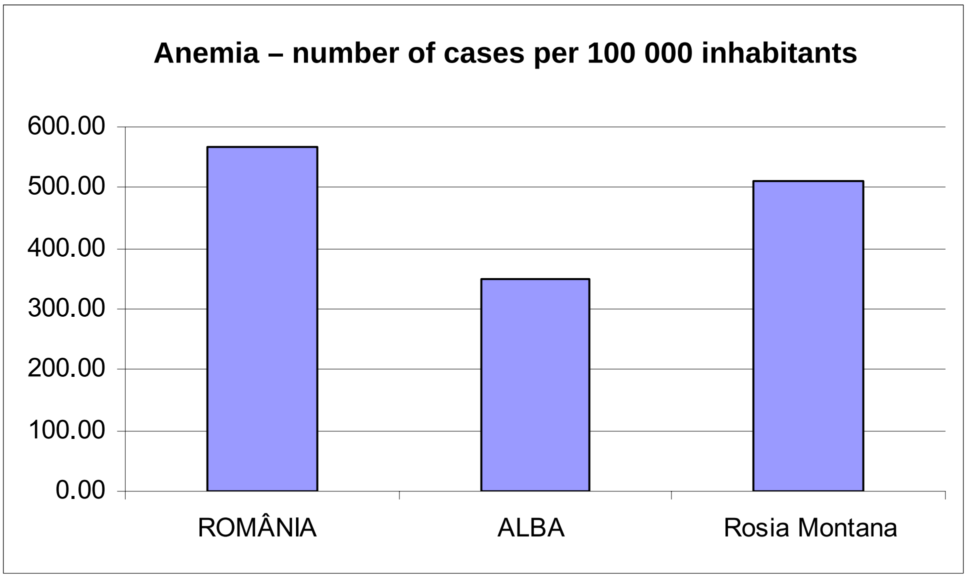

The prevalence of hypertension per 100000 inhabitants in Rosia Montana (see Figure 3.5) is higher than the one calculated at the county level (Alba) and as compared to the prevalence of the disease at the country level (Romania). It has to be noticed that the prevalence of the disease in Alba County is similar with the prevalence of the disease at the country level.

**Figure 3.6. Diabetes Melitus – number of cases per 100 000 inhabitants**



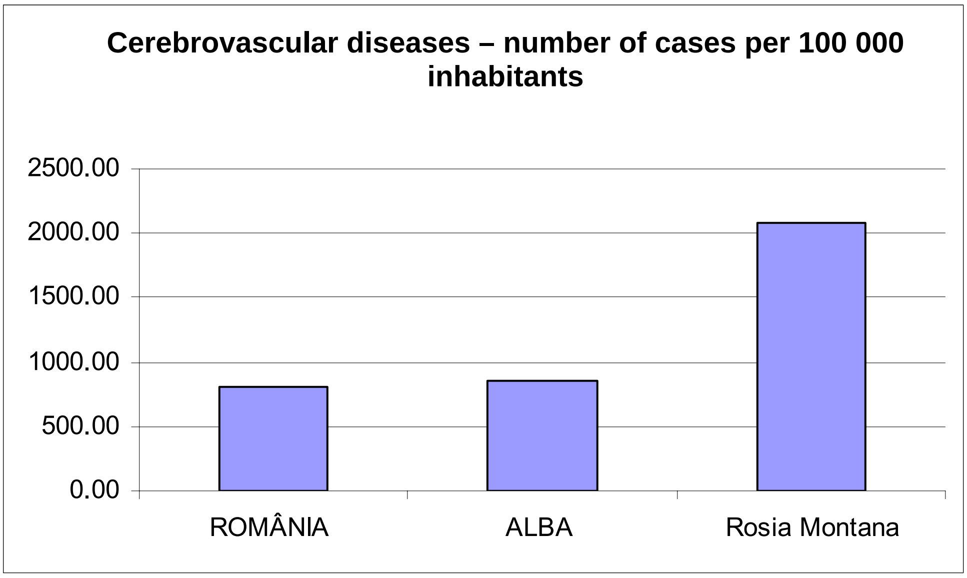

The prevalence of diabetes melitus per 100000 inhabitants in Rosia Montana (see Figure 3.6) is lower than the prevalence of the disease in Alba County and at the country level (Romania) with the remark that the prevalence of diabetes in Alba County is higher than the one calculated at the country level.

**Figure 3.7. Anemia – number of cases per 100 000 inhabitants**



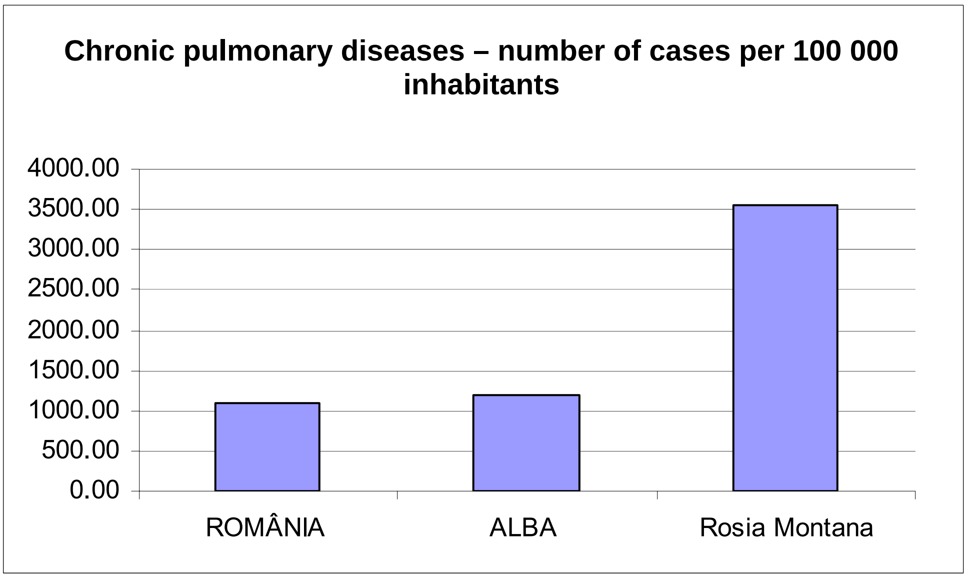

Regarding of anemia (iron deficiency, nutritional, aplastic anemia) as illustrated in Figure 3.7, the prevalence is lower as compared to the prevalence of anemia at the country level (Romania) but is higher as compared to the prevalence of anemia at the county level (Alba).

**Figure 3.8. Cerebrovascular diseases – number of cases per 100 000 inhabitants**



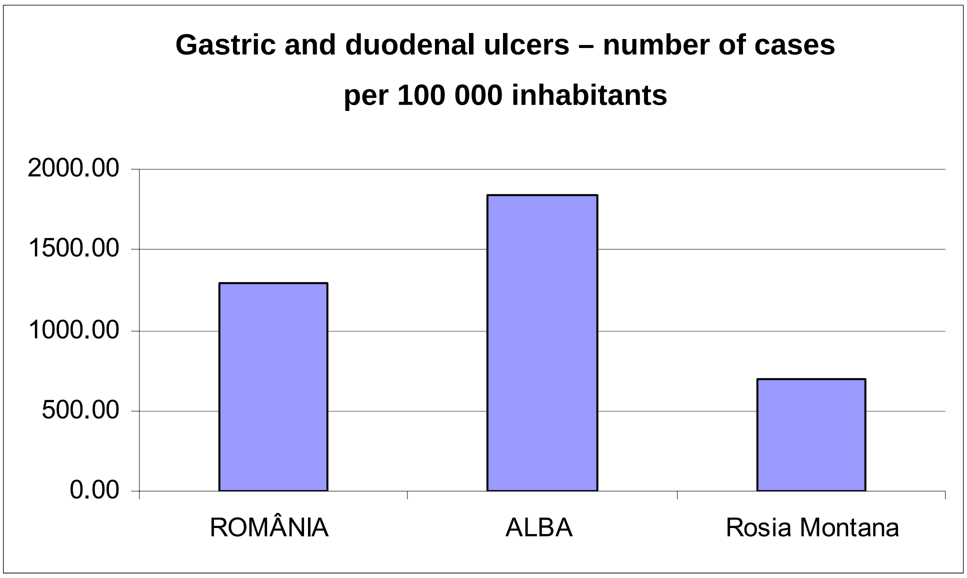

The prevalence of cerebrovascular diseases per 100000 inhabitants in Rosia Montana (see Figure 3.8) is much higher than the prevalence of the disease in Alba County and at the country level (Romania) with the remark that the prevalence of the disease registered similar values both at the county and at the country level.

**Figure 3.9. Chronic pulmonary diseases – number of cases per 100 000 inhabitants**



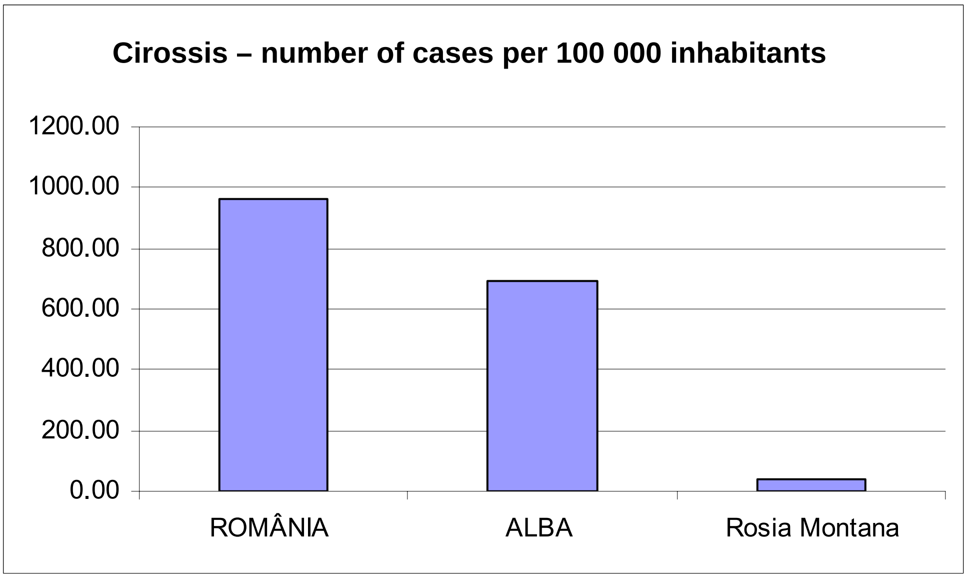

The prevalence of chronic pulmonary diseases (chronic bronchitis, emphysema, asthma, bronchiectasy, other obstructive pulmonary diseases) per 100000 inhabitants (see Figure 3.9) is much higher in Rosia Montana than the prevalence of the diseases calculated at the county level (Alba) and at the country level (Romania) with the remark that the prevalence of the disease registered similar values both at the county and at the country level.

**Figure 3.10. Gastric and duodenal ulcers – number of cases per 100 000 inhabitants**



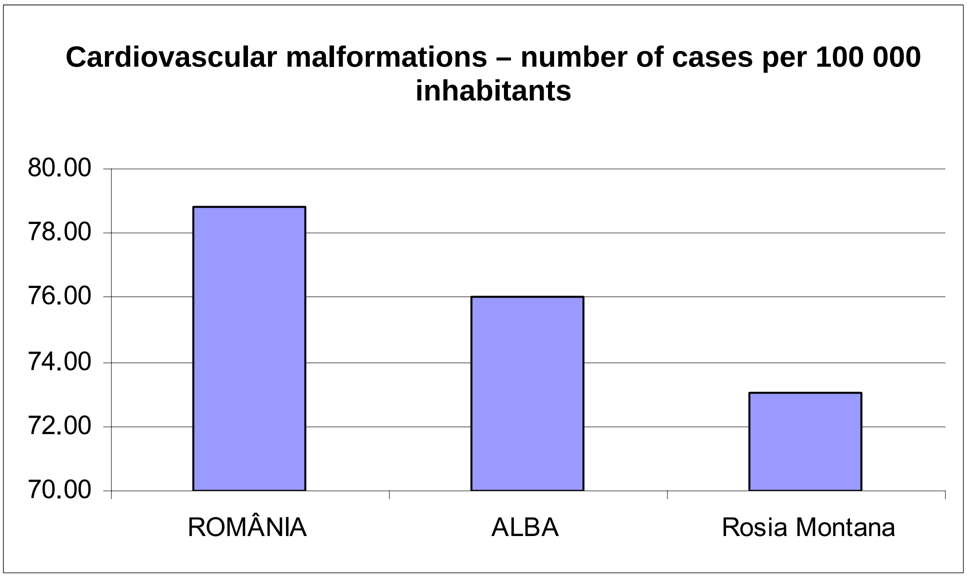

The prevalence of gastric and duodenal ulcers (see Figure 3.10) is lower in Rosia Montana as compared to the prevalence of gastric and duodenal ulcers in Alba County and at the country level (Romania) with the remark that the prevalence in Alba County is higher than the prevalence at the country level.

**Figure 3.11. Cirossis – number of cases per 100 000 inhabitants**




The prevalence of cirossis per 100000 inhabitants in Rosia Montana (see Figure 3.11) is much lower than the prevalence of cirossis calculated at the county level (Alba) and at the country level (Romania) with the remark that the prevalence in Alba County is lower than the prevalence of cirossis at the country level.

**Figure 3.12. Cardiovascular malformations – number of cases per 100 000 inhabitants**




As for the prevalence of cardiovascular malformations per 100000 inhabitants in Rosia Montana (see Figure 3.12) is lower than the prevalence of cardiovascular malformations in Alba County and at the county level (Romania) with the remark that the prevalence in Alba County is lower than the prevalence at the country level.

# 4 Evaluation of Indicators Specific to Population in Rosia Montana Area Based on a Questionnaire Applied Upon a Representative Sample for the Population from the Area in Study

## 4.1 Methodology

The investigated area included Rosia Montana village and some other villages and towns (Ignatesti, Balmosesti, Vartop, Gura Rosiei, Carpinis, Tarina, Corna, Gura Cornei, Abrud, Campeni). Rosia Montana locality is part of Rosia Montana commune, which has an area of 42 sq. km and includes another 15 small villages. Rosia Montana is located in west-central Romania, in a mining district known as the Golden Quadrilateral of Alba county.

### *4.1.1 Population groups in the investigated area*

**POPULATION DATA USED IN STUDY ARE FROM THE CENSUS PERFORMED IN MARCH 2002 BY THE ROMANIAN NATIONAL INSTITUTE OF STATISTICS.**

**Table 4-1. Population in the investigated area**

| Cons.no. | Locality | Population |
|---|---|---|
| 1 | Abrud | 6190 |
| 2 | Balmosesti | 103 |
| 3 | Campeni | 5238 |
| 4 | Carpinis | 417 |
| 5 | Corna | 343 |
| 6 | Gura cornei | 266 |
| 7 | Gura rosiei | 104 |
| 8 | Ignatesti | 98 |
| 9 | Rosia montana | 1369 |
| 10 | Tarina | 169 |
| 11 | Vartop | 157 |

### *4.1.2 Selection of the localities included in study:*

Identification of localities and subjects included in study met the following demands:

- Selection of residential areas situated at different distances from the investigated area
- Selection of housings inside or close to the identified residential area/areas avoiding if possible the ones placed near by the important roads
- Determination of characteristics for population groups at risk in the area/areas of study

#### *4.1.3 Questionnaire*

The questionnaire was designed using the AutoData Scannable Office. The form of the questionnaire was designed in WordAutoData2000. Then the form was scanned and opened in the Template Maker section of AutoData Scannable Office where fields containing the question and those containing the answers options respectively, were defined. The questionnaire was filled in and then scanned with a Fujitju scanner in the Form Reader section of AutoData Scannable Office where the data was checked. The scanning process is automatically introducing the data from the forms in a database which can be generated using Access or Excel.

The questionnaire had several sections. Section A included general questions regarding age, sex, date and place of birth of the subject, date of filling in of questionnaire and the code of the interviewer. Another set of questions collected information about subject previous housings and the period of time when he/she lived there.

Section B included questions regarding the occupation and the actual and previous workplaces as well as questions reagarding the periods of time when he/she worked in those workplaces. Another set of questions collects information regarding exposure at workplace (heavy metals exposure – lead, mercury, arsenic, cadmium and cyanides as well as information about poisonings with these substances which occured during the periods of time when subjects worked there and was exposed to those hazardous substances).

Section L included questions regarding the housing location in relation to the mining, waste dumps and tailings pond upstream or downstream a watercourse, the distance between the housing and the nearest watercourse, type of the housing (house or apartment in a block of flats), age of the housing, traffic close to the housing, fuel used respectively for heating for cooking, noise sources, watersources.

Section I of the questionnaire included questions regarding habits, practices and attitudes: sun exposure, growing fruit and vegetables in the area, washing them before cooking respectively eating, washing hands before eating or preparing food, cleanning and wet mopping indoors.

Section J of the questionnaire included questions regarding respectively active smoking (number of cigarettes smoked per day, type of cigarettes – with filter or without filter, period in years while he/she smoked, that quantity of cigarettes smoked) and pasive smoking (number of persons who smoke in the house, number of cigarettes smoked per day, type of cigarettes and period of time spent with the subject in the house). Another set of questions within this section gathers information regarding alcohol consumption (plum brandy, wine, beer, liqueur) and fish consumption ( fish coming from the rivers or lakes in the area).

Section K of the questionnaire included questions regarding the socio-economical indicators – level of education, employment, monthly income, married/unmarrried, nationality.

Questionnaire was applied to each subject by interviewers previously trained with regard to how the questionnaire must be filled in.

## 4.2 Data Statistics Analysis

Data entry and data processing respected the following protocol:

- Scanning of the questionnaires with a Fujitju scanner and checking of data readings in Form Reader section of AutoData Scannable Office
- Data transfer in Stata 5.0
- Data processing based on a program created in Stata 5.0

Mean, standard deviation, minimum value and maximum value of the investigated subjects age

| Variable | Obs | Mean | Std. Dev. | Min | Max |
|---|---|---|---|---|---|
| age | 141 | 37.68794 | 12.57727 | 18 | 77 |

### Distribution by age groups for the investigated subjects

| Age (years) | Freq. | Percent | Cum. |
|---|---|---|---|
| 18-29 | 55 | 39.01 | 39.01 |
| 30-39 | 27 | 19.15 | 58.16 |
| 40-49 | 31 | 21.99 | 80.14 |
| 50-59 | 20 | 14.18 | 94.33 |
| >60 | 8 | 5.67 | 100.00 |
| Total | 141 | 100.00 | |

### Distribution by gender for investigated subjects

| gender | Freq. | Percent | Cum. |
|---|---|---|---|
| F | 55 | 39.01 | 39.01 |
| M | 86 | 60.99 | 100.00 |
| Total | 141 | 100.00 | |

### Distribution by age groups and gender for investigated subjects

| Age (years) | gender F | M | Total |
|---|---|---|---|
| 18-29 | 17 | 38 | 55 |
| 30-39 | 9 | 18 | 27 |
| 40-49 | 14 | 17 | 31 |
| 50-59 | 12 | 8 | 20 |
| >60 | 3 | 5 | 8 |
| Total | 55 | 86 | 141 |

### Distribution percentage by age groups and gender for the investigated subjects

| Age (years) | gender F | M | Total |
|---|---|---|---|
| 18-29 | 17 | 38 | 55 |
| | 30.91 | 44.19 | 39.01 |
| 30-39 | 9 | 18 | 27 |
| | 16.36 | 20.93 | 19.15 |
| 40-49 | 14 | 17 | 31 |
| | 25.45 | 19.77 | 21.99 |
| 50-59 | 12 | 8 | 20 |
| | 21.82 | 9.30 | 14.18 |
| >60 | 3 | 5 | 8 |
| | 5.45 | 5.81 | 5.67 |
| Total | 55 | 86 | 141 |
| | 100.00 | 100.00 | 100.00 |

## Residence localities for the investigated subjects

| Localities | Freq. | Percent | Cum. |
|---|---|---|---|
| abrud | 34 | 24.11 | 24.11 |
| balmosesti | 2 | 1.42 | 25.53 |
| campeni | 1 | 0.71 | 26.24 |
| carpenis | 14 | 9.93 | 36.17 |
| corna | 5 | 3.55 | 39.72 |
| gura cornei | 2 | 1.42 | 41.13 |
| gura rosiei | 25 | 17.73 | 58.87 |
| ignatesti | 6 | 4.26 | 63.12 |
| rosia montana | 47 | 33.33 | 96.45 |
| tarina | 3 | 2.13 | 98.58 |
| vartop | 2 | 1.42 | 100.00 |
| Total | 141 | 100.00 | |

## Distribution of investigated subjects on current residence localities

| current residence | Freq. | Percent | Cum. |
|---|---|---|---|
| Campeni | 3 | 2.13 | 2.13 |
| Abrud | 41 | 29.08 | 31.21 |
| Carpinis | 39 | 27.66 | 58.87 |
| Rosia M | 58 | 41.13 | 100.00 |
| Total | 141 | 100.00 | |

## Distribution of investigated subjects on previous residence localities

| previous residence | Freq. | Percent | Cum. |
|---|---|---|---|
| AlteJud | 17 | 17.71 | 17.71 |
| Campeni | 22 | 22.92 | 40.62 |
| Abrud | 17 | 17.71 | 58.33 |
| Carpinis | 11 | 11.46 | 69.79 |
| Rosia M | 29 | 30.21 | 100.00 |
| Total | 96 | 100.00 | |

## Distribution percentage of investigated subjects on age groups, gender and current residence localities within the area of study

F

| Age (years) | Current residence Abrud | Carpinis | Rosia M | Total |
|---|---|---|---|---|
| 18-29 | 6 | 4 | 7 | 17 |
| | 33.33 | 25.00 | 33.33 | 30.91 |
| 30-39 | 3 | 2 | 4 | 9 |
| | 16.67 | 12.50 | 19.05 | 16.36 |
| 40-49 | 4 | 4 | 6 | 14 |
| | 22.22 | 25.00 | 28.57 | 25.45 |
| 50-59 | 3 | 5 | 4 | 12 |
| | 16.67 | 31.25 | 19.05 | 21.82 |
| >60 | 2 | 1 | 0 | 3 |
| | 11.11 | 6.25 | 0.00 | 5.45 |
| Total | 18 | 16 | 21 | 55 |
| | 100.00 | 100.00 | 100.00 | 100.00 |

M

| Age (years) | Current residence Campeni | Abrud | Carpinis | Rosia M | Total |
|---|---|---|---|---|---|
| 18-29 | 1 | 11 | 10 | 16 | 38 |
| | 33.33 | 47.83 | 43.48 | 43.24 | 44.19 |
| 30-39 | 1 | 5 | 5 | 7 | 18 |
| | 33.33 | 21.74 | 21.74 | 18.92 | 20.93 |
| 40-49 | 0 | 4 | 2 | 11 | 17 |
| | 0.00 | 17.39 | 8.70 | 29.73 | 19.77 |
| 50-59 | 1 | 2 | 3 | 2 | 8 |
| | 33.33 | 8.70 | 13.04 | 5.41 | 9.30 |
| >60 | 0 | 1 | 3 | 1 | 5 |
| | 0.00 | 4.35 | 13.04 | 2.70 | 5.81 |
| Total | 3 | 23 | 23 | 37 | 86 |
| | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |

## Distribution percentage of investigated subjects on age groups, gender and previous residence localities within the area of study and from other areas

F

| Age (years) | Previous residence OtherAreas | Campeni | Abrud | Carpinis | Rosia M | Total |
|---|---|---|---|---|---|---|
| 18-29 | 3 | 5 | 2 | 1 | 2 | 13 |
| | 42.86 | 31.25 | 28.57 | 20.00 | 18.18 | 28.26 |
| 30-39 | 1 | 4 | 1 | 0 | 1 | 7 |
| | 14.29 | 25.00 | 14.29 | 0.00 | 9.09 | 15.22 |
| 40-49 | 1 | 3 | 3 | 2 | 4 | 13 |
| | 14.29 | 18.75 | 42.86 | 40.00 | 36.36 | 28.26 |
| 50-59 | 2 | 3 | 0 | 2 | 4 | 11 |
| | 28.57 | 18.75 | 0.00 | 40.00 | 36.36 | 23.91 |
| >60 | 0 | 1 | 1 | 0 | 0 | 2 |
| | 0.00 | 6.25 | 14.29 | 0.00 | 0.00 | 4.35 |
| Total | 7 | 16 | 7 | 5 | 11 | 46 |
| | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |

M

| Age (years) | Previous residence OtherAreas | Campeni | Abrud | Carpinis | Rosia M | Total |
|---|---|---|---|---|---|---|
| 18-29 | 3 | 1 | 2 | 1 | 12 | 19 |
| | 30.00 | 16.67 | 20.00 | 16.67 | 66.67 | 38.00 |
| 30-39 | 2 | 3 | 2 | 0 | 5 | 12 |
| | 20.00 | 50.00 | 20.00 | 0.00 | 27.78 | 24.00 |
| 40-49 | 3 | 2 | 4 | 3 | 0 | 12 |
| | 30.00 | 33.33 | 40.00 | 50.00 | 0.00 | 24.00 |
| 50-59 | 1 | 0 | 2 | 1 | 1 | 5 |
| | 10.00 | 0.00 | 20.00 | 16.67 | 5.56 | 10.00 |
| >60 | 1 | 0 | 0 | 1 | 0 | 2 |
| | 10.00 | 0.00 | 0.00 | 16.67 | 0.00 | 4.00 |
| Total | 10 | 6 | 10 | 6 | 18 | 50 |
| | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |

## Current workplace of the investigated subjects

| Current workplace | Freq. | Percent | Cum. |
|---|---|---|---|
| Others | 60 | 42.55 | 42.55 |
| GoldExpl | 81 | 57.45 | 100.00 |
| Total | 141 | 100.00 | |

## Exposure at the current workplace for the investigated subjects

0=absence of exposure
1=presence of exposure

| Exp. at the current workplace | Freq. | Percent | Cum. |
|---|---|---|---|
| 0 | 91 | 64.54 | 64.54 |
| 1 | 50 | 35.46 | 100.00 |
| Total | 141 | 100.00 | |

## Age at the current workplace for the investigated subjects

| Age current workplace (years) | Freq. | Percent | Cum. |
|---|---|---|---|
| 1 | 13 | 9.92 | 9.92 |
| 2 | 29 | 22.14 | 32.06 |
| 3 | 9 | 6.87 | 38.93 |
| 4 | 15 | 11.45 | 50.38 |
| 5 | 8 | 6.11 | 56.49 |
| 6 | 21 | 16.03 | 72.52 |
| 7 | 6 | 4.58 | 77.10 |
| 9 | 3 | 2.29 | 79.39 |
| 11 | 4 | 3.05 | 82.44 |
| 13 | 2 | 1.53 | 83.97 |
| 14 | 3 | 2.29 | 86.26 |
| 15 | 3 | 2.29 | 88.55 |
| 16 | 1 | 0.76 | 89.31 |
| 17 | 1 | 0.76 | 90.08 |
| 18 | 2 | 1.53 | 91.60 |
| 20 | 2 | 1.53 | 93.13 |
| 21 | 2 | 1.53 | 94.66 |
| 23 | 1 | 0.76 | 95.42 |
| 27 | 1 | 0.76 | 96.18 |
| 28 | 1 | 0.76 | 96.95 |
| 29 | 1 | 0.76 | 97.71 |
| 30 | 1 | 0.76 | 98.47 |
| 31 | 2 | 1.53 | 100.00 |
| Total | 131 | 100.00 | |

## Previous workplace of the investigated subjects

| Previous workplace | Freq. | Percent | Cum. |
|---|---|---|---|
| Others | 104 | 73.76 | 73.76 |
| GoldExpl | 37 | 26.24 | 100.00 |
| Total | 141 | 100.00 | |

## Exposure at previous workplaces of the investigated subjects

0=absence of exposure
1=presence of exposure

| Exp. at previous workplace | Freq. | Percent | Cum. |
|---|---|---|---|
| 0 | 115 | 81.56 | 81.56 |
| 1 | 26 | 18.44 | 100.00 |
| Total | 141 | 100.00 | |

## Age at previous workplaces of the investigated subjects

| Age at previous workplace (years) | Freq. | Percent | Cum. |
|---|---|---|---|
| 0 | 5 | 5.05 | 5.05 |
| 1 | 16 | 16.16 | 21.21 |
| 2 | 14 | 14.14 | 35.35 |
| 3 | 9 | 9.09 | 44.44 |
| 4 | 6 | 6.06 | 50.51 |
| 5 | 2 | 2.02 | 52.53 |
| 6 | 5 | 5.05 | 57.58 |
| 7 | 6 | 6.06 | 63.64 |
| 9 | 2 | 2.02 | 65.66 |
| 10 | 1 | 1.01 | 66.67 |
| 11 | 4 | 4.04 | 70.71 |
| 12 | 1 | 1.01 | 71.72 |
| 13 | 2 | 2.02 | 73.74 |
| 14 | 3 | 3.03 | 76.77 |
| 15 | 2 | 2.02 | 78.79 |
| 16 | 2 | 2.02 | 80.81 |
| 17 | 2 | 2.02 | 82.83 |
| 18 | 1 | 1.01 | 83.84 |
| 20 | 3 | 3.03 | 86.87 |
| 21 | 1 | 1.01 | 87.88 |
| 22 | 2 | 2.02 | 89.90 |
| 23 | 1 | 1.01 | 90.91 |
| 25 | 1 | 1.01 | 91.92 |
| 26 | 1 | 1.01 | 92.93 |
| 27 | 1 | 1.01 | 93.94 |
| 30 | 1 | 1.01 | 94.95 |
| 32 | 2 | 2.02 | 96.97 |
| 33 | 1 | 1.01 | 97.98 |
| 36 | 1 | 1.01 | 98.99 |
| 38 | 1 | 1.01 | 100.00 |
| Total | 99 | 100.00 | |

## Distribution on age groups and gender of the investigated subjects within the current workplace

F

| Age (years) | Current workplace Others | GoldExpl | Total |
|---|---|---|---|
| 18-29 | 14 | 3 | 17 |
| | 33.33 | 23.08 | 30.91 |
| 30-39 | 6 | 3 | 9 |
| | 14.29 | 23.08 | 16.36 |
| 40-49 | 9 | 5 | 14 |
| | 21.43 | 38.46 | 25.45 |
| 50-59 | 10 | 2 | 12 |
| | 23.81 | 15.38 | 21.82 |
| >60 | 3 | 0 | 3 |
| | 7.14 | 0.00 | 5.45 |
| Total | 42 | 13 | 55 |
| | 100.00 | 100.00 | 100.00 |

M

| Age (years) | Current workplace Others | GoldExpl | Total |
|---|---|---|---|
| 18-29 | 3 | 35 | 38 |
| | 16.67 | 51.47 | 44.19 |
| 30-39 | 4 | 14 | 18 |
| | 22.22 | 20.59 | 20.93 |
| 40-49 | 2 | 15 | 17 |
| | 11.11 | 22.06 | 19.77 |
| 50-59 | 6 | 2 | 8 |
| | 33.33 | 2.94 | 9.30 |
| >60 | 3 | 2 | 5 |
| | 16.67 | 2.94 | 5.81 |
| Total | 18 | 68 | 86 |
| | 100.00 | 100.00 | 100.00 |

## Distribution on age groups and gender of the investigated subjects within previous workplaces

F

| Age (years) | Previous workplace Others | GoldExpl | Total |
|---|---|---|---|
| 18-29 | 16 | 1 | 17 |
| | 30.77 | 33.33 | 30.91 |
| 30-39 | 8 | 1 | 9 |
| | 15.38 | 33.33 | 16.36 |
| 40-49 | 14 | 0 | 14 |
| | 26.92 | 0.00 | 25.45 |
| 50-59 | 11 | 1 | 12 |
| | 21.15 | 33.33 | 21.82 |
| >60 | 3 | 0 | 3 |
| | 5.77 | 0.00 | 5.45 |
| Total | 52 | 3 | 55 |
| | 100.00 | 100.00 | 100.00 |

M

| Age (years) | Previous workplace Others | GoldExpl | Total |
|---|---|---|---|
| 18-29 | 28 | 10 | 38 |
| | 53.85 | 29.41 | 44.19 |
| 30-39 | 10 | 8 | 18 |
| | 19.23 | 23.53 | 20.93 |
| 40-49 | 8 | 9 | 17 |
| | 15.38 | 26.47 | 19.77 |
| 50-59 | 4 | 4 | 8 |
| | 7.69 | 11.76 | 9.30 |
| >60 | 2 | 3 | 5 |
| | 3.85 | 8.82 | 5.81 |
| Total | 52 | 34 | 86 |
| | 100.00 | 100.00 | 100.00 |

## Distribution on age groups and gender of the investigated subjects in terms of exposure at current workplaces

F

| Age (years) | Exp.at current workplace 0 | 1 | Total |
|---|---|---|---|
| 18-29 | 16 | 1 | 17 |
| | 32.65 | 16.67 | 30.91 |
| 30-39 | 7 | 2 | 9 |
| | 14.29 | 33.33 | 16.36 |
| 40-49 | 12 | 2 | 14 |
| | 24.49 | 33.33 | 25.45 |
| 50-59 | 11 | 1 | 12 |
| | 22.45 | 16.67 | 21.82 |
| >60 | 3 | 0 | 3 |
| | 6.12 | 0.00 | 5.45 |
| Total | 49 | 6 | 55 |
| | 100.00 | 100.00 | 100.00 |

M

| Age (years) | Exp.at current workplace 0 | 1 | Total |
|---|---|---|---|
| 18-29 | 14 | 24 | 38 |
| | 33.33 | 54.55 | 44.19 |
| 30-39 | 9 | 9 | 18 |
| | 21.43 | 20.45 | 20.93 |
| 40-49 | 9 | 8 | 17 |
| | 21.43 | 18.18 | 19.77 |
| 50-59 | 6 | 2 | 8 |
| | 14.29 | 4.55 | 9.30 |
| >60 | 4 | 1 | 5 |
| | 9.52 | 2.27 | 5.81 |
| Total | 42 | 44 | 86 |
| | 100.00 | 100.00 | 100.00 |

## Distribution on age groups and gender of the investigated subjects in terms of exposure at previous workplaces

F

| Age (years) | Exp. at previous workplace 0 | 1 | Total |
|---|---|---|---|
| 18-29 | 16 | 1 | 17 |
| | 30.77 | 33.33 | 30.91 |
| 30-39 | 8 | 1 | 9 |
| | 15.38 | 33.33 | 16.36 |
| 40-49 | 14 | 0 | 14 |
| | 26.92 | 0.00 | 25.45 |
| 50-59 | 11 | 1 | 12 |
| | 21.15 | 33.33 | 21.82 |
| >60 | 3 | 0 | 3 |
| | 5.77 | 0.00 | 5.45 |
| Total | 52 | 3 | 55 |
| | 100.00 | 100.00 | 100.00 |

M

| Age (years) | Exp. at previous workplace 0 | 1 | Total |
|---|---|---|---|
| 18-29 | 28 | 10 | 38 |
| | 44.44 | 43.48 | 44.19 |
| 30-39 | 14 | 4 | 18 |
| | 22.22 | 17.39 | 20.93 |
| 40-49 | 13 | 4 | 17 |
| | 20.63 | 17.39 | 19.77 |
| 50-59 | 5 | 3 | 8 |
| | 7.94 | 13.04 | 9.30 |
| >60 | 3 | 2 | 5 |
| | 4.76 | 8.70 | 5.81 |
| Total | 63 | 23 | 86 |
| | 100.00 | 100.00 | 100.00 |

### *4.2.1 Social-economical indicators*

## Education

| last graduated form of education | Freq. | Percent | Cum. |
|---|---|---|---|
| prim.school | 3 | 2.13 | 2.13 |
| sec.school | 44 | 31.21 | 33.33 |
| high school | 71 | 50.35 | 83.69 |
| university | 23 | 16.31 | 100.00 |
| Total | 141 | 100.00 | |

### Work insertion

| engaged | Freq. | Percent | Cum. |
|---|---|---|---|
| whole-time | 98 | 69.50 | 69.50 |
| notwhole-time | 2 | 1.42 | 70.92 |
| non-eng.>6mo | 4 | 2.84 | 73.76 |
| household | 14 | 9.93 | 83.69 |
| retired | 18 | 12.77 | 96.45 |
| student | 3 | 2.13 | 98.58 |
| employer | 2 | 1.42 | 100.00 |
| Total | 141 | 100.00 | |

### Monthly income

| monthly income | Freq. | Percent | Cum. |
|---|---|---|---|
| >5 mil.lei | 123 | 87.23 | 87.23 |
| between2-5 mil | 15 | 10.64 | 97.87 |
| between1-2 mil | 3 | 2.13 | 100.00 |
| Total | 141 | 100.00 | |

### Civil condition

| You are | Freq. | Percent | Cum. |
|---|---|---|---|
| single | 6 | 4.26 | 4.26 |
| single living with parents | 26 | 18.44 | 22.70 |
| married | 99 | 70.21 | 92.91 |
| divorced | 4 | 2.84 | 95.74 |
| widower | 6 | 4.26 | 100.00 |
| Total | 141 | 100.00 | |

### Nationality

| nationality | Freq. | Percent | Cum. |
|---|---|---|---|
| romanian | 138 | 97.87 | 97.87 |
| hungarian | 3 | 2.13 | 100.00 |
| Total | 141 | 100.00 | |

## *4.2.2 Exposure to environmental pollutants*

### Distance between the housing and mining (perimeter limit)

| L1 | Freq. | Percent | Cum. |
|---|---|---|---|
| under 500 m | 19 | 13.48 | 13.48 |
| 500 m-1 km | 27 | 19.15 | 32.62 |
| 1 km-5 km | 42 | 29.79 | 62.41 |
| 5 km-10 km | 32 | 22.70 | 85.11 |
| over 5 km | 21 | 14.89 | 100.00 |
| Total | 141 | 100.00 | |

### Distance between the housing and the waste dumps of the existing mining

| L2 | Freq. | Percent | Cum. |
|---|---|---|---|
| under 500 m | 27 | 19.15 | 19.15 |
| 500 m-1 km | 16 | 11.35 | 30.50 |
| 1 km-5 km | 46 | 32.62 | 63.12 |
| 5 km-10 km | 33 | 23.40 | 86.52 |
| over 5 km | 19 | 13.48 | 100.00 |
| Total | 141 | 100.00 | |

### Distance between the housing and the tailings pond of the existing mining

| L3 | Freq. | Percent | Cum. |
|---|---|---|---|
| under 500 m | 6 | 4.26 | 4.26 |
| 500 m-1 km | 2 | 1.42 | 5.67 |
| 1 km-5 km | 56 | 39.72 | 45.39 |
| 5 km-10 km | 43 | 30.50 | 75.89 |
| over 5 km | 34 | 24.11 | 100.00 |
| Total | 141 | 100.00 | |

### Presence of geographical barrier or obstacles of great dimension (mountain height, hill, buildings of great dimensions) between the housing and mining/waste dumps/tailings pond

| L4 | Freq. | Percent | Cum. |
|---|---|---|---|
| No | 58 | 41.13 | 41.13 |
| Yes | 83 | 58.87 | 100.00 |
| Total | 141 | 100.00 | |

### Distance between your housing and the nearest permanent watercourse (river, creek, spring)

| L6 | Freq. | Percent | Cum. |
|---|---|---|---|
| under 500 m | 119 | 84.40 | 84.40 |
| 500 m-1 km | 9 | 6.38 | 90.78 |
| 1 km-5 km | 9 | 6.38 | 97.16 |
| 5 km-10 km | 4 | 2.84 | 100.00 |
| Total | 141 | 100.00 | |

## *4.2.3 Informations regarding the housing*

### The housing is situated:

1 upstream the permanent watercourse (river, creek, spring)
2 downstream the permanent watercourse (river, crek, spring)

| L7 | Freq. | Percent | Cum. |
|---|---|---|---|
| 1 | 58 | 41.13 | 41.13 |
| 2 | 83 | 58.87 | 100.00 |
| Total | 141 | 100.00 | |

## Permanent watercourse (river, creek, spring) crosses one of the mining perimeter

| L8 | Freq. | Percent | Cum. |
|---|---|---|---|
| No | 45 | 33.09 | 33.09 |
| Don't know | 1 | 0.74 | 33.82 |
| Yes | 90 | 66.18 | 100.00 |
| Total | 136 | 100.00 | |

## When was the housing built?

1 more than 30 ani ago
2 between 10 - 30 years ago
3 less than 10 years ago

| L9 | Freq. | Percent | Cum. |
|---|---|---|---|
| 1 | 82 | 58.16 | 58.16 |
| 2 | 55 | 39.01 | 97.16 |
| 3 | 4 | 2.84 | 100.00 |
| Total | 141 | 100.00 | |

## Type of housing

1 House detached (isolated) from any other house
2 Apartment block

| L10 | Freq. | Percent | Cum. |
|---|---|---|---|
| 1 | 110 | 78.01 | 78.01 |
| 2 | 31 | 21.99 | 100.00 |
| Total | 141 | 100.00 | |

## Residence location

1 separated from the street by grass plot
2 separated from the street by another space (ex. blank ground)
3 at street

| L11 | Freq. | Percent | Cum. |
|---|---|---|---|
| 1 | 46 | 32.62 | 32.62 |
| 2 | 32 | 22.70 | 55.32 |
| 3 | 63 | 44.68 | 100.00 |
| Total | 141 | 100.00 | |

## Access path to the housing

1 Regional connection road (drive-way)
2 Main street
3 Side street (secondary)
4 Foot-path / isolated road

| L12 | Freq. | Percent | Cum. |
|---|---|---|---|
| 1 | 40 | 28.37 | 28.37 |
| 2 | 40 | 28.37 | 56.74 |
| 3 | 51 | 36.17 | 92.91 |
| 4 | 10 | 7.09 | 100.00 |
| Total | 141 | 100.00 | |

## How often do vehicles pass on the street you live on?

1 never
2 seldom
3 frequently
4 constantly (as a rule)

| L13 | Freq. | Percent | Cum. |
|---|---|---|---|
| 1 | 6 | 4.26 | 4.26 |
| 2 | 46 | 32.62 | 36.88 |
| 3 | 77 | 54.61 | 91.49 |
| 4 | 12 | 8.51 | 100.00 |
| Total | 141 | 100.00 | |

## More or less how many vehicles pass on the street you live on/access path to the housing?

0 absence of answer to the question
1 les than a vehicle per minute
2 more than a vehicle per minute

| L14 | Freq. | Percent | Cum. |
|---|---|---|---|
| 0 | 4 | 2.84 | 2.84 |
| 1 | 76 | 53.90 | 56.74 |
| 2 | 61 | 43.26 | 100.00 |
| Total | 141 | 100.00 | |

## The housing heating is based on the following:

| L15 | Freq. | Percent | Cum. |
|---|---|---|---|
| wood | 139 | 98.58 | 98.58 |
| electricity | 2 | 1.42 | 100.00 |
| Total | 141 | 100.00 | |

## Alternative / additional sources (means) for housing heating

| L16 | Freq. | Percent | Cum. |
|---|---|---|---|
| No | 125 | 88.65 | 88.65 |
| Yes | 16 | 11.35 | 100.00 |
| Total | 141 | 100.00 | |

### Alternative / additional sources (means) for housing heating are the following:

Wood
Coal
Diesel oil
Black oil
Electricity
Methane
Central heating

| L17 | Freq. | Percent | Cum. |
|---|---|---|---|
| Don't use | 123 | 87.23 | 87.23 |
| methane | 10 | 7.09 | 94.33 |
| wood | 4 | 2.84 | 97.16 |
| electricity | 4 | 2.84 | 100.00 |
| Total | 141 | 100.00 | |

### Sources (fuel) used in kitchen

Wood
Coal
Diesel oil
Black oil
Electricity
Methane

| L18 | Freq. | Percent | Cum. |
|---|---|---|---|
| wood | 62 | 43.97 | 43.97 |
| electricity | 1 | 0.71 | 44.68 |
| methane | 78 | 55.32 | 100.00 |
| Total | 141 | 100.00 | |

### Number of hours per day used for heating the housing

| L19 | Freq. | Percent | Cum. |
|---|---|---|---|
| 1 | 2 | 1.42 | 1.42 |
| 3 | 2 | 1.42 | 2.84 |
| 4 | 7 | 4.96 | 7.80 |
| 5 | 30 | 21.28 | 29.08 |
| 6 | 20 | 14.18 | 43.26 |
| 7 | 9 | 6.38 | 49.65 |
| 8 | 10 | 7.09 | 56.74 |
| 9 | 2 | 1.42 | 58.16 |
| 10 | 16 | 11.35 | 69.50 |
| 12 | 27 | 19.15 | 88.65 |
| 20 | 1 | 0.71 | 89.36 |
| 24 | 15 | 10.64 | 100.00 |
| Total | 141 | 100.00 | |

### Noise sources coming from the mining

| L20 | Freq. | Percent | Cum. |
|---|---|---|---|
| No | 101 | 71.63 | 71.63 |
| Yes | 40 | 28.37 | 100.00 |
| Total | 141 | 100.00 | |

### Which are the noise sources?

1 heavy traffic (heavy-duty trucks, dump trucks) from the mining (answer 0 - negative or 1- affirmative)
2 equipment from the mining (answer 0 - negative sau 1- affirmative)
Others, specify (answer 0 - negative or 1- affirmative)

| L21 | Freq. | Percent | Cum. |
|---|---|---|---|
| there aren't | 105 | 74.47 | 74.47 |
| 1 | 6 | 4.26 | 89.36 |
| 2 | 15 | 10.64 | 85.11 |
| 1 and 2 | 15 | 10.64 | 100.00 |
| Total | 141 | 100.00 | |

### Others, specify

| L21c | Freq. | Percent | Cum. |
|---|---|---|---|
| explosions | 3 | 60.00 | 60.00 |
| technological process | 1 | 20.00 | 80.00 |
| mining ore trucks | 1 | 20.00 | 100.00 |
| Total | 5 | 100.00 | |

## *4.2.4 Information regarding the occupational, environmental exposure of the subjectes enroled in the stydy to pollutants*

### Are you working in one of the following industries?

Nonferrous mining industry
Nonferrous metallurgical smelter
Chemical industry
Glass industry
Printing industry
Gas stations
Dyeing industry
Painting
Battery production (storage battery)
Textile industry
Viticulture
Tobacco industry
District heating (stoker)

| L22 | Freq. | Percent | Cum. |
|---|---|---|---|
| No | 60 | 42.55 | 42.55 |
| Mining | 79 | 56.03 | 98.58 |
| Dyeing | 1 | 0.71 | 99.29 |
| Textile ind | 1 | 0.71 | 100.00 |
| Total | 141 | 100.00 | |

## How long have you worked in the specified conditions?

0 no answer
1 less than 3 years
2 more than 3 years

| L23 | Freq. | Percent | Cum. |
|---|---|---|---|
| 0 | 59 | 41.84 | 41.84 |
| 1 | 37 | 26.24 | 68.09 |
| 2 | 45 | 31.91 | 100.00 |
| Total | 141 | 100.00 | |

## Do you work in one of the following industries?

Nonferrous mining industry
Nonferrous metallurgical foundry
Chemical industry
Glass industry
Printing industry
Gas stations
Dyeing industry
Painting
Battery production (storage battery)
Textile industry
Viticulture
Tobacco industry
District heating (stoker)

| L24 | Freq. | Percent | Cum. |
|---|---|---|---|
| No | 83 | 58.87 | 58.87 |
| Minning | 46 | 32.62 | 91.49 |
| Mining,heating | 1 | 0.71 | 92.20 |
| Chemicalind. | 5 | 3.55 | 95.74 |
| Printing ind. | 1 | 0.71 | 96.45 |
| Dyeing | 1 | 0.71 | 97.16 |
| Textile ind. | 4 | 2.84 | 100.00 |
| Total | 141 | 100.00 | |

## Do you grow vegetables (wheat, corn, potatoes, garden stuff, fruits)?

| L25 | Freq. | Percent | Cum. |
|---|---|---|---|
| No | 53 | 37.59 | 37.59 |
| Yes | 88 | 62.41 | 100.00 |
| Total | 141 | 100.00 | |

## The distance between the mining area/waste dump/tailings pond and the cultivated areas

0 no answer

| L26 | Freq. | Percent | Cum. |
|---|---|---|---|
| 0 | 53 | 37.59 | 37.59 |
| < 500 m | 12 | 8.51 | 46.10 |
| 500 m-1 km | 8 | 5.67 | 51.77 |
| 1 km-5 km | 37 | 26.24 | 78.01 |
| 5 km-10 km | 17 | 12.06 | 90.07 |
| > 5 km | 14 | 9.93 | 100.00 |
| Total | 141 | 100.00 | |

## Grown vegetables

Corn
Potatoes
Root crop
Wheat
Garden stuff
Fruits

| L27 | Freq. | Percent | Cum. |
|---|---|---|---|
| Doesn't grow vegetables | 53 | 37.59 | 37.59 |
| fruits | 5 | 3.55 | 40.43 |
| garden stuff | 2 | 1.42 | 42.5 |
| root crop, garden stuff. | 1 | 0.71 | 43.26 |
| root crop,garden stuff,fruits | 4 | 2.84 | 46.10 |
| potatoes | 10 | 7.09 | 53.19 |
| potatoes, garden stuff | 1 | 0.71 | 53.90 |
| potatoes,garden stuff,fruits | 4 | 2.84 | 56.74 |
| potatoes,root crof | 1 | 0.71 | 57.45 |
| potatoes,root crof,fruits. | 5 | 3.55 | 60.99 |
| potatoes,root crof,garden st | 5 | 3.55 | 64.54 |
| potatoes,root crof,garden stuff, fruits. | 40 | 28.37 | 92.91 |
| potatoes,root crof,wheat | 3 | 2.13 | 95.04 |
| potatoes,root crof, wheat, fruits | 5 | 3.55 | 98.58 |
| potatoes,root crof, garden stuff, fruits | 2 | 1.42 | 100.00 |
| Total | 141 | 100.00 | |

## The water used for watering comes from:

1. well
2. permanent waterway which doesn't cross a mining area
3. permanent waterway which crosses a mining area, downstream the mining area
4. permanent waterway which crosses a mining area, upstream the mining area

| L28 | Freq. | Percent | Cum. |
|---|---|---|---|
| no watering | 75 | 53.19 | 53.19 |
| 4 | 1 | 0.71 | 53.90 |
| 3 | 2 | 1.42 | 55.32 |
| 2 | 45 | 31.91 | 87.23 |
| 1 | 18 | 12.77 | 100.00 |
| Total | 141 | 100.00 | |

## Have you used chemical fertilizers and/or other chemical substances for the cultures?

| L29 | Freq. | Percent | Cum. |
|---|---|---|---|
| No | 78 | 92.86 | 92.86 |
| I don't know | 2 | 2.38 | 95.24 |
| Yes | 4 | 4.76 | 100.00 |
| Total | 84 | 100.00 | |

### If YES, which are these? (please specify)

| L30 | Freq. | Percent | Cum. |
|---|---|---|---|
| SODIUM NITRATE | 2 | 66.67 | 66.67 |
| NITRATES | 1 | 33.33 | 100.00 |
| Total | 3 | 100.00 | |

### Do you breed animals?

| L31 | Freq. | Percent | Cum. |
|---|---|---|---|
| No | 95 | 67.38 | 67.38 |
| Yes | 46 | 32.62 | 100.00 |
| Total | 141 | 100.00 | |

### Which is the distance between the mining area/waste dump/tailings pond and the areas where the animals live (graze)?

0 no answer

| L32 | Freq. | Percent | Cum. |
|---|---|---|---|
| 0 | 97 | 68.79 | 68.79 |
| < 500 m | 10 | 7.09 | 75.89 |
| 500 m-1 km | 6 | 4.26 | 80.14 |
| 1 km-5 km | 17 | 12.06 | 92.20 |
| 5 km-10 km | 1 | 0.71 | 92.91 |
| > 5 km | 10 | 7.09 | 100.00 |
| Total | 141 | 100.00 | |

### The water source for the animals is

1. well
2. permanent waterway which doesn’t cross a mining area
3. permanent waterway which crosses a mining area, downstream the mining area
4. permanent waterway which crosses a mining area, upstream the mining area

| L33 | Freq. | Percent | Cum. |
|---|---|---|---|
| no answer | 98 | 69.50 | 69.50 |
| 4 | 1 | 0.71 | 70.21 |
| 2 | 37 | 26.24 | 96.45 |
| 1 | 2 | 1.42 | 97.87 |
| 1 and 2 | 3 | 2.13 | 100.00 |
| Total | 141 | 100.00 | |

### The house water source

Well water
Municipal water network

| L35 | Freq. | Percent | Cum. |
|---|---|---|---|
| water netw. | 78 | 55.32 | 55.32 |
| well | 60 | 42.55 | 97.87 |
| both | 3 | 2.13 | 100.00 |
| Total | 141 | 100.00 | |

### If you use a well, where is it located?

In your own yard
In your neighbours yard
In the street (public well)

| L36 | Freq. | Percent | Cum. |
|---|---|---|---|
| no answer | 94 | 66.67 | 66.67 |
| neighbors | 25 | 17.73 | 84.40 |
| in the yard | 22 | 15.60 | 100.00 |
| Total | 141 | 100.00 | |

### If you use well water, which is the well's depth?

| L37(m) | Freq. | Percent | Cum. |
|---|---|---|---|
| 2 | 6 | 100.00 | 100.00 |
| Total | 6 | 100.00 | |

### If you use well water, which is the distance between the house and well (m)?

| L38(m) | Freq. | Percent | Cum. |
|---|---|---|---|
| 5 | 2 | 6.25 | 6.25 |
| 10 | 3 | 9.38 | 15.62 |
| 20 | 1 | 3.12 | 18.75 |
| 30 | 3 | 9.38 | 28.12 |
| 50 | 1 | 3.12 | 31.25 |
| 60 | 1 | 3.12 | 34.38 |
| 100 | 4 | 12.50 | 46.88 |
| 150 | 1 | 3.12 | 50.00 |
| 200 | 1 | 3.12 | 53.12 |
| 300 | 4 | 12.50 | 65.62 |
| 600 | 4 | 12.50 | 78.12 |
| 700 | 1 | 3.12 | 81.25 |
| 800 | 2 | 6.25 | 87.50 |
| 900 | 4 | 12.50 | 100.00 |
| Total | 32 | 100.00 | |

### If you use well water, when have the well been built?

0 no answer
1 more than 30 years ago
2 10-30 years ago
3 less than 10 years ago

| L39 | Freq. | Percent | Cum. |
|---|---|---|---|
| 0 | 134 | 95.04 | 95.04 |
| 1 | 4 | 2.84 | 97.87 |
| 2 | 2 | 1.42 | 99.29 |
| 3 | 1 | 0.71 | 100.00 |
| Total | 141 | 100.00 | |

### *4.2.5 Habits. Behaviours. Attitudes*

**How many hours are you exposed to the sun in the summer time, usually, during a week day? (number of hours)**

| I1a | Freq. | Percent | Cum. |
|---|---|---|---|
| 0 | 3 | 2.24 | 2.24 |
| 1 | 13 | 9.70 | 11.94 |
| 2 | 15 | 11.19 | 23.13 |
| 3 | 8 | 5.97 | 29.10 |
| 4 | 13 | 9.70 | 38.81 |
| 5 | 15 | 11.19 | 50.00 |
| 6 | 13 | 9.70 | 59.70 |
| 7 | 4 | 2.99 | 62.69 |
| 8 | 19 | 14.18 | 76.87 |
| 9 | 1 | 0.75 | 77.61 |
| 10 | 19 | 14.18 | 91.79 |
| 12 | 11 | 8.21 | 100.00 |
| Total | 134 | 100.00 | |

**How many hours are you exposed to the sun in the summer time, during the weekend? (number of hours)**

| I1b | Freq. | Percent | Cum. |
|---|---|---|---|
| 1 | 11 | 8.03 | 8.03 |
| 2 | 9 | 6.57 | 14.60 |
| 3 | 12 | 8.76 | 23.36 |
| 4 | 18 | 13.14 | 36.50 |
| 5 | 24 | 17.52 | 54.01 |
| 6 | 10 | 7.30 | 61.31 |
| 7 | 5 | 3.65 | 64.96 |
| 8 | 18 | 13.14 | 78.10 |
| 9 | 4 | 2.92 | 81.02 |
| 10 | 16 | 11.68 | 92.70 |
| 11 | 1 | 0.73 | 93.43 |
| 12 | 9 | 6.57 | 100.00 |
| Total | 137 | 100.00 | |

**Is your skin susceptible to the sun burns?**

| I2 | Freq. | Percent | Cum. |
|---|---|---|---|
| No | 68 | 48.23 | 48.23 |
| I don’t know | 2 | 1.42 | 49.65 |
| Yes | 71 | 50.35 | 100.00 |
| Total | 141 | 100.00 | |

**Please specify the days average spent out of your residence area during the yearly vacation/weekends (days/week)**

| I3a | Freq. | Percent | Cum. |
|---|---|---|---|
| 1 | 5 | 14.29 | 14.29 |
| 2 | 3 | 8.57 | 22.86 |
| 3 | 2 | 5.71 | 28.57 |
| 4 | 1 | 2.86 | 31.43 |
| 5 | 1 | 2.86 | 34.29 |
| 6 | 2 | 5.71 | 40.00 |
| 7 | 21 | 60.00 | 100.00 |
| Total | 35 | 100.00 | |

## Weeks/month

| I3b | Freq. | Percent | Cum. |
|---|---|---|---|
| 1 | 32 | 66.67 | 66.67 |
| 2 | 11 | 22.92 | 89.58 |
| 3 | 5 | 10.42 | 100.00 |
| Total | 48 | 100.00 | |

## Months/year

| I3c | Freq. | Percent | Cum. |
|---|---|---|---|
| 1 | 34 | 91.89 | 91.89 |
| 2 | 2 | 5.41 | 97.30 |
| 4 | 1 | 2.70 | 100.00 |
| Total | 37 | 100.00 | |

## Do you grow vegetables, fruits in the area?

| I4 | Freq. | Percent | Cum. |
|---|---|---|---|
| Nu | 51 | 36.17 | 36.17 |
| Da | 90 | 63.83 | 100.00 |
| Total | 141 | 100.00 | |

## Where do you grow usually vegetables and fruits?

0 No answer
1 Far from the traffic area
2 Near the mining area
3 Near the waste dumps

| I5 | Freq. | Percent | Cum. |
|---|---|---|---|
| 0 | 78 | 55.32 | 55.32 |
| 1 | 14 | 9.93 | 65.25 |
| 2 | 39 | 27.66 | 92.91 |
| 3 | 10 | 7.09 | 100.00 |
| Total | 141 | 100.00 | |

## How often do you eat vegetables from the area?

0 no answer
1 not too often
2 monthly
3 weekly
4 daily

| I6 | Freq. | Percent | Cum. |
|---|---|---|---|
| 0 | 53 | 37.59 | 37.59 |
| 1 | 12 | 8.51 | 46.10 |
| 2 | 5 | 3.55 | 49.65 |
| 3 | 33 | 23.40 | 73.05 |
| 4 | 38 | 26.95 | 100.00 |
| Total | 141 | 100.00 | |

### Do you wash well the vegetables and the fruits from the area before eating them?

| I7 | Freq. | Percent | Cum. |
|---|---|---|---|
| No | 12 | 13.48 | 13.48 |
| Yes | 77 | 86.52 | 100.00 |
| Total | 89 | 100.00 | |

### Do you wash your hands every time before cooking or eating?

| I8 | Freq. | Percent | Cum. |
|---|---|---|---|
| No | 24 | 17.02 | 17.02 |
| I don't know | 1 | 0.71 | 17.73 |
| Yes | 116 | 82.27 | 100.00 |
| Total | 141 | 100.00 | |

### How often do you use the vacuum cleaner to clean up the house?

0 no answer
1 daily
2 weekly
3 monthly
4 rare
5 never

| I9 | Freq. | Percent | Cum. |
|---|---|---|---|
| 0 | 2 | 1.42 | 1.42 |
| 1 | 35 | 24.82 | 26.24 |
| 2 | 78 | 55.32 | 81.56 |
| 3 | 2 | 1.42 | 82.98 |
| 4 | 1 | 0.71 | 83.69 |
| 5 | 23 | 16.31 | 100.00 |
| Total | 141 | 100.00 | |

### How often do you use the wet mopping to clean up the house?

0 no answer
1 daily
2 weekly
3 monthly
4 rare
5 never

| I10 | Freq. | Percent | Cum. |
|---|---|---|---|
| 0 | 1 | 0.71 | 0.71 |
| 1 | 61 | 43.26 | 43.97 |
| 2 | 74 | 52.48 | 96.45 |
| 3 | 1 | 0.71 | 97.16 |
| 4 | 4 | 2.84 | 100.00 |
| Total | 141 | 100.00 | |

### *4.2.6 Smoking*

**Have you smoked at least 100 cigarettes during your entire life?**

| J1 | Freq. | Percent | Cum. |
|---|---|---|---|
| No | 58 | 41.13 | 41.13 |
| Yes | 83 | 58.87 | 100.00 |
| Total | 141 | 100.00 | |

-> sex= F

| The age (Years) | J1 No | Yes | Total |
|---|---|---|---|
| 18-29 | 7 | 10 | 17 |
| | 20.59 | 47.62 | 30.91 |
| 30-39 | 7 | 2 | 9 |
| | 20.59 | 9.52 | 16.36 |
| 40-49 | 8 | 6 | 14 |
| | 23.53 | 28.57 | 25.45 |
| 50-59 | 10 | 2 | 12 |
| | 29.41 | 9.52 | 21.82 |
| >60 | 2 | 1 | 3 |
| | 5.88 | 4.76 | 5.45 |
| Total | 34 | 21 | 55 |
| | 100.00 | 100.00 | 100.00 |

-> sex= M

| The age (years) | J1 No | Yes | Total |
|---|---|---|---|
| 18-29 | 14 | 24 | 38 |
| | 58.33 | 38.71 | 44.19 |
| 30-39 | 4 | 14 | 18 |
| | 16.67 | 22.58 | 20.93 |
| 40-49 | 2 | 15 | 17 |
| | 8.33 | 24.19 | 19.77 |
| 50-59 | 2 | 6 | 8 |
| | 8.33 | 9.68 | 9.30 |
| >60 | 2 | 3 | 5 |
| | 8.33 | 4.84 | 5.81 |
| Total | 24 | 62 | 86 |
| | 100.00 | 100.00 | 100.00 |

### At what age have you started to smoke regularly (e.g. at least one cigarette/day)

| J2 | Freq. | Percent | Cum. |
|---|---|---|---|
| 12 | 1 | 1.20 | 1.20 |
| 13 | 1 | 1.20 | 2.41 |
| 14 | 4 | 4.82 | 7.23 |
| 15 | 9 | 10.84 | 18.07 |
| 16 | 4 | 4.82 | 22.89 |
| 17 | 5 | 6.02 | 28.92 |
| 18 | 19 | 22.89 | 51.81 |
| 19 | 5 | 6.02 | 57.83 |
| 20 | 15 | 18.07 | 75.90 |
| 21 | 9 | 10.84 | 86.75 |
| 22 | 2 | 2.41 | 89.16 |
| 23 | 3 | 3.61 | 92.77 |
| 24 | 3 | 3.61 | 96.39 |
| 30 | 1 | 1.20 | 97.59 |
| 39 | 1 | 1.20 | 98.80 |
| 40 | 1 | 1.20 | 100.00 |
| Total | 83 | 100.00 | |

### If you don't smoke anymore, at what age, have you dropped out regulary smoking?

| J3 | Freq. | Percent | Cum. |
|---|---|---|---|
| 20 | 1 | 6.25 | 6.25 |
| 23 | 1 | 6.25 | 12.50 |
| 24 | 1 | 6.25 | 18.75 |
| 25 | 2 | 12.50 | 31.25 |
| 28 | 1 | 6.25 | 37.50 |
| 29 | 1 | 6.25 | 43.75 |
| 34 | 2 | 12.50 | 56.25 |
| 35 | 3 | 18.75 | 75.00 |
| 41 | 1 | 6.25 | 81.25 |
| 43 | 1 | 6.25 | 87.50 |
| 44 | 1 | 6.25 | 93.75 |
| 49 | 1 | 6.25 | 100.00 |
| Total | 16 | 100.00 | |

### Does sombody smoke or has sombody smoked in your house?

| J5 | Freq. | Percent | Cum. |
|---|---|---|---|
| No | 57 | 40.43 | 40.43 |
| Yes | 84 | 59.57 | 100.00 |
| Total | 141 | 100.00 | |

## *4.2.7 Alcohol consumption*

### Do you drink alcohol?

| J7 | Freq. | Percent | Cum. |
|---|---|---|---|
| No | 93 | 65.96 | 65.96 |
| Yes | 48 | 34.04 | 100.00 |
| Total | 141 | 100.00 | |

### How often do you eat a serving of fish (150g) coming from the rivers or lakes in the area?

1. One time or more times/day
2. 2-6 times/week
3. One time/ week
4. 2 times/month
5. One time/month
6. One time every 2 months
7. Less than 6 times/year
8. Never

| J8 | Freq. | Percent | Cum. |
|---|---|---|---|
| 2 | 3 | 2.13 | 2.13 |
| 3 | 4 | 2.84 | 4.96 |
| 4 | 6 | 4.26 | 9.22 |
| 5 | 7 | 4.96 | 14.18 |
| 6 | 4 | 2.84 | 17.02 |
| 7 | 18 | 12.77 | 29.79 |
| 8 | 99 | 70.21 | 100.00 |
| Total | 141 | 100.00 | |

## 4.3 The Results of the Questionnaire Study

### *4.3.1 The description of the studied population*

There were 141 adults aged 18-77 enrolled in the study. The age average and standard deviation were 37.7±12.6 years. The age group subject's distribution was the following: 39% of the subjects were 18-29 years old, 19% of the subjects were 30-39 years old, 22 of the subjects were 18-29 years old % old, 14% of the subjects were 50-59 years old and 6% of the subjects were over 60 years old.

39 % of the subjects were females and 61 % were males. Distribution analysis of the population on age groups and gender groups shows the preponderance of the males in younger age groups and the preponderance of the females in the older groups, excepting the group over 60 years old, the differences having no statistical significance.

The population enrolled in the questionnaire study has the current residence in the Abrud area (29%), Carpenis area (28%) and Rosia Montana (41%). Only 3 subjects live in Campeni area. The subjects have lived at the current residence a period of time varying between less than one year to 67 years, with a mean and standard deviation of 21±15.5 years. There is no statististical significance related to living time average at the current address. 69% of the subjects have lived at the current address since more than 10 years and 7% of them have lived at the current residence since one year or less. 96 of the subjects have lived at other addresses before. From these 96 subjects 18% has lived in other counties, 23 % has lived in Campeni area, 18% has lived in Carpenis area and 30% has lived in Rosia Montana area.

Distribution analysis of the population on gender groups related to living area indicates a decreasing of the females percent from 44 % in Abrud area to 41 % in Carpenis area, having the smallest value in Rosia Montana area (36%). The situation is reversed in the male population, the percentage of the males increasing from 56 in Abrud area to 59 in Carpenis area and 64 in Rosia Montana area. The differences are not statistically significant.

The distribution of the female subjects on age groups related to the living area shows the preponderance of the adults aged 18 to 40 years in Rosia Montana area, the preponderance of the adults aged 50 to 59 years in Carpenis area and the preponderance of the extreme age groups (18-29, respectively over 60 years old) in Abrud area. The distribution of the male subjects is different, namely the group 40-49 years old is preponderant in Rosia

Montana area, the older groups (50-59 and >60 years old) are preponderant in Carpinis area, while the younger groups (18-29, respectively 30-39 years old) are preponderant in Abrud area.

57.5% of the total number of the subjects (141) enrolled in the study is working at the Rosia Montana Gold Corporation (RMGC) or other mining companies in the Rosia Montana area. Their total number of years spent at this work place has varied between one year and 23 years, with a mean and standard deviation of 4.8 ± 4.4 years. Also, 33 % of them had the previous work place in the same companies. 17 % of those who are working in mining companies have had the previous work place at RMGC or other mining companies. The total number of years spent at the previous work place at RMCG or other mining companies varied between one year to 38 years, with a mean standard variation of 9.3 ± 10.5 years.

35.5 % from the subjects have and 18.4 % of the subjects have had occupations with potential exposure to irritant pollutants, metals ( Pb, Cd, As, Hg) and cyanides. 43.3% from the total number of subjects work and/or have worked at work places with potential exposure to the investigated pollutants an average time period of 6.3 ± 9.9 years.

The description of the socio-economic indicators, which characterize the studied population, includes: the education level (the last school graduated), the work for state or private system, the monthly income of the family, the marital status (unmarried/married/divorced/separated/widower) and the nationality. The analysis results of the questionnaire information show that approximately half of the studied population graduated the high school/college, 31% of the population graduated the secondary school and 16 % graduated the university. Three subjects graduated only the primary school. Related to their employment, 69.5 % of the studied adults work full time in the state or private system. 22.7 % from the subjects are retired or stay-at-home and 2.8 % have been unemployed since more than 6 months. About 5 % of the subjects are contractors, students or part time employed.

The monthly income of the family is over 5 millions lei in 87 % of the cases. Approximately 11 % of the subjects have a monthly income/family between 2-5 millions lei and only three subjects have a monthly income/family between one million to 2 millions lei. The analysis of the marital status of the investigated subjects show that 70.2 % of them are married, 18.4 % are unmarried and live with the parents, 4.3 % are unmarried and live alone, 4,3 % are widowers and approximately 2 % are divorced. Regarding the nationality, approximately 98 % of the subjects declared their Romanian nationality and 2 % declared their Hungarian nationality.

### *4.3.2 The exposure assessment based on the questionnaire information*

The filled in questionnaire gave information regarding the position of the house related to the mining area, waste dumps, tailings pond and the existence between all these and house of the natural barriers. It was also investigated the presence of some alternative environmental pollution sources as house heating type and the traffic in the area.

Thus, approximately 1/3 of the studied population has the house placed at less than 1 km from the mining areas perimeter located in the study area. 30 % of the subjects live at 1-5 km distance from mining areas, 23 % of the subjects live at 5-10 km distance and approximately 15 % lives at more than 5 km distance from mining areas.

The percentage distribution of the studied population related to the distance between house and the waste dumps of the mining areas is similar with the previous described situation. Related to the distance between house and tailings pond, it is show that a smaller percent of the subjects (5.7%) lives at a distance less than one km to the ponds, the most of them living at a distance of a 1-10 km (39.07% between 1-5 km, 30.5% 5-10 km). Almost ¼ of the population enrolled in the questionnaire study (24.1 %) lives at a distance bigger than 5 km from the tailings ponds from the mining areas. Almost 30 % of the subjects declared that the mining areas have noise sources. About 60% of the interviewed people declared that between their house and the mining areas are natural barriers represented by relief as mountain or heal.

78 % of the studied population lives in houses and only 22 % live in block of apartments. Almost all the subjects use the wood for the house heating (98.6%). 10% of the investigated subjects use for the heating of their houses both, wood and natural gas. More than a half of the studied population use the natural gas in the kitchen, while 30.5 % of the population use in the kitchen both, wood and natural gas and 13.5 % use only wood. Approximately ½ of the subjects heat their houses 5-8 hours/day, 30% heat the house 10-12 hours/day and 11 % heat the house 24 hours/day.

In 45 % of the cases the house is placed at the street, 60 % of the subjects having the house placed at a regional road or principal street. The traffic is hard on the street where live 55 % of the subjects.

In majority, the subjects have the house placed at less than 500 m from the closest water course (84.4 %) and 60 % of these subjects have the house placed downstream the mining area. In 2/3 of the cases the water course, which is close to the houses of the subjects, crosses a mining area. 62% of the population grows vegetables and approximately 32% of the subjects use for watering the water coming from a water course that crosses the mining areas.

55 % of the studied population uses the municipal network for the water supply of the houses, and 42.5 % of the population uses water from their own well or the neighbours wells. 31 % of the subjects who uses water from wells have those wells located les than 50 m from the house, 19 % have the well located between 50-150 m from the house and 50 % have the well located between 200-900m from house.

### *4.3.3 The assessment of habits and behaviors based on the questionnaire information*

About the 30% of the studied popultion are usualy exposed to the sun less than 3 hours/day, 30% are exposed 4-6 hours/day, 14 % are exposed 8 hours/day and orher 14 % are exposed 10 hours/day during a week day in the summer time. The sun exposure of the subjects during the week end is similar to that during the week time. A half of the interviewed sublets declared that their skin was susceptible to sun burns. About 25 % of the subjects spend during the vacation and week ends approximately one month/year out of residence area.

60 % of the studied population grows vegetable/fruits in the area, and 35 % of the population grows vegetable/fruits close to the mining area or waste dumps. 27 % of the subjects eat daily vegetables grown in the area and 23 % of the subjects eat weekly vegetable grown in the area. The other subjects either eat monthly and more rare or not the vegetables grown in their residence area. 86.5 % out of the subjects, who grow vegetables and eat those vegetables, use to wash them very well before cooking/eating. 83 % of the subjects wash their hands every time before cooking or eating the food.

Related to the frequency and modalities of house cleaning up, 80 % of the studied populatin uses daily or weekly the vacuum cleaner, while 12 % of the subjects has never used it. Abvout 96 % of the subjects use daily the wet mopping and approximately 3 % of the sbjects has never used it.

The analysis of the questionnaire information regarding smoking in investigated adults show that 59 % smokes or has been smoked at least 100 cigarettes during their entire life, the percentage of smokers being higher in men (72 %) than in women (38 %). The distribution of the studied population by smoking on age groups does not show a significant association with the age of any gender group, but it can be observed an increasing trend line of the smokers 18-50 years old, followed by a decreasing trend line. 58 % of the subjects who is smoking (or has smoked) have started to smoke regularly (at least one cigarette/day) between 18-21 years of age. From the total number of the subjects who have smoked at least 100 cigarettes during their entire life, 19.3 % of them gave up smoking.

Approximately 60 % of the investigated population is passively exposed to cigarette smoke into the house. The cumulated number of years of active exposure to cigarette smoke has a mean of 4.8 ± 8.4 years, and a maximum 31 years in women, while in men the mean is 11.5 ± 11.7 years, respectively 50 years the maximum. The cumulated number of years of passive exposure to cigarette smoke has a mean of 12.2 ± 13.3 years, and a maximum 47 years in women, while in men the mean is 8.2 ± 12 years, respectively 56 years the maximum. The mean of smoked cigarettes /day into the house during entire the period of time they have passively exposed to cigarette smoke is 13.1 ± 12.3 in women and 7.2 ± 9.9 in men. 40 % of the investigated subjects are both, active and passive smokers, while 20 % of the subjects are either only passive smokers or only active smokers or they are not exposed to cigarette smoke.

Related to the alcohol consumption the questionnaire information show that 34 % of the subjects drinks alcohol. The statistical analysis of the correlation between alcohol consumption and gender indicates a strong statistical significance with a higher percent of alcohol consumption in men (45 %) compared to women (16%). The distribution of alcohol consumption on age groups shows a strong statistical significance. In spite of this, it observes a decreasing trend line of the alcohol consumer's percentage with the older age in women and an opposite situation in men. Related to the type and quantity of alcohol beverage consumed, it was noticed that the mean consumption is 500 ml beer/day, 100 ml wine/day and 130 ml local brandy (tuica)/day.

The consumption of fish coming from the lakes and rivers from the area was evaluated based on consumption of 150 g serving. 70 % of the subjects declared that they didn't eat fish at all, and 13 % of the subjects have fish less than 6 times/year. Approximately 12 % of the investigated subjects have fish one time every 2 months or 1-2 times/month, and 5 % of the subjects have fish every week, 1-6 times/ week.

# 5 Morbidity Study

## 5.1 Description of the Study Area

The study wascarriedout in Rosia Montana and many other localities in the area (see below). Rosia Montatna is part of Rosia Montana area, having 42 square km and includes 15 villages. It is located in the Cenral-West part of Romania, in the Metal Mountains and belongs to Alba county (Table 5-1).

**Table 5-1. List of towns and villages included in the study:**

| | |
|---|---|
| 1 | Abrud |
| 2 | Balmosesti |
| 3 | Bistra |
| 4 | Blidesti |
| 5 | Boncesti |
| 6 | Bucium |
| 7 | Campeni |
| 8 | Carpinis |
| 9 | Corna |
| 10 | Curaturi |
| 11 | Daroaia |
| 12 | Fata Abrudului |
| 13 | Gura Cornei |
| 14 | Gura Rosiei |
| 15 | Gura Sohodol |
| 16 | Ignatesti |
| 17 | Iacobesti |
| 18 | Rosia Montana |
| 19 | Tarina |
| 20 | Vadu Motilor |
| 21 | Valea Bistrii |
| 22 | Valea Caselor |
| 23 | Vartop |
| 24 | Borlesti |
| 25 | Botesti |
| 26 | Certege |
| 27 | Ciuruleasa |
| 28 | Dealu Bistrii |
| 29 | Dealu Capsei |
| 30 | Floresti |
| 31 | Furduiesti |
| 32 | Horea |
| 33 | Lazuri |
| 34 | Lupsa |
| 35 | Mihoesti |
| 36 | Musca |

| | |
|---|---|
| 37 | Poduri |
| 38 | Poiana Vadului |
| 39 | Ponorel |
| 40 | Scarisoara |
| 41 | Sohodol |
| 42 | Varsi |
| 43 | Vidra |

### *5.1.1 Description of the population within the study area*

The data regarding the population in Rosia Montana area were collected from the census performed by The National Institute for Statistics in March 2002.

**Table 5-2. Description of the population within the study area**

| Locality | | Population |
|---|---|---|
| 1 | Abrud | 6190 |
| 2 | Balmosesti | 103 |
| 3 | Bistra | 1955 |
| 4 | Blidesti | 33 |
| 5 | Boncesti | 151 |
| 6 | Bucium | 115 |
| 7 | Campeni | 5238 |
| 8 | Carpinis | 417 |
| 9 | Corna | 343 |
| 10 | Curaturi | 197 |
| 11 | Daroaia | 481 |
| 12 | Fata Abrudului | 150 |
| 13 | Gura Cornei | 266 |
| 14 | Gura Rosiei | 104 |
| 15 | Gura Sohodol | 222 |
| 16 | Ignatesti | 98 |
| 17 | Iacobesti | 56 |
| 18 | Rosia Montana | 1369 |
| 19 | Tarina | 169 |
| 20 | Vadu Motilor | 203 |
| 21 | Valea Bistrii | 376 |
| 22 | Valea Caselor | 113 |
| 23 | Vartop | 157 |
| 24 | Borlesti | 100 |
| 25 | Botesti | 139 |
| 26 | Certege | 73 |
| 27 | Ciuruleasa | 551 |
| 28 | Dealu Bistrii | 113 |
| 29 | Dealu Capsei | 263 |
| 30 | Floresti | 173 |
| 31 | Furduiesti | 155 |
| 32 | Horea | 344 |
| 33 | Lazuri | 302 |
| 34 | Lupsa | 754 |

| | | |
|---|---|---|
| 35 | Mihoesti | 197 |
| 36 | Musca | 661 |
| 37 | Poduri | 130 |
| 38 | Poiana Vadului | 213 |
| 39 | Ponorel | 56 |
| 40 | Scarisoara | 743 |
| 41 | Sohodol | 236 |
| 42 | Varsi | 184 |
| 43 | Vidra | 51 |

### *5.1.2 The methology for selection of enroled subjects in the study (morbidity)*

The participants in the study were individuals from all age groups, both genders, located in the studied area refered at a family doctor for a health related problem from January 1st 2001 to August 31 2005. The morbidiy data were colected from all the family doctors in the studied area (see below the ICD codes). The data were recorded from Janury 1st 2001 to August 31 2005.

**Table 5-3. Morbidity codes (ICD 10)**

| | |
|---|---|
| | **Malignant neoplasms, stated or presumed to be primary, of specified sites, except of lymphoid, haematopoietic and related tissue** |
| C00-C14 | Lip, oral cavity and pharynx |
| C15-C26 | Digestive organs |
| C30-C39 | Respiratory and intrathoracic organs |
| C43-C44 | Skin |
| C45-C49 | Mesothelial and soft tissue |
| C50 | Breast |
| C51-C58 | Female genital organs |
| C60-C63 | Male genital organs |
| C64-C68 | Urinary tract |
| C69-C72 | Eye, brain and other parts of central nervous system |
| C73-C75 | Thyroid and other endocrine glands |
| C81-C96 | Malignant neoplasms, stated or presumed to be primary, of lymphoid, haematopoietic and related tissue |
| D10-D36 | Benign neoplasms |
| D50 | Iron-deficiency anemia |
| D51-D53 | Nutritional anaemias |
| D60-D64 | Aplastic and other anaemias |
| | **Endocrine, nutritional and metabolic diseases** |
| E00-E07 | Disorders of thyroid gland |
| E10-E14 | Diabetes mellitus |
| E20-E35 | Disorders of other endocrine glands |
| E50-E64 | Other nutritional deficiencies |
| E65-E68 | Obesity and other hyperalimentation |
| | **Diseases of the nervous system** |
| G50-G59 | Nerve, nerve root and plexus disorders |
| G60-G64 | Polyneuropathies and other disorders of the peripheral nervous system |
| | **Diseases of the eye and adnexa** |
| H00-H06 | Disorders of eyelid, lacrimal system and orbit |

| | |
|---|---|
| H10-H13 | Disorders of conjunctiva |
| H46-H48 | Disorders of optic nerve and visual pathways |
| | **Diseases of the circulatory system** |
| I05-I09 | Chronic rheumatic heart diseases |
| I10-I15 | Hypertensive diseases |
| I20-I25 | Ischaemic heart diseases |
| I26-I28 | Pulmonary heart disease and diseases of pulmonary circulation |
| I30-I39 | Diseases of pericardium, endocardium and valve |
| I30-I52 | Other forms of heart disease |
| I60-I69 | Cerebrovascular diseases |
| I70-I79 | Diseases of arteries, arterioles and capillaries |
| | **Diseases of the respiratory system** |
| J00 | Acute naso-faringitis |
| J01 | Acute sinusitis |
| J02 | Acute faringitis |
| J03 | Acute tonsilitis |
| J04 | Acute laryngo-tracheitis |
| J06 | Other acute upper respiratory tract infections |
| J10-J18 | Influenza and pneumonia |
| J20 | Acute bronchitis |
| J21 | Acute bronchiolitis |
| J22 | Unspecified lower respiratory tract infections |
| J30-J39 | Other diseases of upper respiratory tract |
| J40 | Bronchitis, unspecified |
| J41 | Chronic simple and mucopurulent bronchitis |
| J43 | Emphysema |
| J44 | Other chronic obstructive pulmonary diseases |
| J45 | Asthma |
| J47 | Bronchiectasis |
| J60-J70 | Lung diseases due to external agents |
| J80-J84 | Other respiratory diseases principally affecting the interstitium |
| J90 | Pleurisy, unclassified |
| | **Diseases of the digestive system** |
| K20 | Esophagitis |
| K21 | Gastro-oesophageal reflux disease |
| K23 | Disorders of oesophagus in diseases classified elsewhere |
| K25 | Gastric ulcer |
| K26 | Duodenal ulcer |
| K29 | Gastritis and duodenitis |
| K70 | Alcoholic liver disease |
| K71 | Toxic liver disease |
| K73 | Chronic hepatitis, not elsewhere classified |
| K74 | Fibrosis and cirrhosis of liver |
| K76 | Other diseases of liver |
| K77 | Liver disorders in diseases classified elsewhere |
| K80 | Calculus of gallbladder |
| K81 | Cholecystitis |
| K83 | Other diseases of biliary tract |
| K85 | Acute pancreatitis |
| K87 | Disorders of gallbladder, biliary tract and pancreas in diseases classified elsewhere |

| | |
|---|---|
| | **Diseases of the skin and subcutaneous tissue** |
| L00-L08 | Infections of the skin and subcutaneous tissue |
| L20-L30 | Dermatitis and eczema |
| L50-L54 | Urticaria and erythema |
| | **Diseases of the musculoskeletal system and connective tissue** |
| M05-M14 | Inflammatory polyarthropathies |
| M15-M19 | Arthrosis |
| M60-M63 | Disorders of muscles |
| M80-M85 | Disorders of bone density and structure |
| | **Diseases of the genitourinary system** |
| N20-N23 | Urolithiasis |
| N40-N51 | Diseases of male genital organs |
| N60-N64 | Disorders of breast |
| N70-N77 | Inflammatory disorders of female genital tract |
| N80-N98 | Noninflammatory disorders of female genital tract |
| | **Pregnancy, childbirth and the puerperium** |
| O00-O08 | Pregnancy with abortive outcome |
| | **Congenital malformations, deformations and chromosomal abnormalities** |
| Q00-Q07 | Congenital malformations of the nervous system |
| Q20-Q28 | Congenital malformations of the circulatory system |

## 5.2 Management and Statistical Analysis of The Database:

The data entry and statistical analysis processes were conducted following this protocol:

- the data entry (in an Excel 5.0) was done twice, by two different persons
- the database was accepted with less then 5% data entry error
- the database were analyzed using Stata 5.0 statistical package and EpiInfo 3.3.2

The data from the disease registries were collected into 2 databases, one for the acute and another one for the chronic diseases. As a result, a single patient could have been inputted more than once, equal to the number of visits to his family doctor for a certain disease (ex: monthly visits for treatment of blood hypertension). A data cleaning process was focused on keeping a single entry of a patient with a certain disease.

The prevalence values for the selected morbidity codes (acute and chronic) were calculated in Excel 5.0. The dataset containing these results was used to generate the GIS digital maps.

For Rosia Montana the data were collected in two different databases for the acute and chronic diseases. Abrud and Campeni towns were divided into four areas, according to the spatial distribution of the patients' residencies and the frequencies for the selected morbidity codes were calculated and were also used to generate digital maps.

The number of cases (selected morbidity codes) and population number were used to calculate the OR (odds ratio) between Rosia Montana and the other localities (from the original list of localities in the area, the ones that had less then 5 cases of disease were ignored together with the localities for which the morbidity data were not collected from all the family doctors - Albac, or those for which no population data were available - Fantanele, Rogoz, there are some exceptions which are mentioned below).

In order to calculate the OR, the disease codes were grouped by types of diseases, both for acute and chronic data, as illustrated below:

Acute diseases:

Acute respiratory diseases - 3 groups:

1) J00+J01+J02+J03+J04+J05+J06+J30-J39
2) J10-J18+J80-J84+J90
3) J20+J21+J22+J40

Acute digestive diseases - all the codes were grouped: K20, K26, K29, K77, K81, K83, K85

Acute genito-urinary diseases - all the codes were grouped: N40-51, N70-N77, N80-N98, O00-O08

Acute diseases of the eye - all codes were grouped: H00-H06, H10-H13, H46-H48

Acute dermatological diseases - 2 groups:

1) L00-L08
2) L20-L30+L50-L54

Chronic diseases:

Chronic respiratory diseases - 5 groups:

1) J30-J39
2) J40, J41, J44
3) J43, J47
4) J45
5) J60-J70

Chronic cardio-vascular diseases - 4 groups:

1) I10-I15
2) I20-I25
3) I26-I28; I30-I52; I70-I79
4) I60-I69

Chronic digestive diseases - 4 groups:

1) K20, K21
2) K25, K26, K29
3) K70, K71, K73, K74, K76, K77
4) K80, K81, K83, K87

Chronic blood and blood forming organs diseases - all codes were grouped: D50, D51-53; D60-64

Chronic musculoskeletal diseases - 3 groups:

1) M05-M14
2) M15-M19
3) M80-M85

Chronic diseases of the nervous system - all codes were grouped: G50-59; G60-G64

Tumors - 7 groups:

1) C00-C14; C15-C26
2) C30-C26
3) C43-C44; C45-C49
4) C50, C51-C58
5) C60-C63
6) C64-C68; C69-C72; C73-C75, C81-C96
7) D10-D36

Chronic genito-urinary diseases - 3 groups:

1) N40-N51
2) N60-N64; N70-N77; N80-N98
3) N20-N23

Chronic dermatological diseases - 2 groups:

1) L00-L08
2) L20-L30; L50-L54

Chronic endocrine system diseases - 3 groups:

1) E00-E07; E20-E35
2) E10-E14
3) E65-E68

Congenital malformations - all codes were grouped: Q00-Q07; Q20-Q28.

In general, for the diseases with less then 5 registered cases the OR were not calculated. However, in some situations (musculo-skeletal diseases, anemia) the OR were calculated even if the registered number of cases was less then 4. For tumors and congenital malformations no OR were calculated.

## 5.3 General Conclusions

### *5.3.1 Major conclusions raised out for the acute diseases are stated as follows:*

A. the risks to develop acute respiratory diseases are significantly higher within the population groups living in Rosia Montana compared to those from the other investigated localities, with two exceptions:
   (i) inhabitants from Bucium and Certege have been recorded higher risks for some acute respiratory diseases then those from Rosia Montana
   (ii) in some localities with small number of inhabitants, the risks to develop acute respiratory diseases is lower then within the population living in Rosia Montana, even there is no powerful significance
B. the risks to develop acute digestive diseases is significantly higher for the population living in Rosia Montana compared to all the investigated localities, even for few of them statistical power is not of strong relevance, but OR and RR are rather high
C. the risks to develop acute ocular diseases is pretty similar to the trend described above for the acute digestive diseases, meaning higher risks for Rosia Montana,

with one exception recorded for the people living in Certege which expressed higher risks then in Rosia Montana

D. the risks to develop acute skin diseases follows the pattern of the acute digestive diseases, which show higher risk within the population from Rosia Montana

E. the risks to develop genitourinary system diseases is almost the same as for the case of acute ocular diseases, meaning higher risk for the inhabitants from Rosia Montana, the exception this time in terms of higher risks outside Rosia Montana being represented by Bucium

F. in general it may be stated that the population living in Rosia Montana is exposed to higher risks to develop acute respiratory, digestive, ocular, skin, genitourinary system diseases compared to the people from the investigated localities. There are some specific situations when population groups from other localities have showed higher risks for acute respiratory diseases such as Bucium, Certege, or for acute ocular diseases such as Certege, or genitourinary system diseases such as Bucium

### *5.3.2 Major conclusions raised out for the chronic diseases are stated as follows:*

A. chronic respiratory diseases are following the pattern of acute respiratory diseases, which mean that the probability to develop these diseases is higher within the population from Rosia Montana, with two exceptions Certege and Bucium

B. chronic cardiovascular diseases are significant higher in the people of Rosia Montana then in the investigated localities, while in Certege (for all categories) and in Bucium (one category) it is rather the other way round

C. for chronic digestive diseases there is not specific trend in terms of spatial distribution

D. chronic blood and blood forming organs diseases recorded either high or low risks in Rosia Montana without a specific spatial distribution trend

E. chronic skin diseases have pointed out significant higher risks in Rosia Montana compared to Abrud

F. diabetes have been found significant higher within the inhabitants from Rosia Montana then in the population groups from Abrud and Campeni, while for the other chronic endocrine diseases there is no specific trend in terms of spatial distribution (situation similar to chronic digestive diseases)

G. chronic musculoskeletal and connected tissues diseases showed higher risks in Rosia Montana versus the investigated localities, while in Certege and Bucium the risks are higher then in Rosia Montana

H. the risks to develop chronic nervous system diseases is either higher or lower in Rosia Montana compared to the rest of investigated locations

I. chronic genitourinary system diseases pointed out significant higher risks for the population living in Rosia Montana compared to the population groups from the investigated localities

In general it may be stated (taking into account this unique study in our region in terms of spatial distribution) that the health status of the population living in Rosia Montana is worse compared to that of the population groups living in the investigated areas (vicinity and farther away), while for some diseases risks are higher within people of Bucium and Certege.

# 6 Risk Assessment

## 6.1 Methodology

### *6.1.1 Environmental Data*

Environmental data are pollutant concentrations in the environmental media, as follows: for air – breathable particles, $PM_{10}$ and irritant gases $NO_2$ and $SO_2$; for surface and groundwater and for soil – six metals (As, Cd, Cr, Ni, Hg, Pb), and for surface water and soils cyanide The air, surface and ground water and soil samples were collected from Rosia Montana and other localities at more or less long distances from Rosia Montana (see table below). In addition existing environmental data (monitoring, asssessments) were included.

**Table 6-1. Sampling Locations for Environmental Media**

| No. | Locality Code | Locality |
|---|---|---|
| 1 | 01 | Abrud |
| 2 | 02 | Balmosesti |
| 3 | 03 | Carpinis |
| 4 | 04 | Corna |
| 5 | 05 | Gura Cornei |
| 6 | 06 | Gura Rosiei |
| 7 | 07 | Ignatesti |
| 8 | 08 | Roşia Montană |
| 9 | 09 | Tarina |
| 10 | 10 | Avram Iancu |
| 11 | 11 | Bistra |
| 12 | 12 | Campeni |
| 13 | 13 | Curaturi |
| 14 | 14 | Vadu Motilor |
| 15 | 15 | Vartop |
| 16 | 16 | Iacobesti |
| 17 | 17 | Blidesti |
| 18 | 18 | Muntari |
| 19 | 19 | Poiana |
| 20 | 20 | Bisericani |
| 21 | 21 | Helesti |
| 22 | 22 | Valeni |
| 23 | 23 | Bunta |
| 24 | 24 | Dogaresti |
| 25 | 25 | Bucium |
| 26 | 26 | Valea Abruzel |
| 27 | 27 | Valcea |

The collected samples were analysed in the laboratory (Analist Service, Bucharest) and the results were entered into an Excel database. Note that, in developing the database, the following assumptions were made: for the determination of metals in the soil, for of mercury, arsenic, chromium, nickel and cadmium concentrations less than 0.05 μg/kg dry weight, it was assumed that the concentration was 0.01 μg/kg dry weight, for the determination of metals in water, concentrations of arsenic, chromium, nickel and cadmium less than 1 μg/l, it was assumed that the concentration was 0.1 μg/l and for lead concentration in water it was assumed that it was 0.001 μg/l, for mercury, concentrations less than 0,1, were assumed to be 0 μg/l and for determinations of airborne particulate, SLD were assumed to be 0.000 $oz/m^3$.

In building the final database, which included both environmental data (pollutant concentrations in the environmental media) and health data (disease and disease group prevalence) measured ambient pollutant concentrations at various locations in the investigated localities and the geometric mean values calculated in Excel for several values measured at various locations in the investigated localities.

In the final, joint health and environmental database, the investigated localities were grouped into three zones, as follows: zone 1 including the localities of Campeni, Bistra, Gura Rosiei, Carpenis; zone 2 including Abrud, Corna, Gura Cornei, Bucium and zone 3 including Rosia Montana, Tarina, Balmosesti.

### *6.1.2 Health Data*

Prevalence was calculated for the pathology of concern (chronic bronchitis and other obstructive lung diseases, asthma, hypertensive diseases, ischaemic heart disease, chronic pulmonary heart disease, cerebrovascular diseases, anaemias, dermatitis and eczema, thyroid disorders, diabetes mellitus, disorders of the bone density and structure, urolithiasis) in Microsoft Office Excel 2003 using the information on the numbed of cases for the respective disorders and the number of population in the respective localitiy. Prevalence values were entered into the Excel database, with the environmental data, then the information was imported into the Stata 5.0 software where health data were statistically processed against environmental data.

### *6.1.3 Management and statistical analysis of the database:*

The charts were developed in Microsoft Office Excel 2003.

Advanced statistical data processing was done in the Stata 5.0 sofware, using an uni-varied and multi-varied linear regression model. Regression coefficients and standard errors obtained by the use of the linear regression model will show the correlation between the studied dependent variable and the independent variable(s) entered into the model.

The differences revealed in comparing the data were tested by the p-value. The p-value is the probability of differences at least as great as those found in the observed data might occur as a result of chance (zero hypothesis). The zero hypothesis is accepted or rejected based on the p-value, which might be greater or lesser than the significance level, for which the typically selected value is 0.05 (5%). If the p-value is below the significance level, it will show that it is improbable (but not impossible) for the observed results to be determined solely by chance, discarding the zero hypothesis.

### *6.1.4 Environmental and Health Prognosis*

Estimated ambient pollutant concentrations for 2018 (year 9 of operation) and 2023 (year 14) are based on the forecasting models developed by the experts involved in the EIA project.

Databases of estimated ambient pollutant concentrations for 2018 (year 9 of operation) and 2023 (year 14) were developed in Excel, then the information was imported into the Stata software for statistical processing and health forecast modeling.

Estimated health effects based on estimated ambient pollutant concentrations for 2018 (year 9 of operation) and 2023 (year 14) were developed using the uni-varied and multi-varied linear regression model in Stata 5.0.

## 6.2 Statistical Analysis of Health Data

(Prevalent For Groups Of Diseases) Versus Environmental Data (Measured Ambient Pollution Concentrations) In A Linear Regression Model

**Table 6-2. Relation between ambient NO2 concentrations and chronic bronchitis**

| bronchitis | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Zone 1 | | | | | | |
| air_no2 | -.0085744 | .0124074 | -0.691 | 0.561 | -.0619592 | .0448104 |
| Zone 2 | | | | | | |
| air_no2 | -.3618056 | 1.034498 | -0.350 | 0.760 | -4.812891 | 4.08928 |
| Zone 3 | | | | | | |
| air_no2 | -0.4415776 | 0.7648348 | -0.577 | 0.667 | -10.15973 | 9.27657 |
| Zone 1+2+3 | | | | | | |
| air_no2 | -0.0380143 | 0.0469448 | -0.810 | 0.439 | -0.1442108 | 0.0681821 |

Linking chronic bronchitis to ambient $NO_2$ concentration levels in the linear regression model shows a negative correlation (the effect declines with increase of the pollutant concentrations) of no statistical insignificance in zone 1 (including Campeni, Bistra, Gura Rosiei, Carpinis) as well as zone 2 (including Abrud, Gura Cornei, Corna, Bucium) and zone 3 (including Rosia Montana, Tarina, Balmosesti).

**Table 6-3. Relation between ambient SO2 concentrations and chronic bronchitis**

| bronchitis | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Zone 1 | | | | | | |
| air_so2 | -.0627452 | .1881384 | -0.334 | 0.770 | -.8722392 | .7467489 |
| Zone 2 | | | | | | |
| air_so2 | -1.629643 | 2.884892 | -0.565 | 0.629 | -14.04233 | 10.78305 |
| Zone 3 | | | | | | |
| air_so2 | 2.546007 | 2.96 | . | 0.000 | 2.546007 | 2.546008 |
| Zone 1+2+3 | | | | | | |
| air_so2 | -0.4173157 | 0.5359846 | -0.779 | 0.456 | -1.629797 | 0.7951656 |

Linking chronic bronchitis to ambient $SO_2$ concentration levels in the linear regression shows a negative correlation (the effect is reduced with an increase of the pollutant) not statistically significant in zone 1 (Campeni, Bistra, Gura Rosiei, Carpinis) and zone 2 (Abrud, Gura Cornei, Corna, Bucium), respectively and a positive (the effect increases with pollutant concentration) and statistically significant correlation in zone 3 (Rosia Montana, Tarina, Balmosesti).

**Table 6-4. Relation between ambient PM10 concentrations and chronic bronchitis**

| bronchitis | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Zone 1 | | | | | | |
| air_pm | -.0036351 | .0274675 | -0.132 | 0.907 | -.1218181 | .1145479 |
| Zone 2 | | | | | | |
| air_pm | -0.0293644 | 0.2190148 | -0.134 | 0.906 | -0.971709 | 0.9129802 |
| Zone 3 | | | | | | |
| air_pm | .8264475 | 9.61 | . | 0.000 | .8264474 | .8264477 |
| Zone 1+2+3 | | | | | | |
| air_pm | -0.0549173 | 0.0654558 | -0.839 | 0.423 | -0.2029884 | 0.0931539 |

Linking chronic bronchitis to ambient breathable particles concentration levels in the linear regression shows a negative correlation (the effect is reduced with an increase of the pollutant) not statistically insignificant in zone 1 (Campeni, Bistra, Gura Rosiei, Carpinis) and zone 2 (Abrud, Gura Cornei, Corna, Bucium), respectively and a positive (the effect increases with pollutant concentration) and statistically significant correlation in zone 3 (Rosia Montana, Tarina, Balmosesti).

**Table 6-5. Relation between ambient NO2 concentrations and asthma**

| asthma | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Zone 1 | | | | | | |
| air_no2 | -0.0023789 | 0.0043572 | -0.546 | 0.640 | -0.0211265 | 0.0163687 |
| Zone 2 | | | | | | |
| air_no2 | -0.0743421 | 0.0438851 | -1,694 | 0.232 | -0.2631644 | 0.1144801 |
| Zone 3 | | | | | | |
| air_no2 | -0.0358549 | 0.0621025 | -0.577 | 0.667 | -0.8249418 | 0.7532321 |
| Zone 1+2+3 | | | | | | |
| air_no2 | -0.0023212 | 0.0034353 | -0.676 | 0.516 | -0.0100923 | 0.0054499 |

Linking asthma to ambient $NO_2$ concentration levels in the linear regression model shows a negative correlation (the effect is reduced with an increase of the pollutant) not statistically significant in zone 1 (Campeni, Bistra, Gura Rosiei, Carpinis) as well as zone 2 (Abrud, Gura Cornei, Corna, Bucium) and zone 3 (Rosia Montana, Tarina, Balmosesti).

**Table 6-6. Relation between ambient SO2 concentrations and asthma**

| asthma | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Zone 1 | | | | | | |
| air_so2 | 0.0117763 | 0.0648449 | 0.182 | 0.873 | -0.2672288 | 0.2907813 |
| Zone 2 | | | | | | |
| air_so2 | .0688059 | .1936017 | 0.355 | 0.756 | -.7641949 | .9018068 |
| Zone 3 | | | | | | |
| air_so2 | 0.2067288 | . | . | . | . | . |
| Zone 1+2+3 | | | | | | |
| air_so2 | -0.0021997 | 0.0400941 | -0.055 | 0.957 | -0.0928989 | 0.0884995 |

Linking asthma to ambient $SO_2$ concentration levels in the linear regression model shows a positive correlation (the effect increases with an increase of the pollutant) not statistically significant in zone 1 (Campeni, Bistra, Gura Rosiei, Carpinis) as well as zone 2 (Abrud, Gura Cornei, Corna, Bucium).

**Table 6-7. Relation between ambient PM10 concentrations and asthma**

| asthma | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Zone 1 | | | | | | |
| air_pm | -0.0069744 | 0.0079208 | -0.881 | 0.471 | -0.0410548 | 0.0271059 |
| Zone 2 | | | | | | |
| air_pm | .0105873 | .0119918 | 0.883 | 0.470 | -.0410091 | .0621837 |
| Zone 3 | | | | | | |
| air_pm | 0.0671053 | 8.49 | . | 0.000 | .0671053 | .0671053 |
| Zone 1+2+3 | | | | | | |
| air_pm | -0.0000677 | 0.004922 | -0.014 | 0.989 | -0.0112021 | 0.0110666 |

Linking asthma to ambient breathable particles concentration levels in the linear regression model shows a negative correlation (the effect is reduced with an increase of the pollutant concentration) not statistically significant in zone 1 (Campeni, Bistra, Gura Rosiei, Carpinis) of a positive correlation (the effect increases with pollutant concentration), but without statistical significance in zone 2 (Abrud, Gura Cornei, Corna, Bucium) and a positive and statistically significant correlation in zone 3 (Rosia Montana, Tarina, Balmosesti).

**Table 6-8. Relation between soil Cr concentrations and asthma**

| asthma | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Zone 1 | | | | | | |
| soil_cr | -.009756 | .011345 | -0.860 | 0.480 | -.0585696 | .0390576 |
| Zone 2 | | | | | | |
| soil_cr | -0.1632533 | 0.2870557 | -0.569 | 0.627 | -1.398354 | 1.071848 |
| Zone 3 | | | | | | |
| soil_cr | .0724561 | .074659 | 0.970 | 0.510 | -.876176 | 1.021088 |
| Zone 1+2+3 | | | | | | |
| soil_cr | -0.0015062 | 0.0078179 | -0.193 | 0.852 | -0.0191915 | 0.0161792 |

In regard to asthma, linking it to soil chrome concentrations in the linear regression model shows a negative correlation (the effect is reduced with an increase in the pollutant concentration) not statistically significant in zone 1 (Campeni, Bistra, Gura Rosiei, Carpinis) and zone 2 (Abrud, Gura Cornei, Corna, Bucium), respectively and a positive (the effect increases with pollutant concentration) but not statistically significant correlation in zone 3 (including Rosia Montana, Tarina, Balmosesti).

**Table 6-9. Relation between Pb concentrations in the groundwater and hypertension**

| hta | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Zone 1 | | | | | | |
| gw_pb | -.3108394 | 4.060983 | -0.077 | 0.946 | -17.78384 | 17.16216 |
| Zone 2 | | | | | | |
| gw_pb | .9648456 | 4.208571 | 0.229 | 0.840 | -17.14317 | 19.07286 |
| Zone 3 | | | | | | |
| gw_pb | 20.75723 | 8.757236 | 2,370 | 0.254 | -90,514 | 132.0285 |
| Zone 1+2+3 | | | | | | |
| gw_pb | 2.626051 | 3.07435 | 0.854 | 0.415 | -4.328612 | 9.580714 |

Hypertension appears negative (the effect is reduced with an increase of the pollutant concentration) and not statistically significant when correlated to lead levels in groundwater in zone 1 (Campeni, Bistra, Gura Rosiei, Carpinis) and positive (the effect increases with pollutant concentration), respectively, but not statistically significant when correlated to groundwater lead concentrations in zone 2 (Abrud, Gura Cornei, Corna, Bucium) and zone 3 (including Rosia Montana, Tarina, Balmosesti), respectively.

**Table 6-10. Relation between As concentrations in the groundwater and hypertension**

| hta | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Zone 1 | | | | | | |
| gw._as | -9.849014 | 18.62136 | -0.529 | 0.650 | -89.97028 | 70.27225 |
| Zone 2 | | | | | | |
| gw._as | -11.15231 | 11.53215 | -0.967 | 0.436 | -60.77115 | 38.46654 |
| Zone 3 | | | | | | |
| gw._as | 105.4585 | 6.942568 | 15,190 | 0.042 | 17.24484 | 193.6722 |
| Zone 1+2+3 | | | | | | |
| gw._as | -2.775507 | 9.313865 | -0.298 | 0.772 | -23.84493 | 18.29392 |

Linking hypertension to groundwater arsenic levels in the linear regression model shows a negative correlation (the effect is reduced with an increase of the pollutant concentration) of no statistical significance in zone 1 (Campeni, Bistra, Gura Rosiei, Carpinis) and zone 2

(Abrud, Gura Cornei, Corna, Bucium), respectively, and a positive (the effect increases with pollutant concentration) and statistically significant correlation in zone 3 (Rosia Montana, Tarina, Balmosesti).

**Table 6-11. Relation between As concentrations in surface water and hypertension**

| hta | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Zone 1 | | | | | | |
| sw_as | -10.32422 | 2.993948 | -3.448 | 0.075 | -23.20614 | 2.557699 |
| Zone 2 | | | | | | |
| sw_as | (dropped) | | | | | |
| Zone 3 | | | | | | |
| sw_as | 145.9131 | 9.605783 | 15.190 | 0.042 | 23.86008 | 267.9662 |
| Zone 1+2+3 | | | | | | |
| sw_as | -1.736446 | 14.90405 | 15.190 | 0.910 | -35.45175 | 31.97886 |

The same pattern is found in linking hypertension to arsenic concentration levels in surface waters, this time excepting zone 2.

**Table 6-12. Relation between Pb concentrations in surface water and hypertension**

| hta | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Zone 1 | | | | | | |
| sw_pb | -6.21876 | 7.943854 | -0.783 | 0.516 | -40.3984 | 27.96089 |
| Zone 2 | | | | | | |
| sw_pb | -5.406734 | 11.03401 | -0.490 | 0.673 | -52.88227 | 42.0688 |
| Zone 3 | | | | | | |
| sw_pb | 37.11719 | 2.443506 | 15,190 | 0.042 | 6.069494 | 68.16488 |
| Zone 1+2+3 | | | | | | |
| sw_pb | -.0298653 | 3.506425 | -0.009 | 0.993 | -7.96195 | 7.90222 |

Linking hypertension to lead levels in surface water in the linear regression model shows a negative correlation (the effect is reduced with an increase of the pollutant) of no statistical significance in zone 1 (Campeni, Bistra, Gura Rosiei, Carpinis) and zone 2 (Abrud, Gura Cornei, Corna, Bucium), respectively, and a positive (the effect increases with pollutant concentration) and statistically significant correlation in zone 3 (Rosia Montana, Tarina, Balmosesti).

**Table 6-13. Relation between soil Pb concentrations and hypertension**

| hta | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Zone 1 | | | | | | |
| soil_pb | 0.9997313 | 0.481273 | 2,077 | 0.173 | -1.071019 | 3.070482 |
| Zone 2 | | | | | | |
| soil_pb | -1.471738 | 0.5503589 | -2,674 | 0.116 | -3.839741 | 0.8962653 |
| Zone 3 | | | | | | |
| soil_pb | .6208616 | 2.926823 | 0.212 | 0.867 | -36.56795 | 37.80967 |
| Zone 1+2+3 | | | | | | |
| soil_pb | -.1439589 | .6735775 | -0.214 | 0.836 | -1.667697 | 1.379779 |

When linking hypertension to lead concentration levels in the soil, the linear regression model shows a positive correlation (the effect increases with an increase of the pollutant concentration), not statistically significant in zone 1 (Campeni, Bistra, Gura Rosiei, Carpinis) and zone 3 (Rosia Montana, Tarina, Balmosesti) and a negative correlation (the effect declines with pollutant concentration) also not statistically significant in zone 2 (Abrud, Gura Cornei, Corna, Bucium).

**Table 6-14. Relation between soil Cd concentrations and hypertension**

| hta | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Zone 1 | | | | | | |
| soil_cd | -4.767987 | 10.78594 | -0.442 | 0.702 | -51.17614 | 41.64016 |
| Zone 2 | | | | | | |
| soil_cd | -12.03361 | 22.11107 | -0.544 | 0.641 | -107.1699 | 83.10264 |
| Zone 3 | | | | | | |
| soil_cd | 324.8431 | 21.38514 | 15,190 | 0.042 | 53.11915 | 596,567 |
| Zone 1+2+3 | | | | | | |
| soil_cd | -8.586481 | 12.28858 | -0.699 | 0.502 | -36.38518 | 19.21222 |

Linking hypertension to soil cadmium levels in the linear regression model shows a negative correlation (the effect is reduced with an increase of the pollutant concentration) of no statistical significance in zone 1 (Campeni, Bistra, Gura Rosiei, Carpinis) and zone 2 (Abrud, Gura Cornei, Corna, Bucium), respectively, and a positive (the effect increases with pollutant concentration) and statistically significant correlation in zone 3 (Rosia Montana, Tarina, Balmosesti).

**Table 6-15. Relation between soil Hg concentrations and hypertension**

| hta | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Zone 1 | | | | | | |
| soil_hg | 20.41181 | 72.36822 | 0.282 | 0.804 | -290.9635 | 331.7871 |
| Zone 2 | | | | | | |
| soil_hg | -41.08596 | 482.5878 | -0.085 | 0.940 | -2117.494 | 2035.322 |
| Zone 3 | | | | | | |
| soil_hg | 928.1502 | 27.54494 | 33,696 | 0.019 | 578.1586 | 1278.142 |
| Zone 1+2+3 | | | | | | |
| soil_hg | 139.2935 | 122.5997 | 1,136 | 0.285 | -138.0464 | 416.6334 |

Hypertension appears positive (the effect increases with an increase of the pollutant concentration) and not statistically significant when correlated to mercury levels in the soil in zone 1 (Campeni, Bistra, Gura Rosiei, Carpinis) and positive and statistically significant when correlated to soil mercury concentrations in zone 3 (including Rosia Montana, Tarina, Balmosesti) and negative (the effect increases with pollutant concentration), respectively and not statistically significant when correlated to soil mercury levels in zone 2 (Abrud, Gura Cornei, Corna, Bucium).

**Table 6-16. Relation between soil As concentrations and hypertension**

| hta | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Zone 1 | | | | | | |
| soil_as | 2.327967 | 5.520815 | 0.422 | 0.714 | -21.42618 | 26.08212 |
| Zone 2 | | | | | | |
| soil_as | -4.979262 | 9.582326 | -0.520 | 0.655 | -46.20868 | 36.25016 |
| Zone 3 | | | | | | |
| soil_as | 5.714097 | 0.7767375 | 7,357 | 0.086 | -4.155289 | 15.58348 |
| Zone 1+2+3 | | | | | | |
| soil_as | 4.76438 | 1.489673 | 3,198 | 0.011 | 1.394506 | 8.134253 |

The same pattern as above is found in linking hypertension to arsenic concentration levels in soil, but the statistical significance of the correlation is not maintained for zone 3.

**Table 6-17. Relation between ambient PM10 concentrations and hypertension**

| hta | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Zone 1 | | | | | | |
| air_pm | -.1258272 | .2034204 | -0.619 | 0.599 | -1.001075 | .7494203 |
| Zone 2 | | | | | | |
| air_pm | -0.0046914 | 0.4725077 | -0.010 | 0.993 | -2.037728 | 2.028345 |
| Zone 3 | | | | | | |
| air_pm | 5.855725 | .3854953 | 15.190 | 0.042 | .9575427 | 10.75391 |
| Zone 1+2+3 | | | | | | |
| air_pm | 0.0031655 | 0.2287564 | 0.014 | 0.989 | -0.5143174 | 0.5206484 |

Linking hypertension to ambient breathable particles concentration levels in the linear regression model shows a negative correlation (the effect is reduced with an increase of the pollutant concentration) of not statistically significant in zone 1 (Campeni, Bistra, Gura Rosiei, Carpinis) and zone 2 (Abrud, Gura Cornei, Corna, Bucium), respectively, and a positive (the effect increases with pollutant concentration) and statistically significant correlation in zone 3 (Rosia Montana, Tarina, Balmosesti).

**Table 6-18. Relation between Pb concentrations in the groundwater and ischaemic heart disease**

| cih | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Zone 1 | | | | | | |
| gw_pb | -0.125946 | 1.654515 | -0.076 | 0.946 | -7.244749 | 6.992857 |
| Zone 2 | | | | | | |
| gw_pb | 0.6934085 | 2.466819 | 0.281 | 0.805 | -9.920459 | 11.30728 |
| Zone 3 | | | | | | |
| gw_pb | 4.449905 | 1.259348 | 3,534 | 0.176 | -11.55162 | 20.45143 |
| Zone 1+2+3 | | | | | | |
| gw_pb | 1.034014 | 1.170505 | 0.883 | 0.400 | -1.613852 | 3.681879 |

Ischaemic heart disease appears negative (the effect is reduced with an increase of the pollutant concentration) and not statistically significant when correlated to lead levels in groundwater in zone 1 (Campeni, Bistra, Gura Rosiei, Carpinis) and positive (the effect increases with pollutant concentration) but not statistically significant when correlated to groundwater lead concentrations in zone 2 (Abrud, Gura Cornei, Corna, Bucium) and zone 3 (including Rosia Montana, Tarina, Balmosesti), respectively.

**Table 6-19. Relation between As concentrations in the groundwater and ischaemic heart disease**

| cih | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Zone 1 | | | | | | |
| gw._as | -1.165141 | 8.057752 | -0.145 | 0.898 | -35.83485 | 33.50457 |
| Zone 2 | | | | | | |
| gw._as | -6.536992 | 6.823031 | -0.958 | 0.439 | -35.89413 | 22.82014 |
| Zone 3 | | | | | | |
| gw._as | 21.30806 | 4.07976 | 5,223 | 0.120 | -30.53021 | 73.14632 |
| Zone 1+2+3 | | | | | | |
| gw._as | -1.430493 | 3.540863 | -0.404 | 0.696 | -9.440482 | 6.579495 |

Linking ischaemic heart disease to groundwater arsenic levels in the linear regression model shows a negative correlation (the effect is reduced with an increase of the pollutant concentration) of no statistical significance in zone 1 (Campeni, Bistra, Gura Rosiei, Carpinis) and zone 2 (including Abrud, Gura Cornei, Corna, Bucium), respectively, and a positive (the effect increases with pollutant concentration) but not statistically significant correlation in zone 3 (including Rosia Montana, Tarina, Balmosesti).

**Table 6-20. Relation between As concentrations in the surface water and ischaemic heart disease**

| cih | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Zone 1 | | | | | | |
| sw_as | -3.127718 | 2.332933 | -1.341 | 0.312 | -13.16552 | 6.91008 |
| Zone 2 | | | | | | |
| sw_as | (dropped) | | | | | |
| Zone 3 | | | | | | |
| sw_as | 29.48197 | 5.644782 | 5.223 | 0.120 | -42.24179 | 101.2057 |
| Zone 1+2+3 | | | | | | |
| sw_as | -2.698987 | 5.621996 | -0.480 | 0.643 | -15.41683 | 10.01885 |

The same pattern is found in linking ischaemic heart disease to arsenic concentration levels in surface waters, this time excepting zone 2.

**Table 6-21. Relation between Pb concentrations in the surface water and ischaemic heart disease**

| cih | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Zone 1 | | | | | | |
| sw_pb | -0.4550395 | 3.685156 | -0.123 | 0.913 | -16.31099 | 15.40091 |
| Zone 2 | | | | | | |
| sw_pb | -3.136622 | 6.521872 | -0.481 | 0.678 | -31.19797 | 24.92473 |
| Zone 3 | | | | | | |
| sw_pb | 7.499583 | 1.435912 | 5,223 | 0.120 | -10.74541 | 25.74458 |
| Zone 1+2+3 | | | | | | |
| sw_pb | -1.04426 | 1.292439 | -0.808 | 0.440 | -3.967961 | 1.87944 |

Linking ischaemic heart disease to  lead levels in surface waters in the linear regression model shows a negative correlation (the effect declines with an increase of the pollutant concentration) of no statistical significance in zone 1 (Campeni, Bistra, Gura Rosiei, Carpinis) and zone 2 (Abrud, Gura Cornei, Corna, Bucium), and a positive (the effect increases with pollutant concentration) but not a statistically significant correlation in zone 3 (including Rosia Montana, Tarina, Balmosesti).

**Table 6-22. Relation between soil Pb concentrations and ischaemic heart disease**

| cih | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Zone 1 | | | | | | |
| soil_pb | 0.4274213 | 0.1733449 | 2,466 | 0.133 | -0.3184214 | 1.173264 |
| Zone 2 | | | | | | |
| soil_pb | -0.8514981 | 0.3460574 | -2,461 | 0.133 | -2.340463 | 0.6374668 |
| Zone 3 | | | | | | |
| soil_pb | 0.052504 | 0.6119312 | 0.086 | 0.946 | -7.722819 | 7.827827 |
| Zone 1+2+3 | | | | | | |
| soil_pb | -.2240652 | .246715 | -0.908 | 0.387 | -.7821734 | .334043 |

When linking ischaemic heart disease to lead concentration levels in the soil, shows a positive correlation (the effect is increased with an increase of the pollutant) but not statistically significant in zone 1 (Campeni, Bistra, Gura Rosiei, Carpinis) and zone 3 (Rosia Montana, Tarina, Balmosesti), respectively, and a negative correlation (the effect increases with pollutant concentration) and not statistically significant in zone 2 (Abrud, Gura Cornei, Corna, Bucium).

**Table 6-23. Relation between soil Cd concentrations and ischaemic heart disease**

| cih | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Zone 1 | | | | | | |
| soil_cd | 0.7645107 | 4.572135 | 0.167 | 0.883 | -18.9078 | 20.43682 |
| Zone 2 | | | | | | |
| soil_cd | -6.395852 | 13.22402 | -0.484 | 0.676 | -63.29421 | 50.50251 |
| Zone 3 | | | | | | |
| soil_cd | 65.63504 | 12.56685 | 5,223 | 0.120 | -94.04195 | 225,312 |
| Zone 1+2+3 | | | | | | |
| soil_cd | -3.413956 | 4.680035 | -0.729 | 0.484 | -14.00093 | 7.17302 |

The situation is identical with that of soil lead described above when correlation is made between ischaemic heart disease and levels of cadmium concentrations in the soil.

**Table 6-24. Relation between soil Hg concentrations and ischaemic heart disease**

| cih | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Zone 1 | | | | | | |
| soil_hg | -9.413601 | 29.31813 | -0.321 | 0.779 | -135.5593 | 116.7321 |
| Zone 2 | | | | | | |
| soil_hg | -8.974758 | 285.1267 | -0.031 | 0.978 | -1235.776 | 1217.827 |
| Zone 3 | | | | | | |
| soil_hg | 188.3823 | 29.07021 | 6,480 | 0.097 | -180.9898 | 557.7544 |
| Zone 1+2+3 | | | | | | |
| soil_hg | 15.58783 | 49.77261 | 0.313 | 0.761 | -97.00563 | 128.1813 |

Linking ischaemic heart disease to soil arsenic levels in the linear regression model shows a negative correlation (the effect is reduced with an increase of the pollutant concentration) of no statistical significance in zone 1 (Campeni, Bistra, Gura Rosiei, Carpinis) and zone 2 (Abrud, Gura Cornei, Corna, Bucium), respectively, and a positive (the effect increases with pollutant concentration) but not statistically significant correlation in zone 3 (Rosia Montana, Tarina, Balmosesti).

**Table 6-25. Relation between soil Cr concentrations and ischaemic heart disease**

| cih | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Zone 1 | | | | | | |
| soil_cr | -0.0668092 | 0.1197401 | -0.558 | 0.633 | -0.5820092 | 0.4483908 |
| Zone 2 | | | | | | |
| soil_cr | -0.1632533 | 0.3738214 | -0.447 | 0.699 | -1.77536 | 1.441487 |
| Zone 3 | | | | | | |
| soil_cr | 1.025466 | 1.560937 | 0.657 | 0.630 | -18.80812 | 20.85906 |
| Zone 1+2+3 | | | | | | |
| soil_cr | -0.0485104 | 0.1380404 | -0.351 | 0.733 | -0.3607795 | 0.2637587 |

The same pattern is found in linking ischaemic heart disease to chromium concentration levels in the soil.

**Table 6-26. Relation between soil As concentrations and ischaemic heart disease**

| cih | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. Interval] | |
|---|---|---|---|---|---|---|
| Zone 1 | | | | | | |
| soil_as | -.4294811 | 2.327364 | -0.185 | 0.871 | -10.44332 | 9.584357 |
| Zone 2 | | | | | | |
| soil_as | -2.991435 | 5.63847 | -0.531 | 0.649 | -27.25181 | 21.26894 |
| Zone 3 | | | | | | |
| soil_as | 1.144418 | 0.3026565 | 3,781 | 0.165 | -2.701198 | 4.990033 |
| Zone 1+2+3 | | | | | | |
| soil_as | 0.7728013 | 0.7902586 | 0.978 | 0.354 | -1.014888 | 2.56049 |

The same sitation is found in linking ischaemic heart disease to arsenic concentration levels in the soil.

**Table 6-27. Relation between ambient PM10 concentrations and ischaemic heart disease**

| cih | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. Interval] | |
|---|---|---|---|---|---|---|
| Zone 1 | | | | | | |
| air_pm | -0.0585296 | 0.0804332 | -0.728 | 0.542 | -0.4046055 | 0.2875464 |
| Zone 2 | | | | | | |
| air_pm | -0.000452 | 0.2787423 | -0.002 | 0.999 | -1.199783 | 1.198879 |
| Zone 3 | | | | | | |
| air_pm | 1.183158 | .2265341 | 5.223 | 0.120 | -1.69523 | 4.061546 |
| Zone 1+2+3 | | | | | | |
| air_pm | -0.052442 | 0.0855552 | -0.613 | 0.555 | -0.2459814 | 0.1410973 |

Linking ischaemic heart disease to $PM_{10}$ levels in ambient air in the linear regression model shows a negative correlation (the effect is reduced with an increase of the pollutant concentration) of no statistical significance in zone 1 (Campeni, Bistra, Gura Rosiei, Carpinis) and zone 2 (Abrud, Gura Cornei, Corna, Bucium), and a positive (the effect increases with pollutant concentration) and not statistically significant correlation in zone 3 (Rosia Montana, Tarina, Balmosesti).

**Table 6-28. Relation between ambient NO2 concentrations and chronic pulmonary heart disease**

| cph | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. Interval] | |
|---|---|---|---|---|---|---|
| Zone 1 | | | | | | |
| air_no2 | -.0315948 | .0038779 | -8.147 | 0.015 | -.0482799 | -.0149097 |
| Zone 2 | | | | | | |
| air_no2 | -0.0833354 | 0.1819745 | -0.458 | 0.692 | -0.8663084 | 0.6996376 |
| Zone 3 | | | | | | |
| air_no2 | -0.2833239 | 0.2028681 | -1,397 | 0.396 | -2.861008 | 2.29436 |
| Zone 1+2+3 | | | | | | |
| air_no2 | -0.0095769 | 0.0130312 | -0.735 | 0.481 | -0.0390554 | 0.0199017 |

Linking chronic pulmonary heart disease to ambient $NO_2$ concentration levels in the linear regression model shows a statistically significant negative correlation (the effect is reduced with an increase of the pollutant) in zone 1 (Campeni, Bistra, Gura Rosiei, Carpinis) and no statistical significance in zone 2 (Abrud, Gura Cornei, Corna, Bucium), respectively and a negative (the effect increases with pollutant concentration) anso not statistically significant correlation in zone 3 (Rosia Montana, Tarina, Balmosesti).

**Table 6-29. Relation between ambient SO2 concentrations and chronic pulmonary heart disease**

| cph | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. Interval] | |
|---|---|---|---|---|---|---|
| Zone 1 | | | | | | |
| air_so2 | -0.2962285 | 0.2384579 | -1,242 | 0.340 | -1.32223 | 0.729773 |
| Zone 2 | | | | | | |
| air_so2 | -.2419069 | .5307089 | -0.456 | 0.693 | -2.525363 | 2.041549 |
| Zone 3 | | | | | | |
| air_so2 | 0.9148764 | 0.4149339 | 2,205 | 0.271 | -4.357359 | 6.187112 |
| Zone 1+2+3 | | | | | | |
| air_so2 | 0.0225631 | 0.1526021 | 0.148 | 0.886 | -0.3226469 | 0.3677731 |

Linking pulmonary heart disease to $SO_2$ levels in ambient air in the linear regression model shows a negative correlation (the effect is reduced with an increase of the pollutant concentration) of no statistical significance in zone 1 (Campeni, Bistra, Gura Rosiei, Carpinis) and zone 2 (Abrud, Gura Cornei, Corna, Bucium), and a positive (the effect increases with pollutant concentration) and not statistically significant correlation in zone 3 (Rosia Montana, Tarina, Balmosesti).

**Table 6-30. Relation between ambient PM10 concentrations and chronic pulmonary heart disease**

| cph | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. Interval] | |
|---|---|---|---|---|---|---|
| Zone 1 | | | | | | |
| air_pm | -0.0001019 | 0.0452979 | -0.002 | 0.998 | -0.1950031 | 0.1947992 |
| Zone 2 | | | | | | |
| air_pm | -0.0011188 | 0.0394797 | -0.028 | 0.980 | -0.170986 | 0.1687485 |
| Zone 3 | | | | | | |
| air_pm | .2969737 | .1346898 | 2.205 | 0.271 | -1.414422 | 2.008369 |
| Zone 1+2+3 | | | | | | |
| air_pm | 0.0149071 | 0.0180831 | 0.824 | 0.431 | -0.0259997 | 0.055814 |

The situation described for $SO_2$, exposure is the same when correlation is made between pulmonary heart disease and levels of $PM_{10}$ concentrations in the ambient air.

**Table 6-31. Relation between Pb concentrations in the groundwater and cerebrovascular diseases**

| cerebrov | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. Interval] | |
|---|---|---|---|---|---|---|
| Zone 1 | | | | | | |
| gw_pb | 0.5643827 | 0.5011333 | 1,126 | 0.377 | -1.59182 | 2.720585 |
| Zone 2 | | | | | | |
| gw_pb | 0.1347899 | 0.4402953 | 0.306 | 0.788 | -1.759648 | 2.029228 |
| Zone 3 | | | | | | |
| gw_pb | 1.827115 | 0.048351 | 37,789 | 0.017 | 1.212758 | 2.441473 |
| Zone 1+2+3 | | | | | | |
| gw_pb | 0.3516463 | 0.2770659 | 1,269 | 0.236 | -0.2751203 | 0.9784128 |

Cerebrovascular diseases appear positive (the effect is increased with an increase of the pollutant concentration) and not statistically significant when correlated to lead levels in groundwater in zone 1 (Campeni, Bistra, Gura Rosiei, Carpinis) and zone 2 (Abrud, Gura Cornei, Corna, Bucium) and appear positive and statistically significant when correlated to groundwater lead concentrations in zone 3 (including Rosia Montana, Tarina, Balmosesti).

**Table 6-32. Relation between As concentrations in the groundwater and cerebrovascular diseases**

| cerebrov | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Zone 1 | | | | | | |
| gw._as | 1.355544 | 2.981378 | 0.455 | 0.694 | -11.47229 | 14.18338 |
| Zone 2 | | | | | | |
| gw._as | -1.500638 | 1.026213 | -1,462 | 0.281 | -5.916078 | 2.914801 |
| Zone 3 | | | | | | |
| gw._as | 7.763033 | 3.64059 | 2,132 | 0.279 | -38.49505 | 54.02112 |
| Zone 1+2+3 | | | | | | |
| gw_as | -.5035933 | .8647404 | -0.582 | 0.575 | -2.459772 | 1.452585 |

Cerebrovascular diseases appear positive (the effect is increased with an increase of the pollutant concentration) and not statistically significant when correlated to arsenic levels in groundwater in zone 1 (Campeni, Bistra, Gura Rosiei, Carpinis) and zone 3 (including Rosia Montana, Tarina, Balmosesti), respectively and negative (the effect reduces with pollutant concentration) and not statistically significant when correlated to groundwater lead concentrations in zone 2 (Abrud, Gura Cornei, Corna, Bucium).

**Table 6-33. Relation between As concentrations in the surface water and cerebrovascular diseases**

| cerebrov | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Zone 1 | | | | | | |
| sw_as | -1.29623 | .839459 | -1.544 | 0.263 | -4.908131 | 2.315671 |
| Zone 2 | | | | | | |
| sw_as | (dropped) | | | | | |
| Zone 3 | | | | | | |
| sw_as | 10.74098 | 5.037144 | 2.132 | 0.279 | -53.262 | 74.74397 |
| Zone 1+2+3 | | | | | | |
| as_as | -.5705498 | 1.3908 | -0.410 | 0.691 | -3.716758 | 2.575659 |

In regard to cerebrovascular disease relation to arsenic concentration levels in surface waters, the linear regression model shows a not statistically significant negative correlation (the effect is reduced with an increase of the pollutant) in zone 1 (Campeni, Bistra, Gura Rosiei, Carpinis) and a positive, also not statistically significant in zone 3 (Rosia Montana, Tarina, Balmosesti), respectively.

**Table 6-34. Relation between Pb concentrations in the surface water and cerebrovascular diseases**

| cerebrov | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Zone 1 | | | | | | |
| sw_pb | -0.2327599 | 1.420739 | -0.164 | 0.885 | -6.345705 | 5.880185 |
| Zone 2 | | | | | | |
| sw_pb | -0.2362917 | 1.222517 | -0.193 | 0.865 | -5.496358 | 5.023775 |
| Zone 3 | | | | | | |
| sw_pb | 2.732277 | 1.281342 | 2,132 | 0.279 | -13.54872 | 19.01327 |
| Zone 1+2+3 | | | | | | |
| as_pb | .0178126 | .329953 | 0.054 | 0.958 | -.728593 | .7642182 |

Cerebrovascular diseases appear negative (the effect is reduced with an increase of the pollutant concentration) and not statistically significant when correlated to lead levels in surface waters in zone 1 (Campeni, Bistra, Gura Rosiei, Carpinis) and zone 2 (Abrud, Gura Cornei, Corna, Bucium) and appear positive (the effect is increased with an increase of the pollutant concentration) and not statistically significant when correlated to lead concentrations in surface water in zone 3 (including Rosia Montana, Tarina, Balmosesti).

**Table 6-35. Relation between soil Pb concentrations and cerebrovascular diseases**

| cerebrov | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. Interval] | |
|---|---|---|---|---|---|---|
| Zone 1 | | | | | | |
| soil_pb | 0.1833186 | 0.0366606 | 5,000 | 0.038 | 0.0255808 | 0.3410564 |
| Zone 2 | | | | | | |
| soil_pb | -0.1471874 | 0.0681243 | -2,161 | 0.163 | -0.4403025 | 0.1459278 |
| Zone 3 | | | | | | |
| soil_pb | -0.0395694 | 0.2394879 | -0.165 | 0.896 | -3.082552 | 3.003413 |
| Zone 1+2+3 | | | | | | |
| soil_pb | -0.0329279 | 0.062599 | -0.526 | 0.612 | -0.1745368 | 0.108681 |

Linking cerebrovascular diseases to soil lead levels in the linear regression model shows a positive correlation (the effect is increased with an increase of the pollutant concentration) of statistical significance in zone 1 (Campeni, Bistra, Gura Rosiei, Carpinis) and a not statistically significant negative correlation (the effect declines with pollutant concentration) in zone 2 (Abrud, Gura Cornei, Corna, Bucium), and in zone 3 (Rosia Montana, Tarina, Balmosesti).

**Table 6-36. Relation between soil Cd concentrations and cerebrovascular diseases**

| cerebrov | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. Interval] | |
|---|---|---|---|---|---|---|
| Zone 1 | | | | | | |
| soil_cd | -.7753569 | 1.693537 | -0.458 | 0.692 | -8.06206 | 6.511346 |
| Zone 2 | | | | | | |
| soil_cd | -1.26079 | 2.339211 | -0.539 | 0.644 | -11.3256 | 8.804024 |
| Zone 3 | | | | | | |
| soil_cd | 23.91241 | 11.21408 | 2,132 | 0.279 | -118,576 | 166.4008 |
| Zone 1+2+3 | | | | | | |
| soil_cd | -0.938268 | 1.145562 | -0.819 | 0.434 | -3.529708 | 1.653172 |

Linking cerebrovascular diseases to soil cadmium levels in the linear regression model shows a negative correlation (the effect is reduced with an increase of the pollutant concentration) of no statistical significance in zone 1 (Campeni, Bistra, Gura Rosiei, Carpinis) and zone 2 (Abrud, Gura Cornei, Corna, Bucium), respectively, and a positive (the effect increases with pollutant concentration) but not statistically significant correlation in zone 3 (Rosia Montana, Tarina, Balmosesti).

**Table 6-37. Relation between soil Hg concentrations and cerebrovascular diseases**

| cerebrov | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. Interval] | |
|---|---|---|---|---|---|---|
| Zone 1 | | | | | | |
| soil_hg | -1.772314 | 11.55622 | -0.153 | 0.892 | -51.49472 | 47.95009 |
| Zone 2 | | | | | | |
| soil_hg | -5.77246 | 50.92041 | -0.113 | 0.920 | -224.8653 | 213.3204 |
| Zone 3 | | | | | | |
| soil_hg | 69.3147 | 29.50567 | 2,349 | 0.256 | -305.5904 | 444.2198 |
| Zone 1+2+3 | | | | | | |
| soil_hg | 8.04986 | 12.04285 | 0.668 | 0.521 | -19.19295 | 35.29268 |

The situation described above foe cadmium in soil is found in linking cerebrovasclar diseases to mercury concentration levels in the soil.

**Table 6-38. Relation between soil As concentrations and cerebrovascular diseases**

| cerebrov | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Zone 1 | | | | | | |
| soil_as | -0.053358 | 0.9066898 | -0.059 | 0.958 | -3.954529 | 3.847813 |
| Zone 2 | | | | | | |
| soil_as | -0.2292766 | 1.066423 | -0.215 | 0.850 | -4.817726 | 4.359173 |
| Zone 3 | | | | | | |
| soil_as | 0.4087915 | 0.2275251 | 1,797 | 0.323 | -2.482189 | 3.299772 |
| Zone 1+2+3 | | | | | | |
| soil_as | .3496001 | .1685701 | 2.074 | 0.068 | -.031732 | .7309321 |

The same pattern is found in linking cerebrovascular diseases to arsenic concentration levels in the soil.

**Table 6-39. Relation between Pb concentrations in the groundwater and anaemias**

| anemia | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Zone 1 | | | | | | |
| gw_pb | 0.3982388 | 0.5031593 | 0.791 | 0.512 | -1.766681 | 2.563159 |
| Zone 2 | | | | | | |
| gw_pb | .051513 | .1120447 | 0.460 | 0.691 | -.4305763 | .5336023 |
| Zone 3 | | | | | | |
| gw_pb | 0.46144 | 0.231483 | 1,993 | 0.296 | -2.479831 | 3.402711 |
| Zone 1+2+3 | | | | | | |
| gw_pb | 0.1315563 | 0.1517804 | 0.867 | 0.409 | -0.2117947 | 0.4749074 |

Anaemias appear positive (the effect is increased with an increase of the pollutant concentration) and not statistically significant when correlated to lead levels in groundwater both in zone 1 (Campeni, Bistra, Gura Rosiei, Carpinis) and in zone 2 (Abrud, Gura Cornei, Corna, Bucium) and in zone 3 (including Rosia Montana, Tarina, Balmosesti).

**Table 6-40. Relation between Pb concentrations in the surface water and anaemias**

| anemia | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Zone 1 | | | | | | |
| sw_pb | -1.195321 | 0.9709515 | -1,231 | 0.343 | -5.372988 | 2.982346 |
| Zone 2 | | | | | | |
| sw_pb | -0.0274545 | 0.3221108 | -0.085 | 0.940 | -1.413386 | 1.358477 |
| Zone 3 | | | | | | |
| sw_pb | .8523771 | 1.08 | . | 0.000 | .8523769 | .8523772 |
| Zone 1+2+3 | | | | | | |
| as_pb | 0.2700775 | 0.1480877 | 1,824 | 0.101 | -0.0649202 | 0.6050752 |

Linking anaemias to lead levels in surface water in the linear regression model shows a negative correlation (the effect is reduced with an increase of the pollutant) of no statistical significance in zone 1 (Campeni, Bistra, Gura Rosiei, Carpinis) and zone 2 (Abrud, Gura Cornei, Corna, Bucium), and a positive (the effect increases with pollutant concentration) and statistically significant correlation in zone 3 (Rosia Montana, Tarina, Balmosesti).

**Table 6-41. Relation between soil Pb concentrations and anaemias**

| anemia | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Zone 1 | | | | | | |
| soil_pb | 0.1047944 | 0.0959685 | 1,092 | 0.389 | -0.3081246 | 0.5177134 |
| Zone 2 | | | | | | |
| soil_pb | -0.035588 | 0.0206169 | -1,726 | 0.226 | -0.1242952 | 0.0531192 |
| Zone 3 | | | | | | |
| soil_pb | .0186019 | .0659884 | 0.282 | 0.825 | -.8198599 | .8570638 |
| Zone 1+2+3 | | | | | | |
| soil_pb | -0.0186285 | 0.0327931 | -0.568 | 0.584 | -0.0928116 | 0.0555546 |

Linking anaemias to soil lead levels in the linear regression model shows a positive correlation (the effect is increased with an increase of the pollutant concentration) of no statistical significance in zone 1 (Campeni, Bistra, Gura Rosiei, Carpinis) and zone 3 (Rosia Montana, Tarina, Balmosesti) and a negative (the effect reduces with pollutant concentration) and not statistically significant correlation in zone 2 (Abrud, Gura Cornei, Corna, Bucium), respectively.

**Table 6-42. Relation between soil Cr concentrations and dermatitis and eczema**

| derma | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Zone 1 | | | | | | |
| soil_cr | -0.0045131 | 0.0113687 | -0.397 | 0.730 | -0.0534286 | 0.0444023 |
| Zone 2 | | | | | | |
| soil_cr | 0.0036548 | 0.0012151 | 3,008 | 0.095 | -0.0015736 | 0.0088832 |
| Zone 3 | | | | | | |
| soil_cr | 0.1451963 | 0.1496107 | 0.970 | 0.510 | -1.755788 | 2.046181 |
| Zone 1+2+3 | | | | | | |
| soil_cr | 0.0052863 | 0.0075396 | 0.701 | 0.501 | -0.0117693 | 0.022342 |

Linking dermatitis and eczema to soil chromium levels in the linear regression model shows a negative correlation (the effect is reduced with an increase of the pollutant concentration) of no statistical significance in zone 1 (Campeni, Bistra, Gura Rosiei, Carpinis) and a positive (the effect increases with pollutant concentration) but not statistically significant correlation in zone 2 (Abrud, Gura Cornei, Corna, Bucium), and in zone 3 (Rosia Montana, Tarina, Balmosesti).

**Table 6-43. Relation between soil Cr concentrations and thyroid disorders**

| thyroid | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Zone 1 | | | | | | |
| soil_cr | -0.0180766 | 0.0263747 | -0.685 | 0.564 | -0.1315577 | 0.0954045 |
| Zone 2 | | | | | | |
| soil_cr | 0.012863 | 0.0042767 | 3,008 | 0.095 | -0.0055382 | 0.0312642 |
| Zone 3 | | | | | | |
| soil_cr | 0.248908 | 0.2564755 | 0.970 | 0.510 | -3.009922 | 3.507738 |
| Zone 1+2+3 | | | | | | |
| soil_cr | 0.00523 | 0.0143703 | 0.364 | 0.724 | -0.0272779 | 0.0377379 |

The pattern described for anaemias above is found in linking thyroid disorders to chromium concentration levels in the soil.

**Table 6-44. Relation between soil Cr concentrations and diabetes mellitus**

| dm | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Zone 1 | | | | | | |
| soil_cr | 0.1101588 | 0.042561 | 2,588 | 0.122 | -0.0729663 | 0.293284 |
| Zone 2 | | | | | | |
| soil_cr | -0.0239421 | 0.0665079 | -0.360 | 0.753 | -0.3101023 | 0.2622182 |
| Zone 3 | | | | | | |
| soil_cr | 0.2903926 | 0.2992214 | 0.970 | 0.510 | -3.511576 | 4.092361 |
| Zone 1+2+3 | | | | | | |
| soil_cr | 0.009648 | 0.0345859 | 0.279 | 0.787 | -0.0685908 | 0.0878868 |

Diabetes mellitus appears positive (the effect is increased with an increase of the pollutant concentration) and not statistically significant when correlated to chromium levels in soil in both zone 1 (Campeni, Bistra, Gura Rosiei, Carpinis) and zone 3 (including Rosia Montana, Tarina, Balmosesti) and negative (the effect reduces with pollutant concentration) and not statistically significant when correlated to groundwater arsenic concentrations in groundwater in zone 2 (Abrud, Gura Cornei, Corna, Bucium).

**Table 6-45. Relation between soil Cd concentrations and osteoporosis**

| osteopor | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Zone 1 | | | | | | |
| soil_cd | -0.0510538 | 0.3980681 | -0.128 | 0.910 | -1.763803 | 1.661695 |
| Zone 2 | | | | | | |
| soil_cd | -1.696049 | 3.16902 | -0.535 | 0.646 | -15.33124 | 11.93915 |
| Zone 3 | | | | | | |
| soil_cd | 5.321168 | 9.42 | . | 0.000 | 5.321167 | 5.321169 |
| Zone 1+2+3 | | | | | | |
| soil_cd | -0.8260982 | 1.040569 | -0.794 | 0.448 | -3.180029 | 1.527832 |

Linking osteoporosis to soil cadmium levels in the linear regression model shows a negative correlation (the effect is reduced with an increase of the pollutant concentration) of no statistical significance in zone 1 (Campeni, Bistra, Gura Rosiei, Carpinis) and zone 2 (Abrud, Gura Cornei, Corna, Bucium), and a positive (the effect increases with pollutant concentration) and statistically significant correlation in zone 3 (Rosia Montana, Tarina, Balmosesti).

**Table 6-46. Relation between Pb concentrations in the groundwater and osteoporosis**

| osteopor | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Zone 1 | | | | | | |
| gw_pb | 0.1794161 | 0.0678007 | 2,646 | 0.118 | -0.1123066 | 0.4711388 |
| Zone 2 | | | | | | |
| gw_pb | 0.1055286 | 0.6051758 | 0.174 | 0.878 | -2.498333 | 2.70939 |
| Zone 3 | | | | | | |
| gw_pb | 0.3291485 | 0.1651185 | 1,993 | 0.296 | -1.768881 | 2.427178 |
| Zone 1+2+3 | | | | | | |
| gw_pb | 0.1746403 | 0.266408 | 0.656 | 0.529 | -0.4280166 | 0.7772972 |

Linking osteoporosis to Pb concentration levels in groundwater in the linear regression model shows a positive correlation (the effect increases with an increase of the pollutant) not statistically significant in all three zones.

**Table 6-47. Relation between soil Pb concentrations and osteoporosis**

| osteopor | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Zone 1 | | | | | | |
| soil_pb | 0.0339834 | 0.0183716 | 1,850 | 0.206 | -0.0450632 | 0.11303 |
| Zone 2 | | | | | | |
| soil_pb | -0.2132812 | 0.0748531 | -2,849 | 0.104 | -0.5353481 | 0.1087856 |
| Zone 3 | | | | | | |
| soil_pb | 0.0132689 | 0.04707 | 0.282 | 0.825 | -0.584812 | 0.6113498 |
| Zone 1+2+3 | | | | | | |
| soil_pb | -0.0735769 | 0.0521265 | -1,412 | 0.192 | -0.1914952 | 0.0443414 |

Osteoporosis appears positive (the effect is increased with an increase of the pollutant concentration) and not statistically significant when correlated to lead levels in soil in both zone 1 (Campeni, Bistra, Gura Rosiei, Carpinis) and zone 3 (including Rosia Montana, Tarina, Balmosesti) and negative (the effect reduces with pollutant concentration) and not statistically significant when correlated to groundwater lead concentrations in soil in zone 2 (Abrud, Gura Cornei, Corna, Bucium).

**Table 6-48. Relation between Pb concentrations in the groundwater and urolithiasis**

| urolithi | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Zone 1 | | | | | | |
| gw_pb | -0.082522 | 0.2209792 | -0.373 | 0.745 | -1.033319 | 0.8682747 |
| Zone 2 | | | | | | |
| gw_pb | 0.1739772 | 0.178093 | 0.977 | 0.432 | -0.5922953 | 0.9402497 |
| Zone 3 | | | | | | |
| gw_pb | 0.2961885 | 0.148584 | 1,993 | 0.296 | -1.59175 | 2.184128 |
| Zone 1+2+3 | | | | | | |
| gw_pb | 0.1716333 | 0.1059022 | 1,621 | 0.140 | -0.0679341 | 0.4112007 |

Urolithiasis appears negative (the effect is reduced with an increase of the pollutant concentration) and not statistically significant when correlated to lead levels in groundwater in zone 1 (Campeni, Bistra, Gura Rosiei, Carpinis) and positive (the effect increases with pollutant concentration) but not statistically significant when correlated to groundwater lead concentrations in zone 2 (Abrud, Gura Cornei, Corna, Bucium) and zone 3 (including Rosia Montana, Tarina, Balmosesti), respectively.

**Table 6-49. Relation between soil Cd concentrations and urolithiasis**

| urolithi | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Zone 1 | | | | | | |
| soil_cd | 0.2747268 | 0.6046312 | 0.454 | 0.694 | -2.326791 | 2.876245 |
| Zone 2 | | | | | | |
| soil_cd | 0.4545308 | 1.159058 | 0.392 | 0.733 | -4.532495 | 5.441556 |
| Zone 3 | | | | | | |
| soil_cd | 4.788321 | 6.66 | . | 0.000 | 4.788321 | 4.788322 |
| Zone 1+2+3 | | | | | | |
| soil_cd | .235493 | .4685902 | 0.503 | 0.627 | -.8245317 | 1.295518 |

Linking urolithiasis to soil cadmium levels in the linear regression model shows a positive (the effect increases with pollutant concentration) correlation of no statistical significance in zone 1 (Campeni, Bistra, Gura Rosiei, Carpinis) and zone 2 (Abrud, Gura Cornei, Corna, Bucium), and a positive and statistically significant correlation in zone 3 (Rosia Montana, Tarina, Balmosesti).

**Table 6-50. Relation between soil Hg concentrations and polyneuropathy**

| polineur | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Zone 1 | | | | | | |
| soil_hg | -1.755703 | 3.954763 | -0.444 | 0.700 | -18.77168 | 15.26027 |
| Zone 2 | | | | | | |
| soil_hg | 19.22817 | 20.43137 | 0.941 | 0.446 | -68.68092 | 107.1373 |
| Zone 3 | | | | | | |
| soil_hg | 3.016905 | 0.1088634 | 27,713 | 0.023 | 1.633664 | 4.400146 |
| Zone 1+2+3 | | | | | | |
| soil_hg | - 0.6339256 | 4.964371 | -0.128 | 0.901 | -11.86411 | 10.59626 |

Linking polyneuropathy to soil mercury levels in the linear regression model shows a negative correlation (the effect is reduced with an increase of the pollutant concentration) of no statistical significance in zone 1 (Campeni, Bistra, Gura Rosiei, Carpinis) and a positive (the effect increases with pollutant concentration) not statistically significant correlation in zone 2 (Abrud, Gura Cornei, Corna, Bucium), and a statistically significant positive correlation in zone 3 (Rosia Montana, Tarina, Balmosesti).

### Cyanides

**Table 6-51. Relation between soil cyanide concentrations and ischaemic heart disease**

| cih | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Zone 1 | | | | | | |
| cn | -6.810794 | 7.767046 | -0.877 | 0.414 | -25.81607 | 12.19448 |
| Zone 2 | | | | | | |
| cn | -33.13134 | 30.27604 | -1,094 | 0.316 | -107.2141 | 40.95146 |
| Zone 3 | | | | | | |
| cn | 42.79727 | 98.83605 | 0.433 | 0.707 | -382.4599 | 468.0545 |
| Zone 1+2+3 | | | | | | |
| cn | -12.24918 | 15.23168 | -0.804 | 0.432 | -44.24975 | 19.75139 |

Linking ischaemic heart disease to soil cyanide levels in the linear regression model shows a negative correlation (the effect is reduced with an increase of the pollutant concentration) of no statistical significance in zone 1 (including Campeni, Bistra, Gura Rosiei, Carpinis) and zone 2 (including Abrud, Gura Cornei, Corna, Bucium), respectively, and a positive (the effect increases with pollutant concentration) not statistically significant correlation in zone 3 (including Rosia Montana, Tarina, Balmosesti).

**Table 6-52. Relation between soil cyanide concentrations and hypertension**

| hta | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Zone 1 | | | | | | |
| cn | 0.1418692 | 22.27007 | 0.006 | 0.995 | -54.35103 | 54.63477 |
| Zone 2 | | | | | | |
| cn | -56,921 | 52.07147 | -1,093 | 0.316 | -184.3353 | 70.49331 |
| Zone 3 | | | | | | |
| cn | 197.9811 | 457.2176 | 0.433 | 0.707 | -1769.268 | 2165.23 |
| Zone 1+2+3 | | | | | | |
| cn | -31.28005 | 43.60568 | -0.717 | 0.482 | -122.8922 | 60.33209 |

Hypertension appears positive (the effect is increased with an increase of the pollutant concentration) and not statistically significant when correlated to cyanide concentrations in soil in zone 1 (Campeni, Bistra, Gura Rosiei, Carpinis) and zone 3 (including Rosia Montana, Tarina, Balmosesti) and negative (the effect reduces with pollutant concentration) and not statistically significant when correlated to soil levels of cyanide in zone 2 (Abrud, Gura Cornei, Corna, Bucium).

**Table 6-53. Relation between soil cyanide concentrations and cerebrovascular diseases**

| cerebrov | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Zone 1 | | | | | | |
| cn | -1.094638 | 3.637433 | -0.301 | 0.774 | -9.995117 | 7.805841 |
| Zone 2 | | | | | | |
| cn | -5.486782 | 5.346608 | -1,026 | 0.344 | -18.56946 | 7.595897 |
| Zone 3 | | | | | | |
| cn | 17.83981 | 41.19928 | 0.433 | 0.707 | -159.4264 | 195,106 |
| Zone 1+2+3 | | | | | | |
| cn | -2.943259 | 3.873669 | -0.760 | 0.457 | -11.08154 | 5.195018 |

Linking cerebrovascular diseases to soil cyanide concentration levels in the linear regression model shows a negative correlation (the effect is reduced with an increase of the pollutant concentration) of no statistical significance in zone 1 (Campeni, Bistra, Gura Rosiei, Carpinis) and zone 2 (Abrud, Gura Cornei, Corna, Bucium), respectively, and a positive (the effect increases with pollutant concentration) and not statistically significant correlation in zone 3 (Rosia Montana, Tarina, Balmosesti).

**Table 6-54. Relation between soil cyanide concentrations and anaemias**

| anemia | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Zone 1 | | | | | | |
| cn | 0.8270445 | 3.713727 | 0.223 | 0.831 | -8.260117 | 9.914206 |
| Zone 2 | | | | | | |
| cn | -1.328086 | 1.331636 | -0.997 | 0.357 | -4.586482 | 1.93031 |
| Zone 3 | | | | | | |
| cn | 4.378476 | 10.11166 | 0.433 | 0.707 | -39.12847 | 47.88542 |
| Zone 1+2+3 | | | | | | |
| cn | -0.8872761 | 1.873972 | -0.473 | 0.642 | -4.824346 | 3.049794 |

Anaemias appear positive (the effect is increased with an increase of the pollutant concentration) and not statistically significant when correlated to cyanide concentrations in soil in zone 1 (Campeni, Bistra, Gura Rosiei, Carpinis) and zone 3 (including Rosia Montana, Tarina, Balmosesti) and negative (the effect reduces with pollutant concentration) and not statistically significant when correlated to soil levels of cyanide in zone 2 (Abrud, Gura Cornei, Corna, Bucium).

**Table 6-55. Relation between soil cyanide concentrations and polyneuropathies**

| polineur | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Zone 1 | | | | | | |
| cn | -.1181572 | .1947317 | -0.607 | 0.566 | -.5946485 | .3583341 |
| Zone 2 | | | | | | |
| cn | 0 | . | . | . | . | . |
| Zone 3 | | | | | | |
| cn | 0.6218231 | 1.436039 | 0.433 | 0.707 | -5.556953 | 6.800599 |
| Zone 1+2+3 | | | | | | |
| cn | -0.1347306 | 0.1528035 | -0.882 | 0.390 | -0.455759 | 0.1862977 |

Linking polyneuropathies to soil cyanide levels in the linear regression model shows a negative correlation (the effect is reduced with an increase of the pollutant concentration) of no statistical significance in zone 1 (Campeni, Bistra, Gura Rosiei, Carpinis) and zone 2 (Abrud, Gura Cornei, Corna, Bucium), and a positive (the effect increases with pollutant concentration) and not statistically significant correlation in zone 3 (Rosia Montana, Tarina, Balmosesti).

**Table 6-56. Relation between soil cyanide concentrations and liver diseases**

| liv. dis | Coef. | Std. Err. | t | P>\|t\| | [95% Conf. | Interval] |
|---|---|---|---|---|---|---|
| Zone 1 | | | | | | |
| cn | 1.814515 | 1.499162 | 1,210 | 0.272 | -1.853801 | 5.482832 |
| Zone 2 | | | | | | |
| cn | -8.274552 | 7.558662 | -1,095 | 0.316 | -26.76993 | 10.22083 |
| Zone 3 | | | | | | |
| cn | 1.560986 | 3.604943 | 0.433 | 0.707 | -13.94983 | 17.0718 |
| Zone 1+2+3 | | | | | | |
| cn | -.919318 | 3.400773 | -0.270 | 0.790 | -8.064076 | 6.22544 |

Liver diseases appear positive (the effect is increased with an increase of the pollutant concentration) and not statistically significant when correlated to cyanide concentrations in soil in zone 1 (Campeni, Bistra, Gura Rosiei, Carpinis) and zone 3 (including Rosia Montana, Tarina, Balmosesti) and negative (the effect reduces with pollutant concentration) and not statistically significant when correlated to soil levels of cyanide in zone 2 (Abrud, Gura Cornei, Corna, Bucium).

## 6.3 Baseline Prevalence and Predicted Prevalence Respectively for Year 9 of Operation (2018) and Year 14 Of Operation (2023), respectively, for Various Diseases in the Case of Exposure to Diverse Environmental Pollutants, in the Three Areas (Zone 1 – Campeni, Bistra, Gura Rosiei, Carpinis; Zone 2 – Abrud, Gura Cornei, Corna, Bucium; Zone 3 – Rosia Montana)

**Table 6-57. Prevalence of asthma in relation to the hazardous substances investigated (sulphur dioxide, breathable particles, chromium in soil) in the three zones**

| Pathology | Zone | Baseline prevalence | Year 9 prevalence | Year 14 prevalence |
|---|---|---|---|---|
| Prevalence of asthma in relation to the hazardous substances investigated (sulphur dioxide, breathable particles, chromium in soil) in the three zones | 1 | 0.44 | 0.27 | 0.27 |
| | 2 | 0.75 | 0.26 | 0.26 |
| | 3 | 0.51 | 0.26 | 0.26 |

**Figure 6.1. Prevalence of asthma in relation to the hazardous substances investigated (sulphur dioxide, breathable particles, chromium in soil) in the three zones**

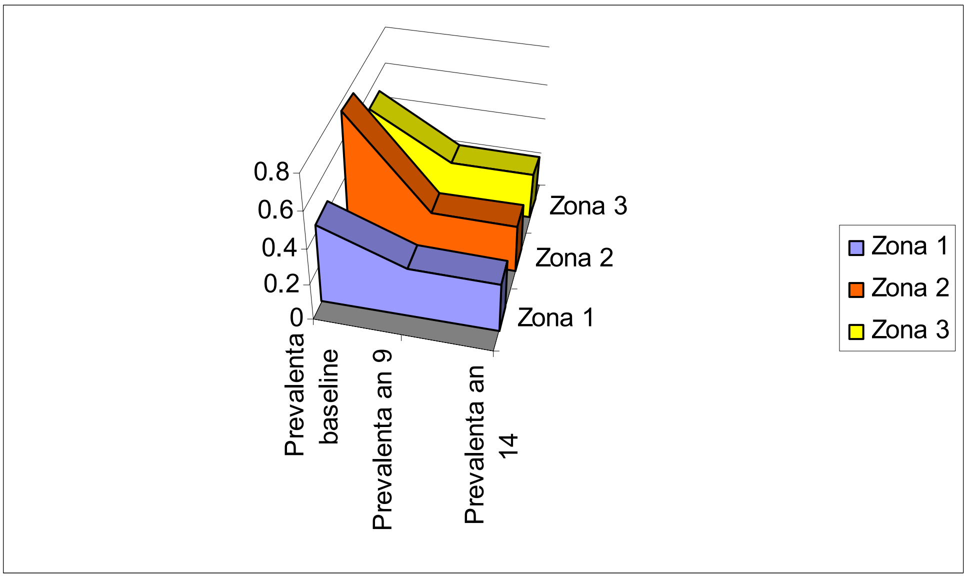


**Table 6-58. Prevalence of hypertension in relation to the hazardous substances investigated (lead in groundwater, mercury, arsenic in the soil, breathable particles) in the three zones**

| Pathology | Zone | Baseline prevalence | Year 9 prevalence | Year 14 prevalence |
|---|---|---|---|---|
| Prevalence of hypertension in relation to the hazardous substances investigated (lead in groundwater, mercury, arsenic in the soil, breathable particles) in the three zones | 1 | 13.16 | 9.80 | 9.80 |
| | 2 | 19.44 | 12.74 | 12.74 |
| | 3 | 24.06 | 18.60 | 18.60 |

**Figure 6.2. Prevalence of hypertension in relation to the hazardous substances investigated (lead in groundwater, mercury, arsenic in the soil, breathable particles) in the three zones**

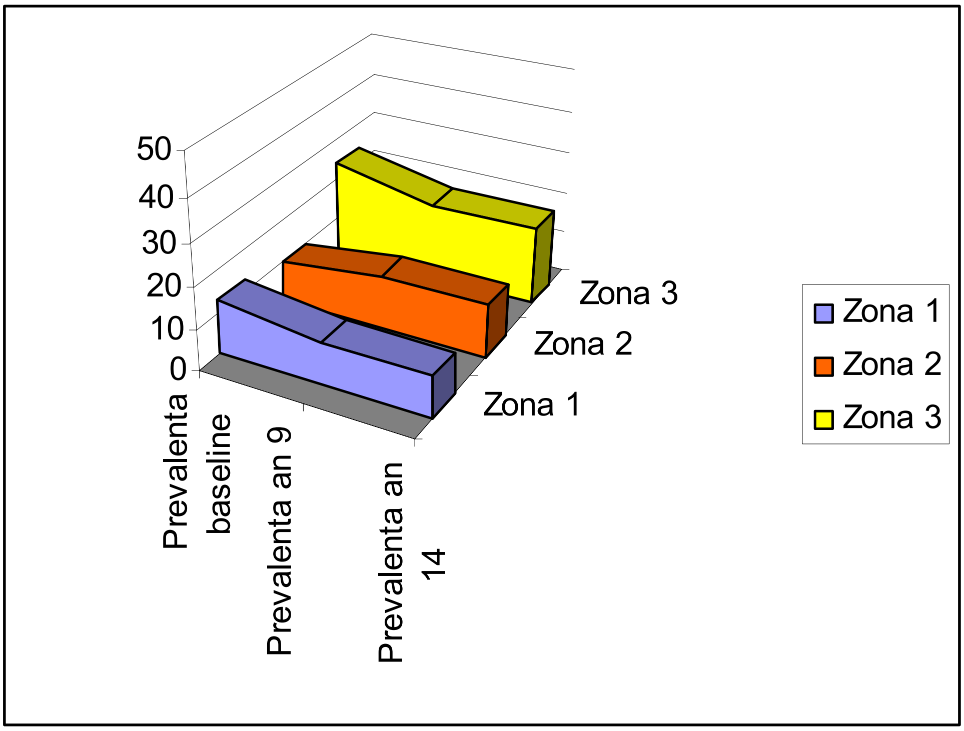


**Table 6-59. Prevalence of ischaemic heart disease in relation to the hazardous substances investigated (lead in groundwater, mercury, arsenic in the soil) in the three zones**

| Pathology | Zone | Baseline prevalence | Year 9 prevalence | Year 14 prevalence |
|---|---|---|---|---|
| Prevalence of ischaemic heart disease in relation to the hazardous substances investigated (lead in groundwater, mercury, arsenic in the soil) in the three zones | 1 | 4.72 | 4.15 | 4.15 |
| | 2 | 11.66 | 4.97 | 4.97 |
| | 3 | 10.95 | 4.96 | 4.96 |

**Figure 6.3. Prevalence of ischaemic heart disease in relation to the hazardous substances investigated (lead in groundwater, mercury, arsenic in the soil) in the three zones**

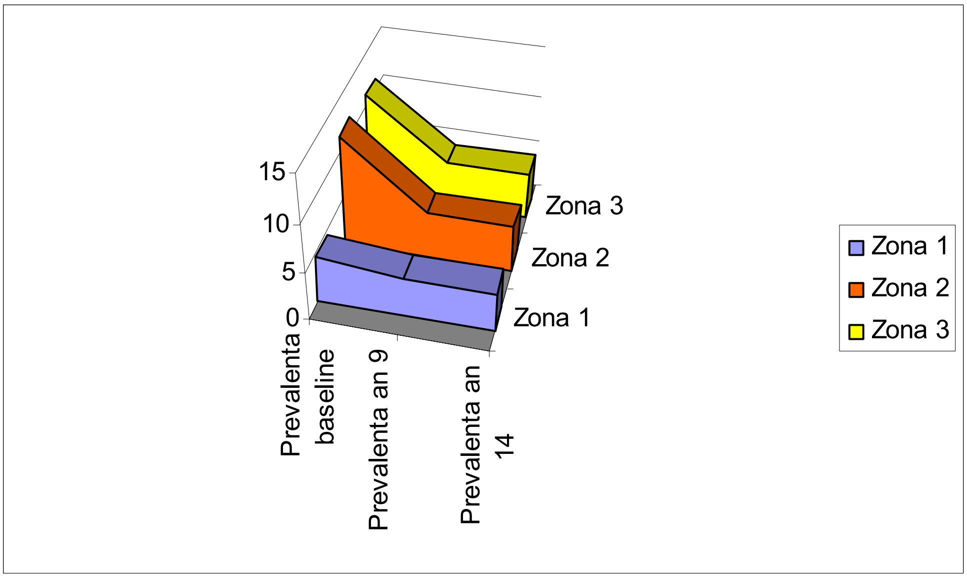


**Table 6-60. Prevalence of cerebrovascular diseases in relation to the hazardous substances investigated (lead in groundwater and surface water, mercury, arsenic in the soil) in the three zones**

| Pathology | Zone | Baseline prevalence | Year 9 prevalence | Year 14 prevalence |
|---|---|---|---|---|
| Prevalence of cerebrovascular diseases in relation to the hazardous substances investigated (lead in groundwater and surface waters, mercury, arsenic in the soil) in the three zones | 1 | 1.83 | 1.30 | 1.30 |
| | 2 | 2.43 | 1.54 | 1.54 |
| | 3 | 4.16 | 1.70 | 1.70 |

**Figure 6.4. Prevalence of cerebrovascular diseases in relation to the hazardous substances investigated (lead in groundwater and surface water, mercury, arsenic in the soil) in the three zones**

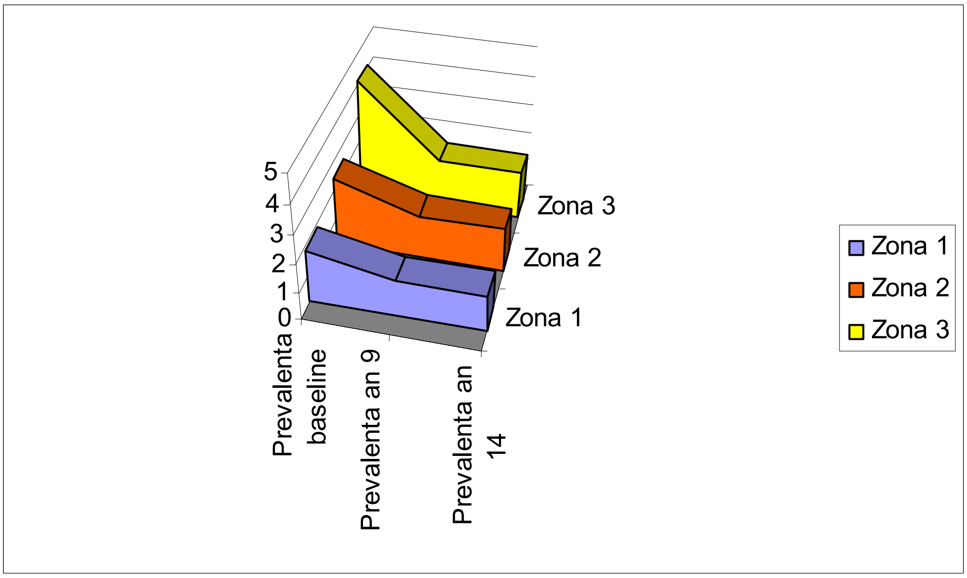


**Table 6-61. Prevalence of aneamias in relation to the hazardous substances investigated (lead in groundwater, lead in the soil) in the three zones**

| Pathology | Zone | Baseline prevalence | Year 9 prevalence | Year 14 prevalence |
|---|---|---|---|---|
| Prevalence of anaemias in relation to the hazardous substances investigated (lead in groundwater, lead in the soil) | 1 | 1.44 | 0.65 | 0.65 |
| | 2 | 0.62 | 0.75 | 0.75 |
| | 3 | 1.02 | 0.30 | 0.30 |

**Figure 6.5. Prevalence of aneamias in relation to the hazardous substances investigated (lead in groundwater, lead in the soil) in the three zones**

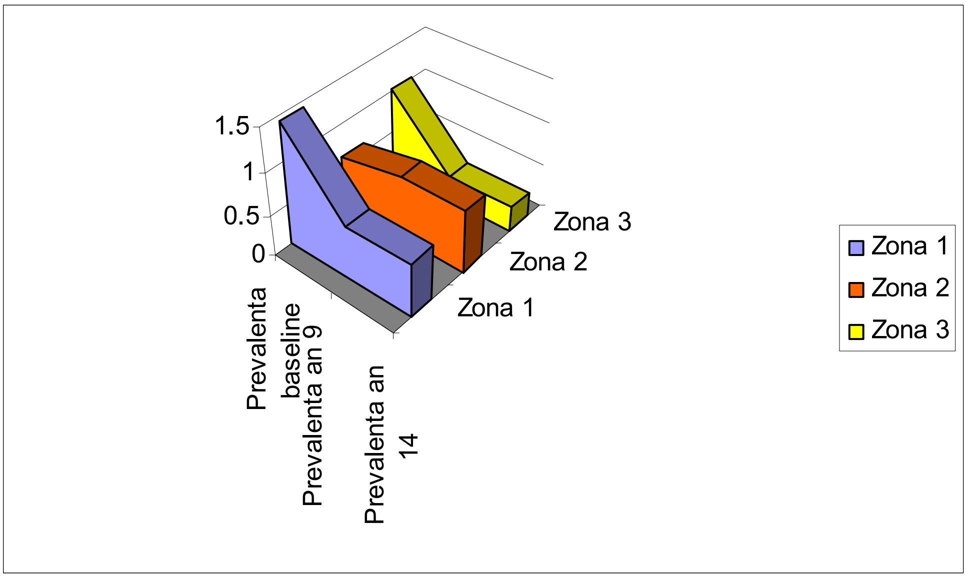


**Table 6-62. Prevalence of dermatitis and eczema in relation to the hazardous substances investigated (chromium in soil) in the three zones**

| Pathology | Zone | Baseline prevalence | Year 9 prevalence | Year 14 prevalence |
|---|---|---|---|---|
| Prevalence of dermatitis and eczema in relation to the hazardous substances investigated (chromium in soil) | 1 | 0.26 | 0.08 | 0.08 |
| | 2 | 0.06 | 0.17 | 0.17 |
| | 3 | 1.02 | 0.22 | 0.22 |

**Figure 6.6. Prevalence of dermatitis and eczema in relation to the hazardous substances investigated (chromium in soil) in the three zones**

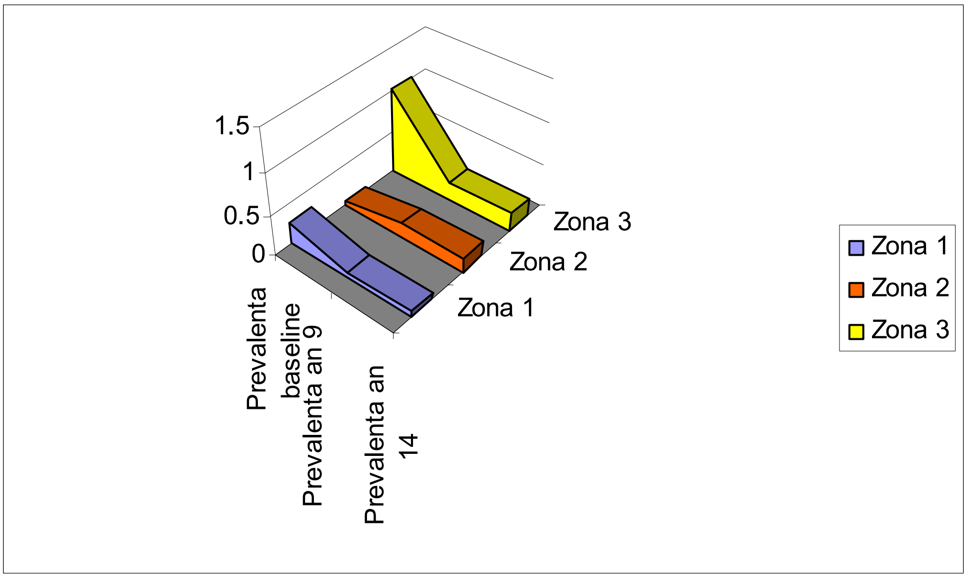


**Table 6-63. Prevalence of diabetes mellitus in relation to the hazardous substances investigated (chromium in soil) in the three zones**

| Pathology | Zone | Baseline prevalence | Year 9 prevalence | Year 14 prevalence |
|---|---|---|---|---|
| Prevalence of diabetes mellitus in relation to the hazardous substances investigated (chromium in soil) | 1 | 1.48 | 1.13 | 1.13 |
| | 2 | 2.16 | 1.29 | 1.29 |
| | 3 | 2.04 | 1.38 | 1.38 |

**Figure 6.7. Prevalence of diabetes mellitus in relation to the hazardous substances investigated (chromium in soil) in the three zones**

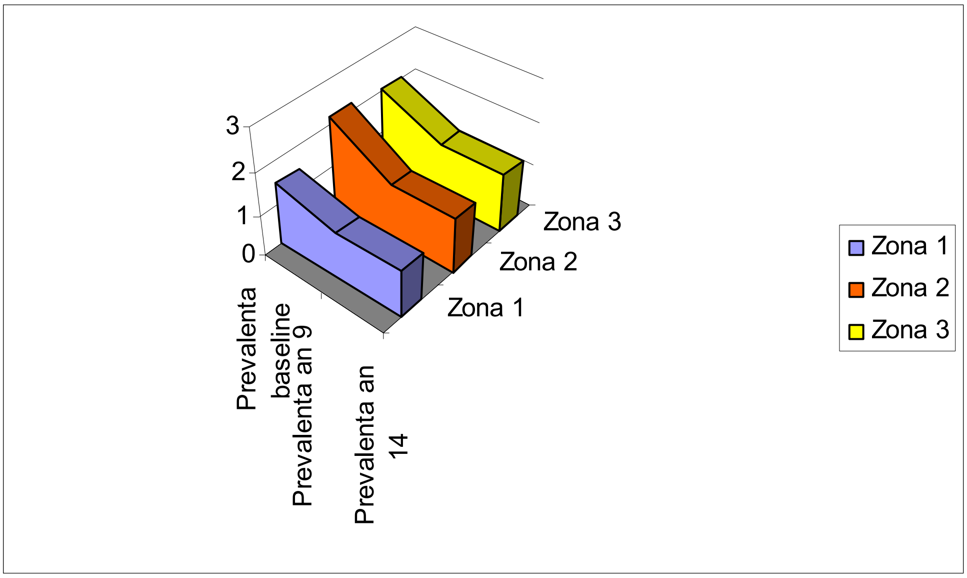


**Table 6-64. Prevalence of urolithiasis in relation to the hazardous substances investigated (cadmium in soil) in the three zones**

| Pathology | Zone | Baseline prevalence | Year 9 prevalence | Year 14 prevalence |
|---|---|---|---|---|
| Prevalence of urilithiasis in relation to the hazardous substances investigated (cadmium in soil) | 1 | 0.56 | 0.54 | 0.54 |
| | 2 | 1.11 | 0.44 | 0.44 |
| | 3 | 0.65 | 0.42 | 0.42 |

**Figure 6.8. Prevalence of urolithiasis in relation to the hazardous substances investigated (cadmium in soil) in the three zones**

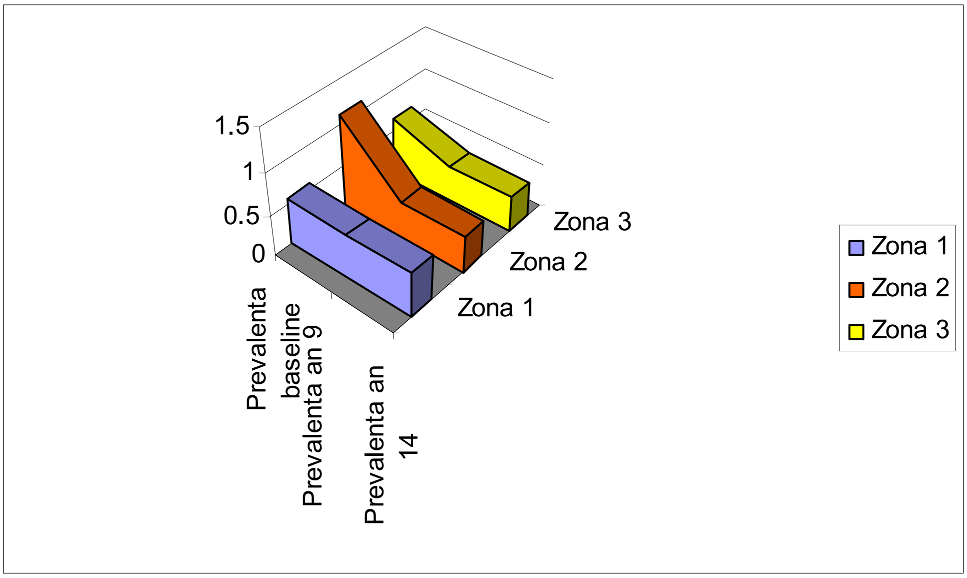
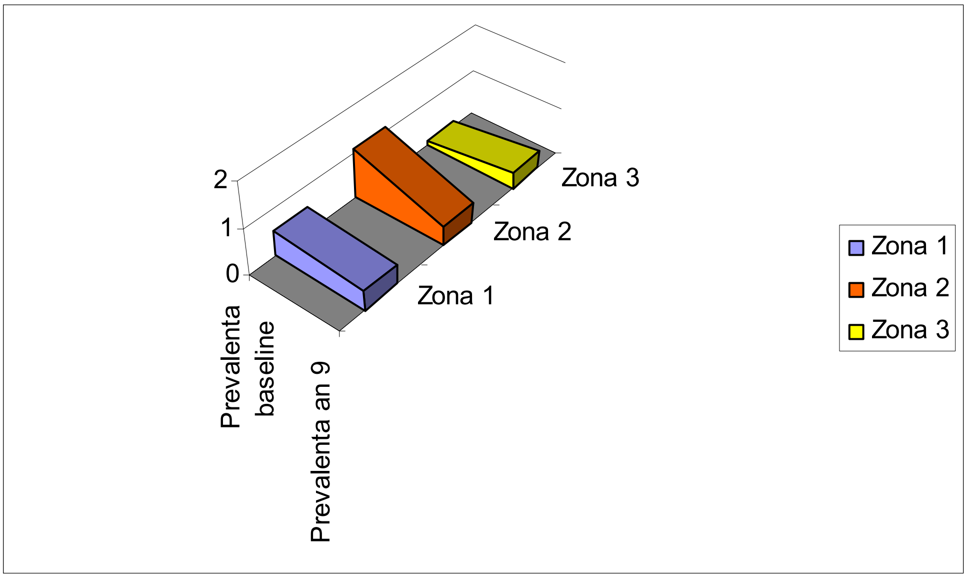


**Table 6-65. Prevalence of polyneuropathy in relation to the hazardous substances investigated (mercury in soil) in the three zones**

| Pathology | Zone | Baseline prevalence | Year 9 prevalence | Year 14 prevalence |
|---|---|---|---|---|
| Prevalence of polyneuropathy in relation to the hazardous substances investigated (mercury in soil) | 1 | 0.56 | 0.43 | |
| | 2 | 1.11 | 0.42 | |
| | 3 | 0.14 | 0.38 | |

**Figure 6.9. Prevalence of polyneuropathy in relation to the hazardous substances investigated (mercury in soil) in the three zones**



## 6.4 Baseline Prevalence and Predicted Prevalence Respectively for Year 9 of Operation (2018) and Year 14 of Operation (2023), Respectively, for Various Diseases in the Case of Exposure to Diverse Environmental Pollutants, in Rosia Montana (Historic Area)

**Table 6-66. Prevalence of asthma in relation to the hazardous substances investigated (sulphur dioxide, breathable particles, chromium in soil) in Rosia Montana (historic area)**

| Pathology | Baseline prevalence | Year 9 prevalence | Year 14 prevalence |
|---|---|---|---|
| Prevalence of asthma in relation to the hazardous substances investigated (chromium in soil) | 0.51 | 0.33 | 0.33 |

**Figure 6.10. Prevalence of asthma in relation to the hazardous substances investigated (sulphur dioxide, breathable particles, chromium in soil) in Rosia Montana (historic area)**

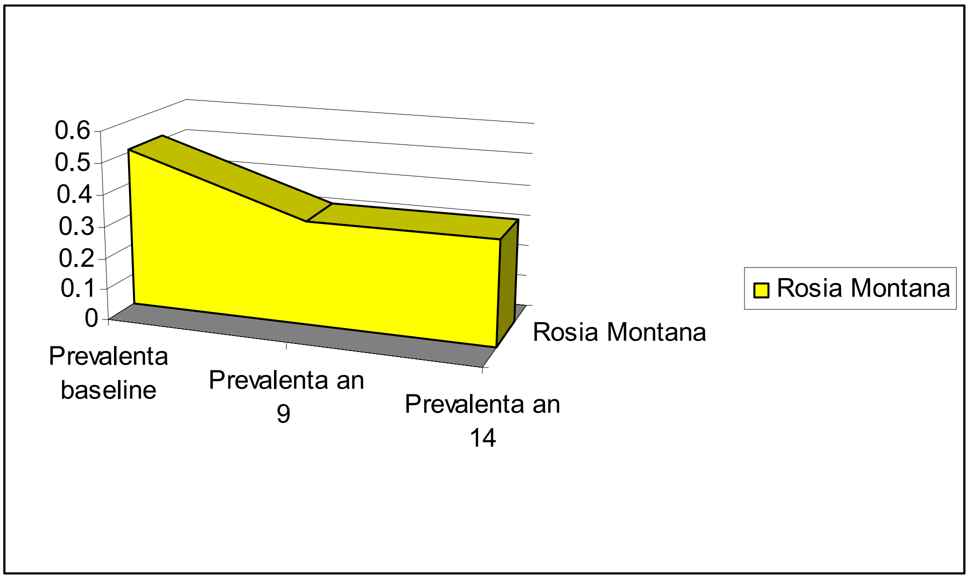


**Table 6-67. Prevalence of hypertension in relation to the hazardous substances investigated (lead, cadmium, mercury, arsenic in soil) in Rosia Montana (historic area)**

| Pathology | Baseline prevalence | Year 9 prevalence | Year 14 prevalence |
|---|---|---|---|
| Prevalence of AH in relation to the hazardous substances investigated (lead, cadmium, mercury, arsenic in soil) | 24.06 | 20.72 | 20.72 |

**Figure 6.11. Prevalence of hypertension in relation to the hazardous substances investigated (lead, cadmium, mercury, arsenic in soil) in Rosia Montana (historic area)**

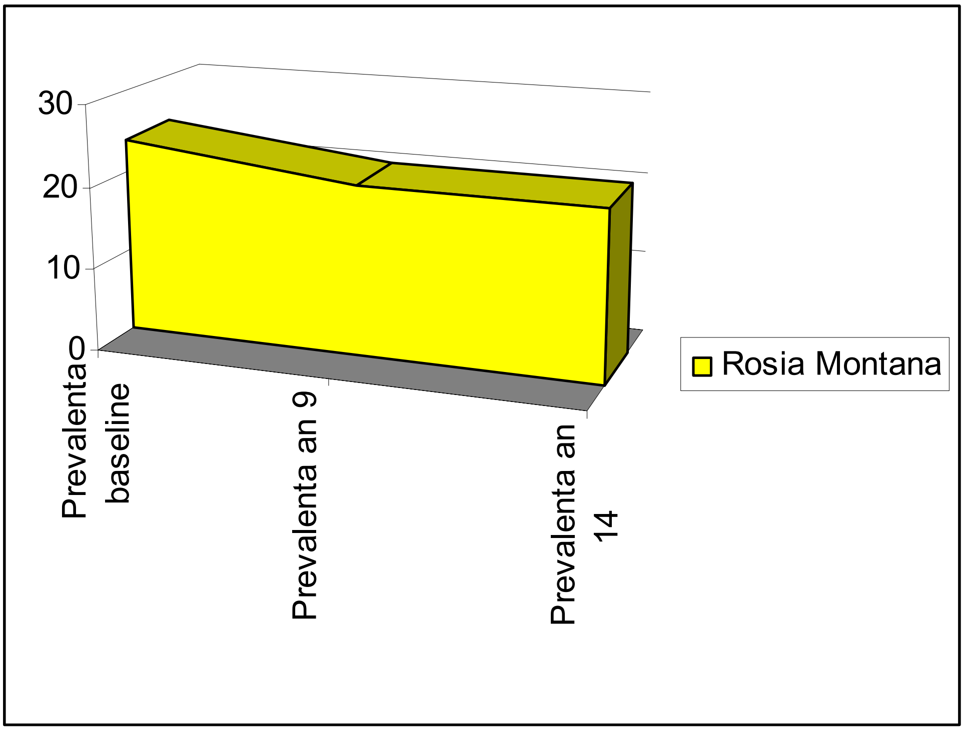


**Table 6-68. Prevalence of ischaemic heart disease in relation to the hazardous substances investigated (lead, cadmium, mercury, chromium arsenic in soil) in Rosia Montana (historic area)**

| Pathology | Baseline prevalence | Year 9 prevalence | Year 14 prevalence |
|---|---|---|---|
| Prevalence of ischaemic heart disease in relation to the hazardous substances investigated (lead, cadmium, mercury, chromium, arsenic in soil) | 10.95 | 9.09 | 9.09 |

**Figure 6.12. Prevalence of ischaemic heart disease in relation to the hazardous substances investigated (lead, cadmium, mercury, chromium arsenic in soil) in Rosia Montana (historic area)**

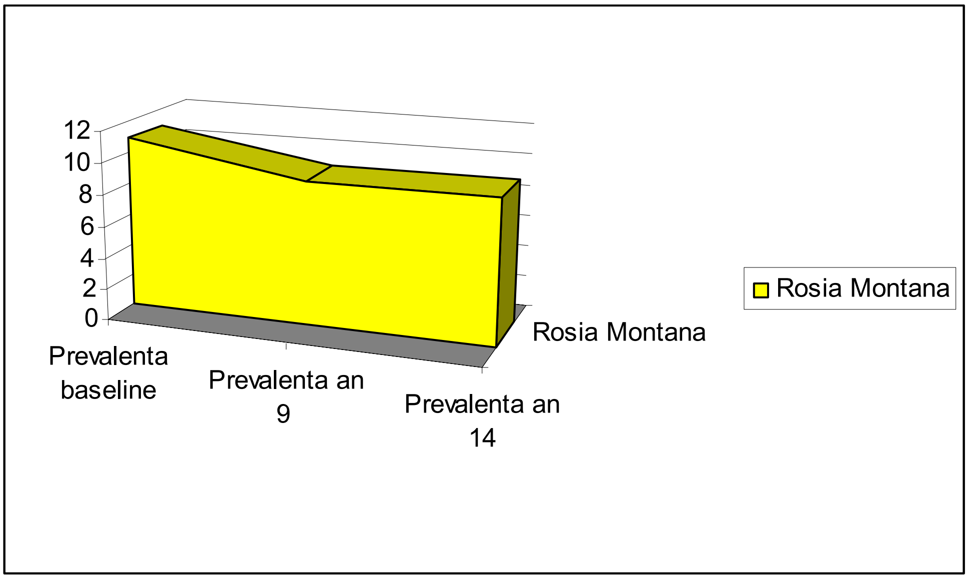


**Table 6-69. Prevalence of cerebrovascular diseases in relation to the hazardous substances investigated (cadmium, mercury, arsenic in soil) in Rosia Montana (historic area)**

| Pathology | Baseline prevalence | Year 9 prevalence | Year 14 prevalence |
|---|---|---|---|
| Prevalence of cerebrovascular diseases in relation to the hazardous substances investigated (cadmium, mercury, arsenic in soil) | 4.16 | 4.17 | 4.17 |

**Figure 6.13. Prevalence of cerebrovascular diseases in relation to the hazardous substances investigated (cadmium, mercury, arsenic in soil) in Rosia Montana (historic area)**

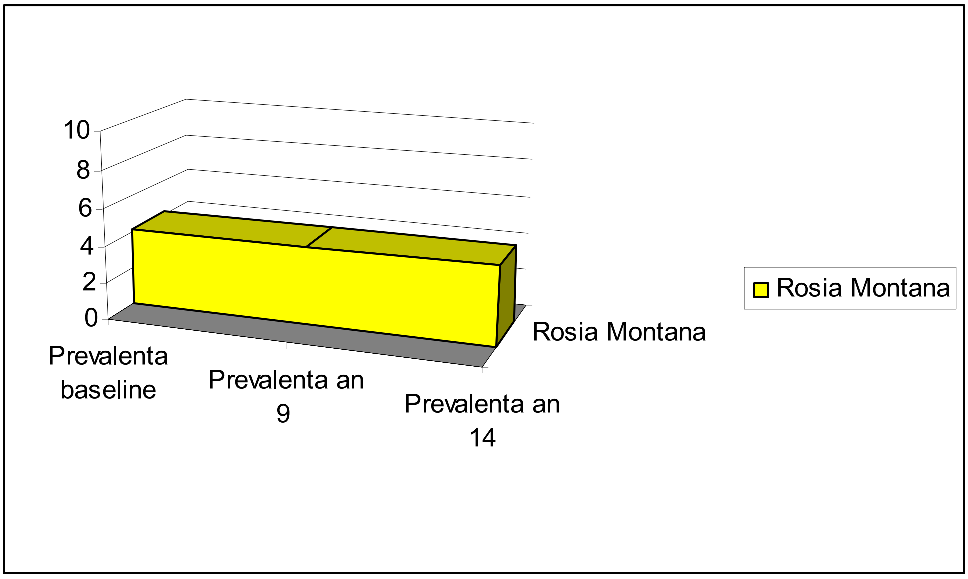


**Table 6-70. Prevalence of anaemia in relation to the hazardous substances investigated (lead in soil) in Rosia Montana (historic area)**

| Pathology | Baseline prevalence | Year 9 prevalence | Year 14 prevalence |
|---|---|---|---|
| Prevalence of anaemias in relation to the hazardous substances investigated (lead in soil) | 1.02 | 0.39 | 0.39 |

**Figure 6.14. Prevalence of anaemia in relation to the hazardous substances investigated (lead in soil) in Rosia Montana (historic area)**

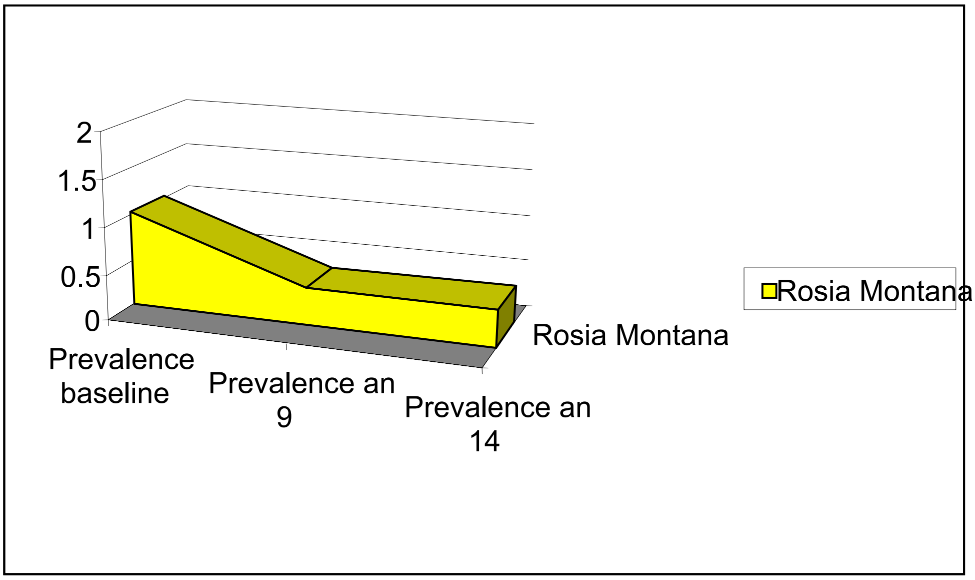


**Table 6-71. Prevalence of dermatitis and eczema in relation to the hazardous substances investigated (chromium in soil) in Rosia Montana (historic area)**

| Pathology | Baseline prevalence | Year 9 prevalence | Year 14 prevalence |
|---|---|---|---|
| Prevalence of dermatitis and eczema in relation to the hazardous substances investigated (chromium in soil) | 1.02 | 0.67 | 0.67 |

**Figure 6.15. Prevalence of dermatitis and eczema in relation to the hazardous substances investigated (chromium in soil) in Rosia Montana (historic area)**

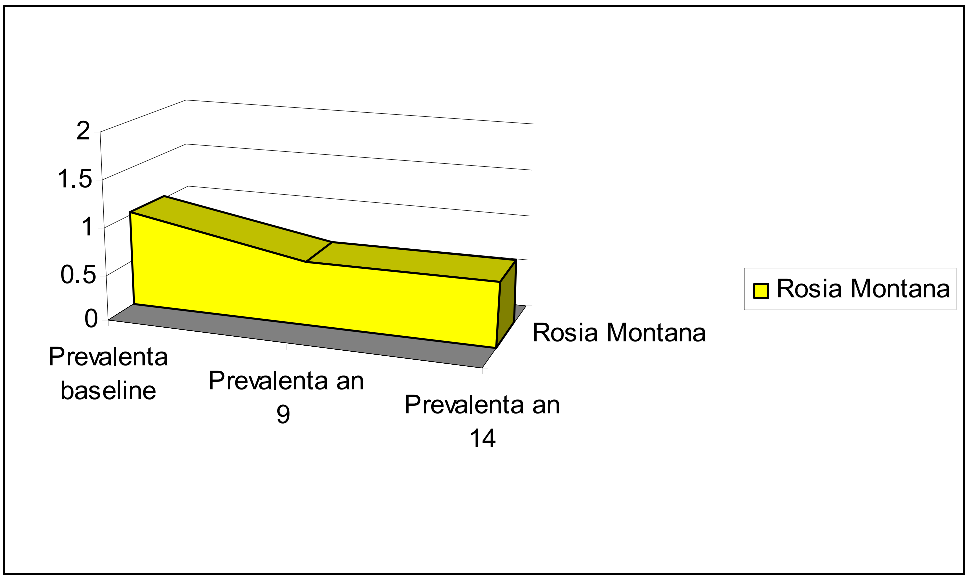


**Table 6-72. Prevalence of diabetes mellitus in relation to the hazardous substances investigated (chromium in soil) in Rosia Montana (historic area)**

| Pathology | Baseline prevalence | Year 9 prevalence | Year 14 prevalence |
|---|---|---|---|
| Prevalence of diabetes mellitus in relation to the hazardous substances investigated (chromium in soil) | 2.04 | 1.34 | 1.34 |

**Figure 6.16. Prevalence of diabetes mellitus in relation to the hazardous substances investigated (chromium in soil) in Rosia Montana (historic area)**

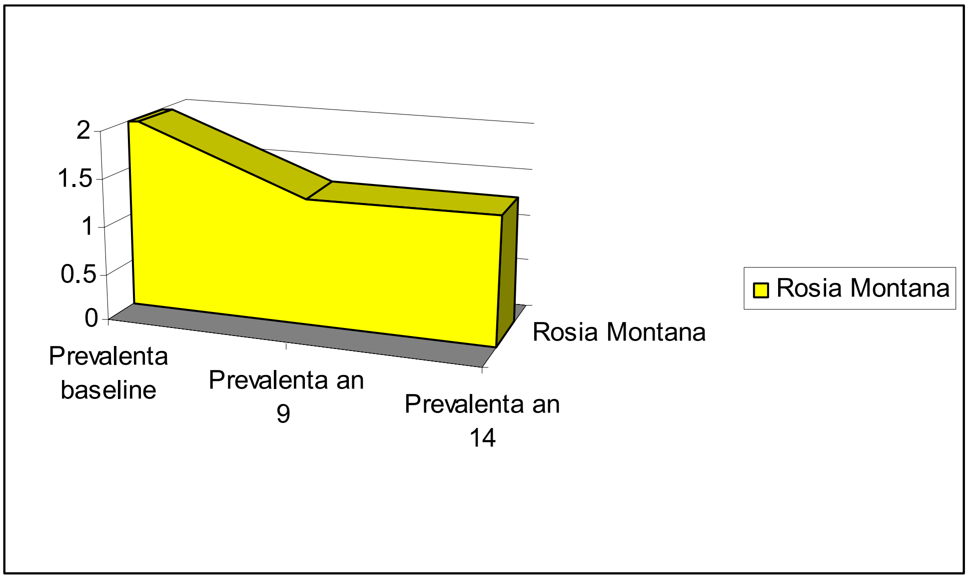


**Table 6-73. Prevalence of bone structure diseases in relation to the hazardous substances investigated (cadmium, and lead in soil) in Rosia Montana (historic area)**

| Pathology | Baseline prevalence | Year 9 prevalence | Year 14 prevalence |
|---|---|---|---|
| Prevalence of bone structure diseases in relation to the hazardous substances investigated (cadmium, lead in soil) | 0.73 | 0.50 | 0.50 |

**Figure 6.17. Prevalence of bone structure diseases in relation to the hazardous substances investigated (cadmium, and lead in soil) in Rosia Montana (historic area)**

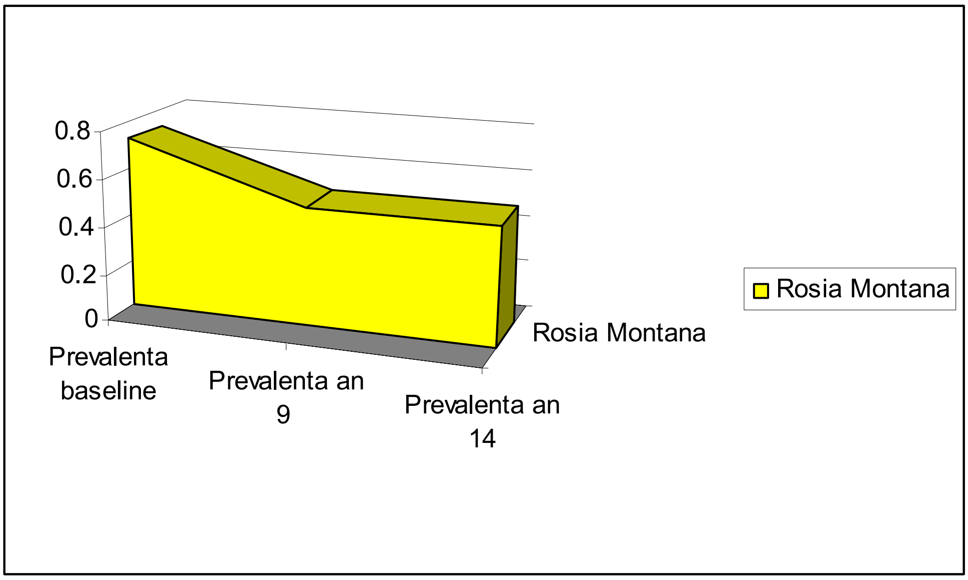


**Table 6-74. Prevalence of urolithiasis in relation to the hazardous substances investigated (cadmium in soil) in Rosia Montana (historic area)**

| Pathology | Baseline prevalence | Year 9 prevalence | Year 14 prevalence |
|---|---|---|---|
| Prevalence of urolithiasis in relation to the hazardous substances investigated (cadmium in soil) | 0.65 | 0.66 | 0.66 |

**Figure 6.18. Prevalence of urolithiasis in relation to the hazardous substances investigated (cadmium in soil) in Rosia Montana (historic area)**

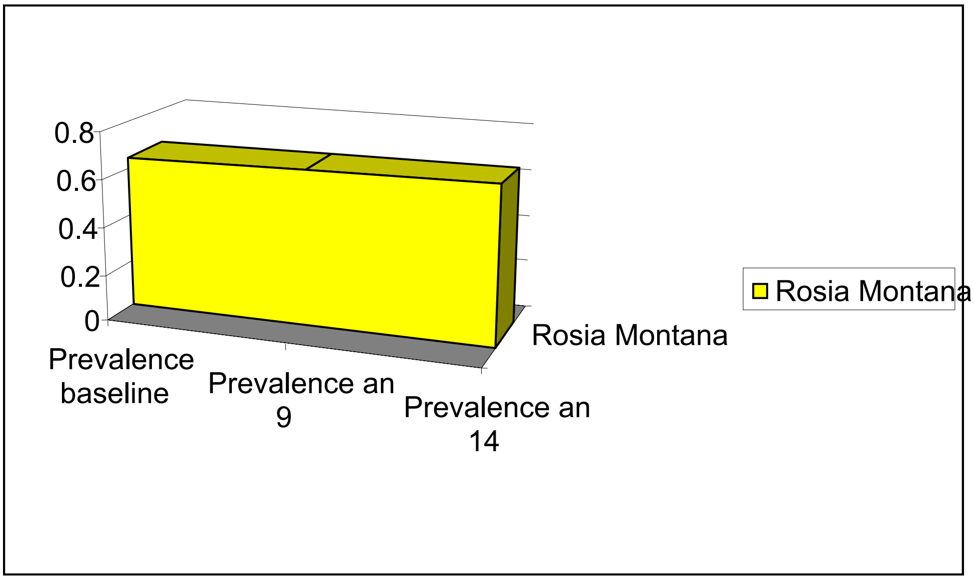
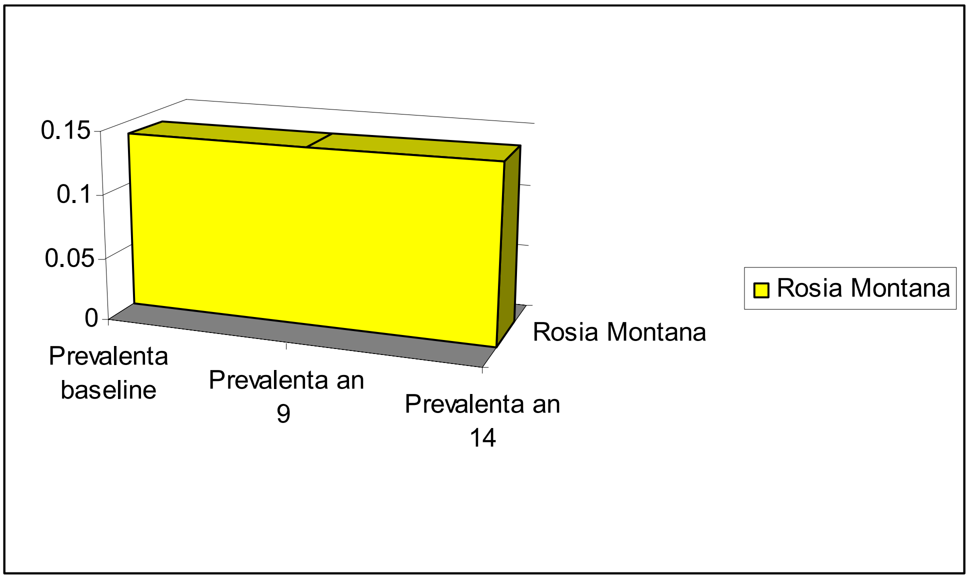


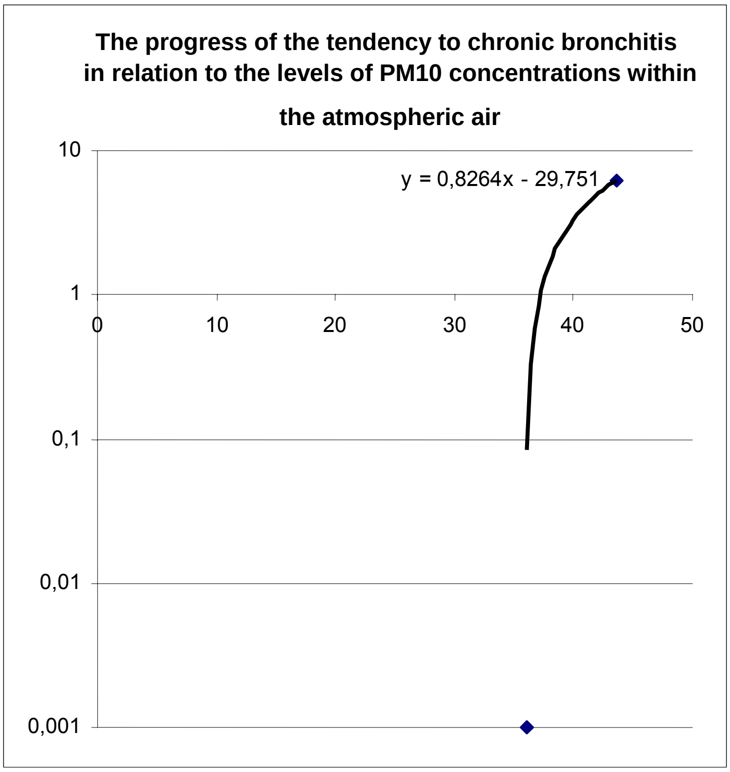
**Table 6-75. Prevalence of polyneuropathies in relation to the hazardous substances investigated (mercury in soil) in Rosia Montana (historic area)**

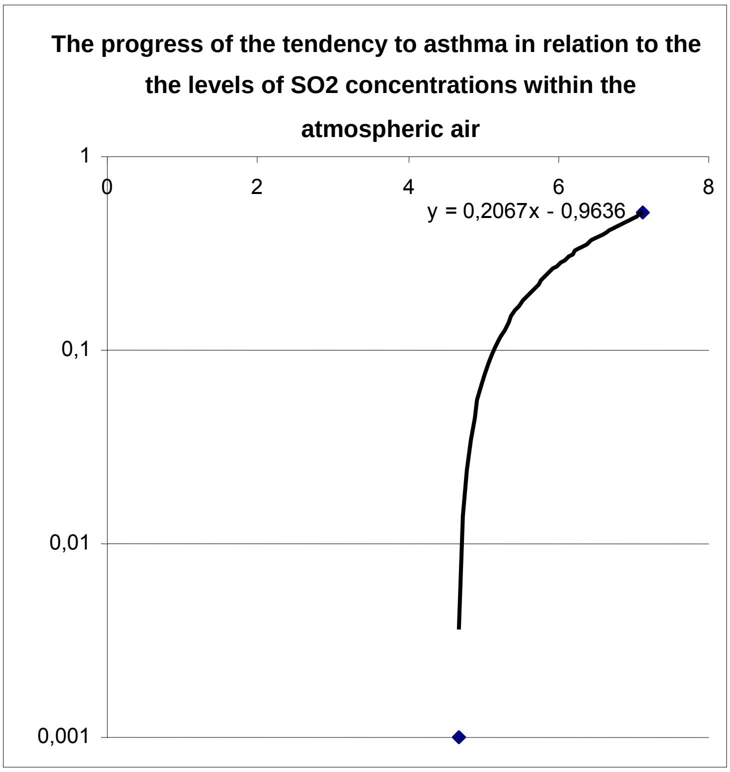
| Pathology | Baseline prevalence | Year 9 prevalence | Year 14 prevalence |
|---|---|---|---|
| Prevalence of polyneuropathy in relation to the hazardous substances investigated (mercury in soil) | 0.14 | 0.14 | 0.14 |

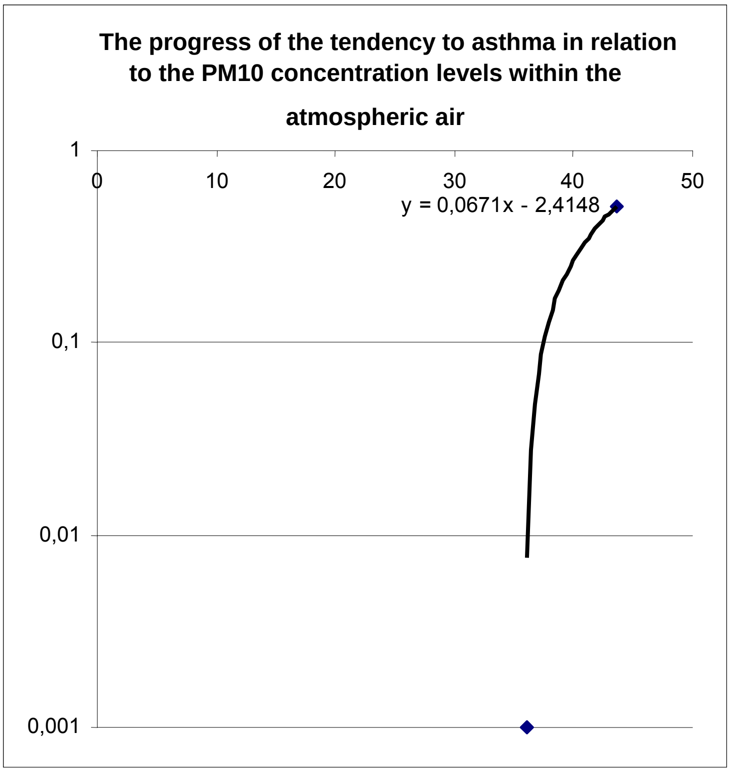
**Figure 6.19. Prevalence of polyneuropathies in relation to the hazardous substances investigated (mercury in soil) in Rosia Montana (historic area)**

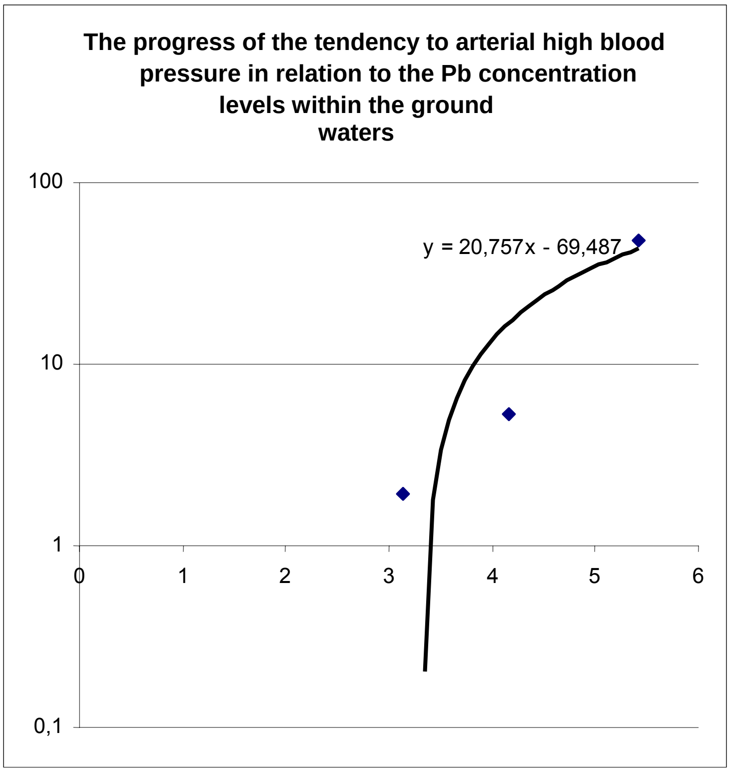


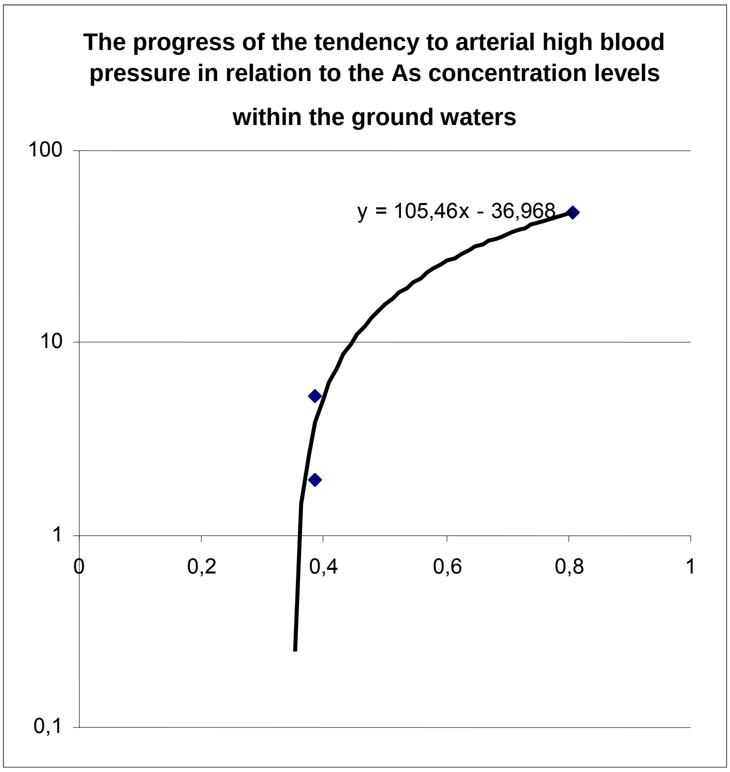

With regard to the figures below, it has to be mentioned that the trend of each investigated disease start at the highest values as a baseline towards the lowest values on graph which represent the prediction trend for 9 and 14 years, respectively.

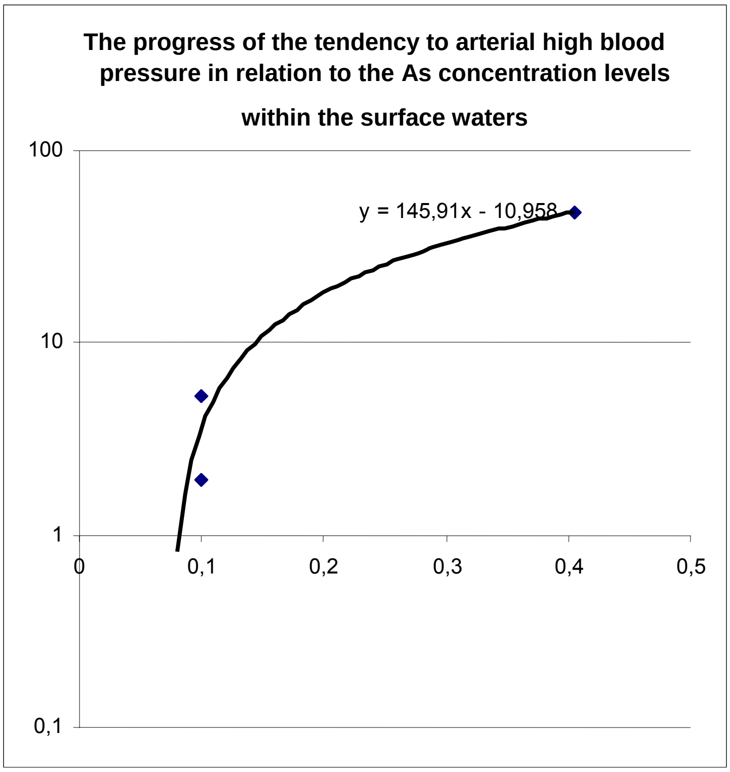

The progress of the tendency to chronic bronchitis in relation to the levels of PM10 concentrations within the atmospheric air
y = 0,8264x - 29,751
10
1
0,1
0,01
0,001
0
10
20
30
40
50

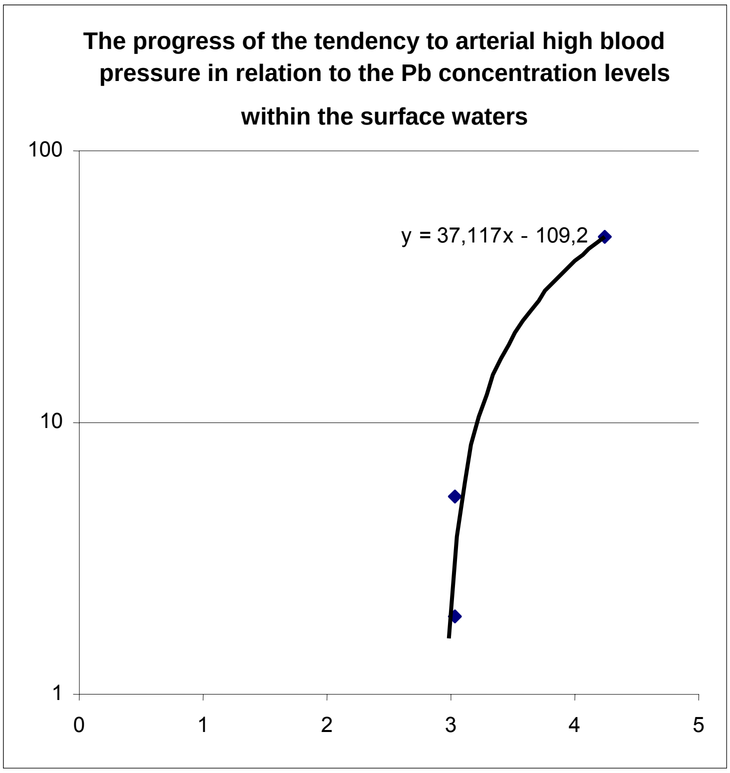

The progress of the tendency to asthma in relation to the the levels of SO2 concentrations within the atmospheric air
y = 0,2067x - 0,9636
1
0,1
0,01
0,001
0
2
4
6
8

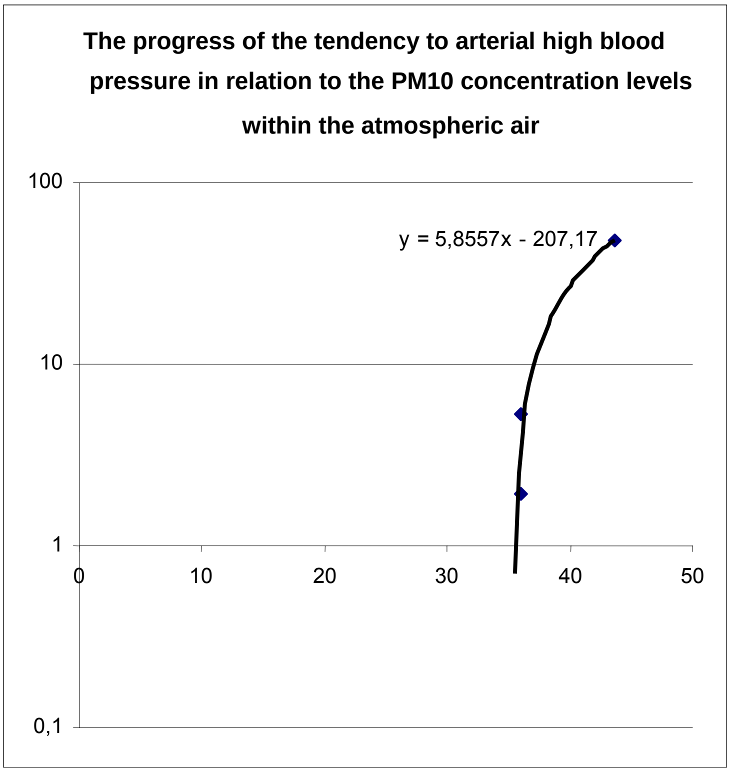

The progress of the tendency to asthma in relation to the PM10 concentration levels within the atmospheric air
1
0,1
0,01
0,001
0
10
20
30
40
50
y = 0,0671x - 2,4148

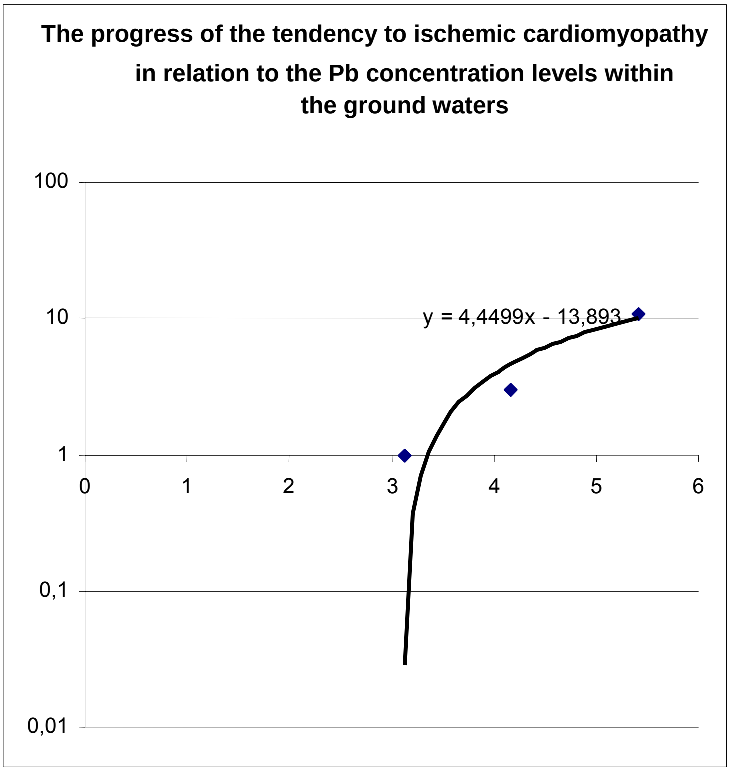

The progress of the tendency to arterial high blood pressure in relation to the Pb concentration levels within the ground waters
100
10
1
0,1
0
1
2
3
4
5
6
y = 20,757x - 69,487

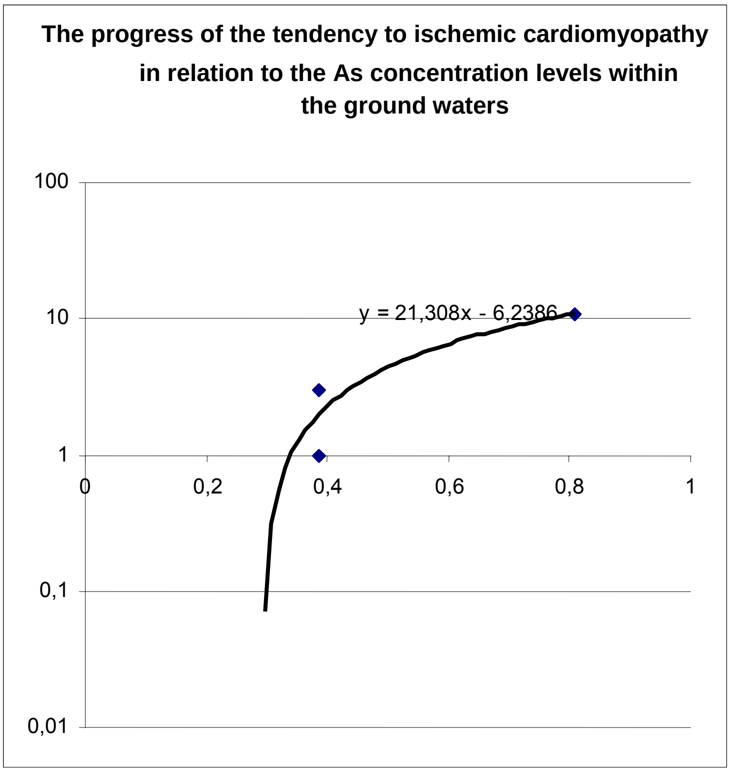

The progress of the tendency to arterial high blood pressure in relation to the As concentration levels within the ground waters
y = 105,46x - 36,968
100
10
1
0,1
0
0,2
0,4
0,6
0,8
1

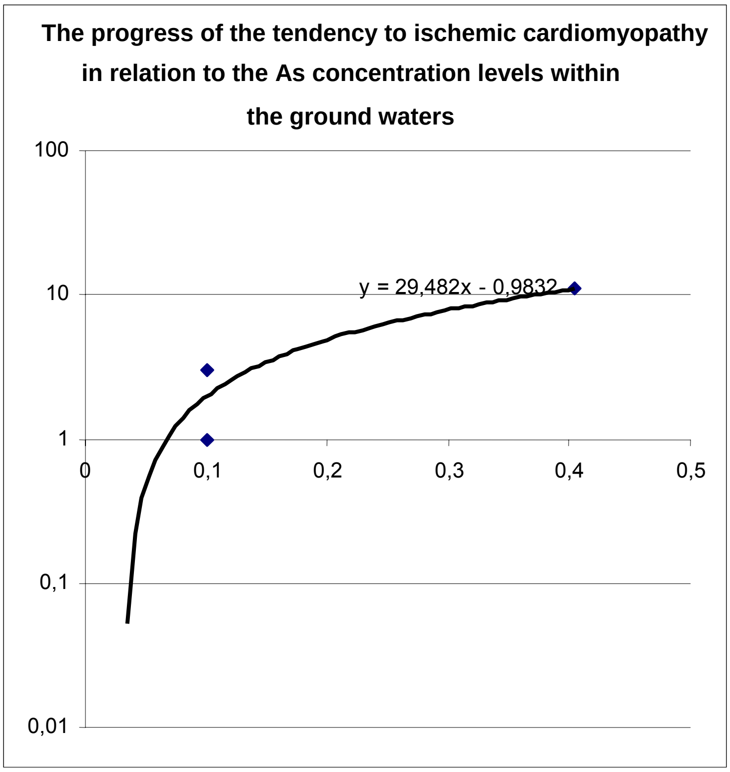

The progress of the tendency to arterial high blood pressure in relation to the As concentration levels within the surface waters
y = 145,91x - 10,958
100
10
1
0,1
0
0,1
0,2
0,3
0,4
0,5

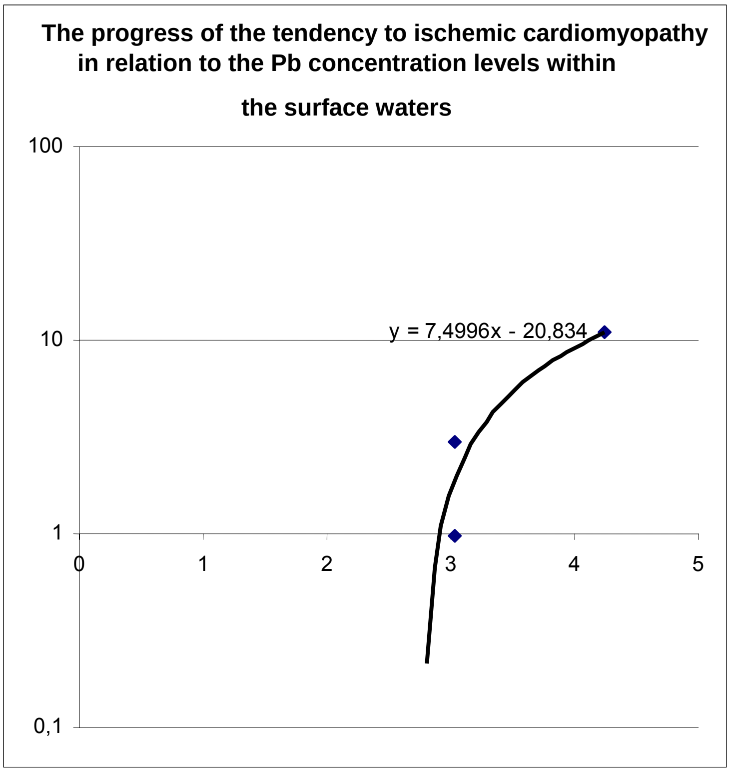

The progress of the tendency to arterial high blood pressure in relation to the Pb concentration levels within the surface waters
y = 37,117x - 109,2
100
10
1
0
1
2
3
4
5

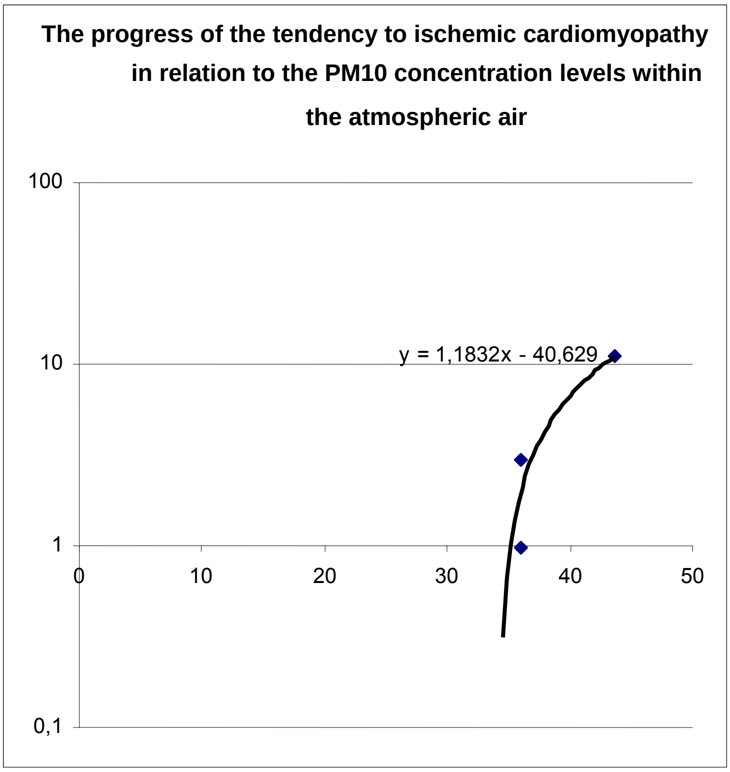

The progress of the tendency to arterial high blood pressure in relation to the PM10 concentration levels within the atmospheric air
y = 5,8557x - 207,17
100
10
1
0,1
0
10
20
30
40
50

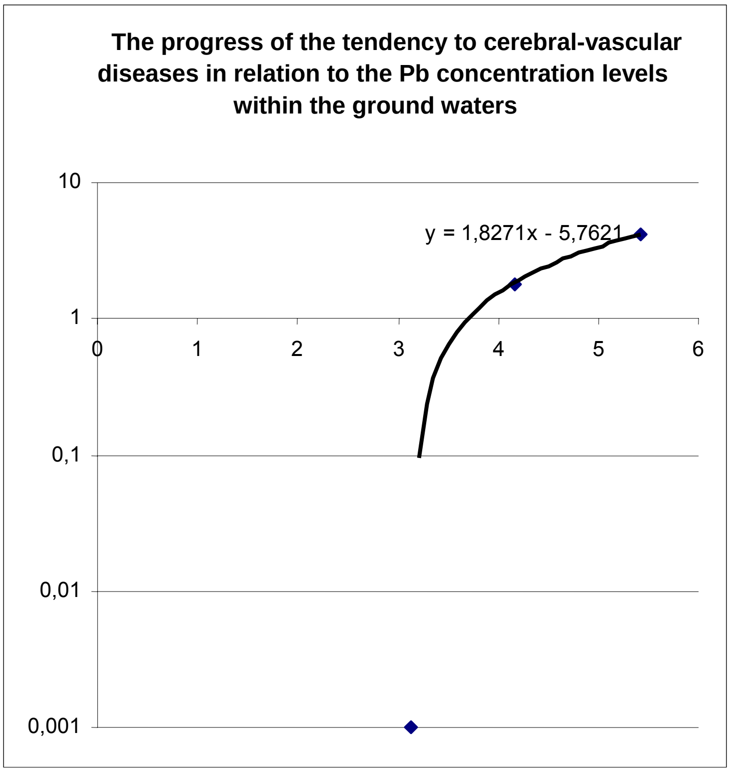

The progress of the tendency to ischemic cardiomyopathy
in relation to the Pb concentration levels within
the ground waters
100
10
1
0,1
0,01
0
1
2
3
4
5
6
y = 4,4499x - 13,893

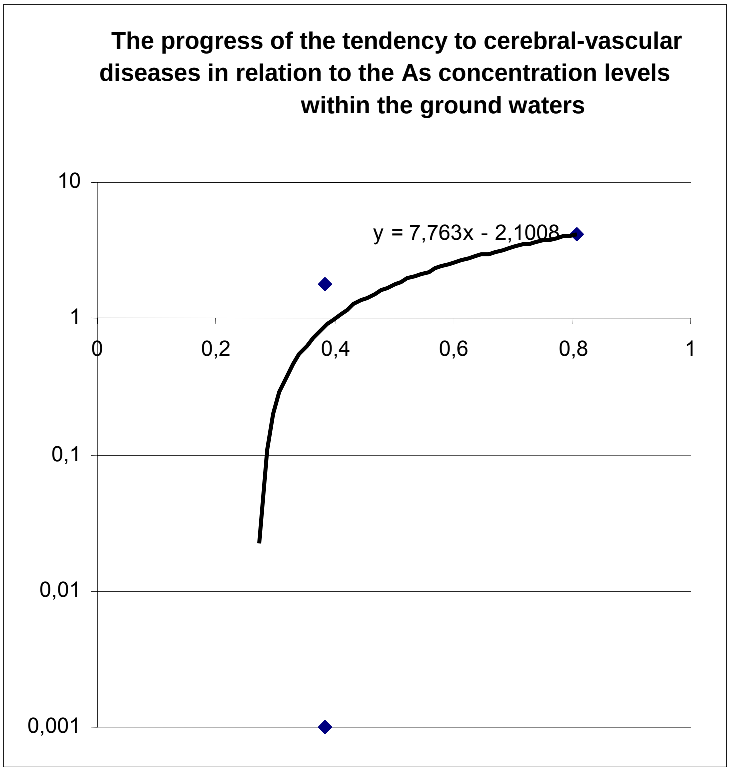

The progress of the tendency to ischemic cardiomyopathy
in relation to the As concentration levels within
the ground waters
100
10
1
0,1
0,01
0
0,2
0,4
0,6
0,8
1
y = 21,308x - 6,2386


The progress of the tendency to ischemic cardiomyopathy in relation to the As concentration levels within the ground waters
100
10
1
0,1
0,01
0
0,1
0,2
0,3
0,4
0,5
y = 29,482x - 0,9832

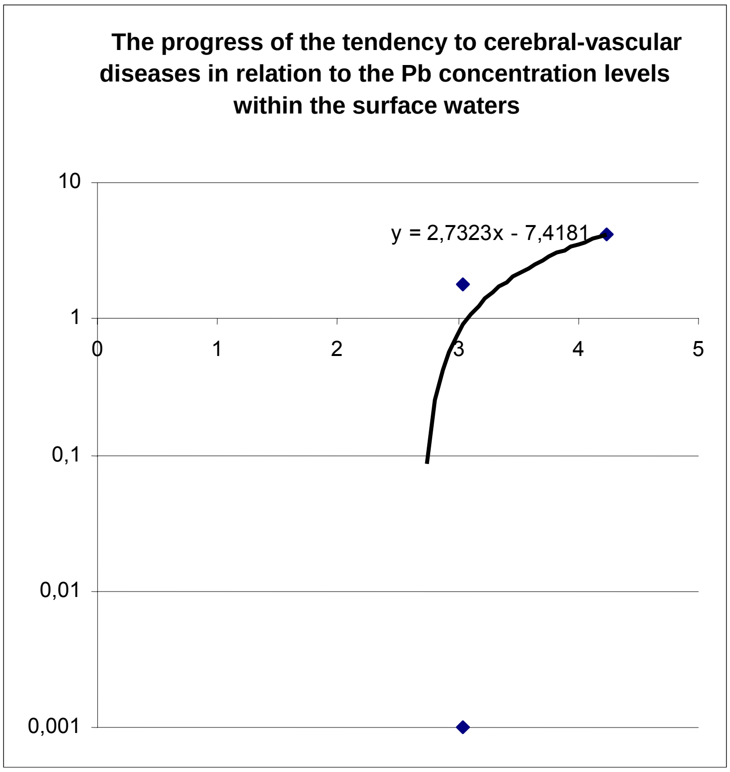

The progress of the tendency to ischemic cardiomyopathy in relation to the Pb concentration levels within the surface waters
100
10
1
0,1
0
1
2
3
4
5
y = 7,4996x - 20,834


The progress of the tendency to ischemic cardiomyopathy in relation to the PM10 concentration levels within the atmospheric air
100
10
1
0,1
0
10
20
30
40
50
y = 1,1832x - 40,629

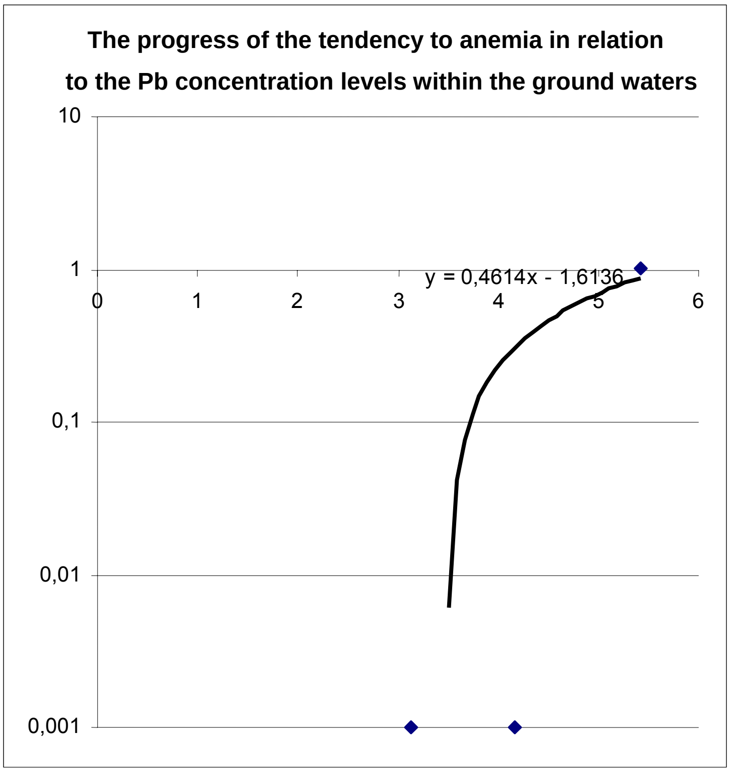

The progress of the tendency to cerebral-vascular diseases in relation to the Pb concentration levels within the ground waters
10
1
0,1
0,01
0,001
0
1
2
3
4
5
6
y = 1,8271x - 5,7621

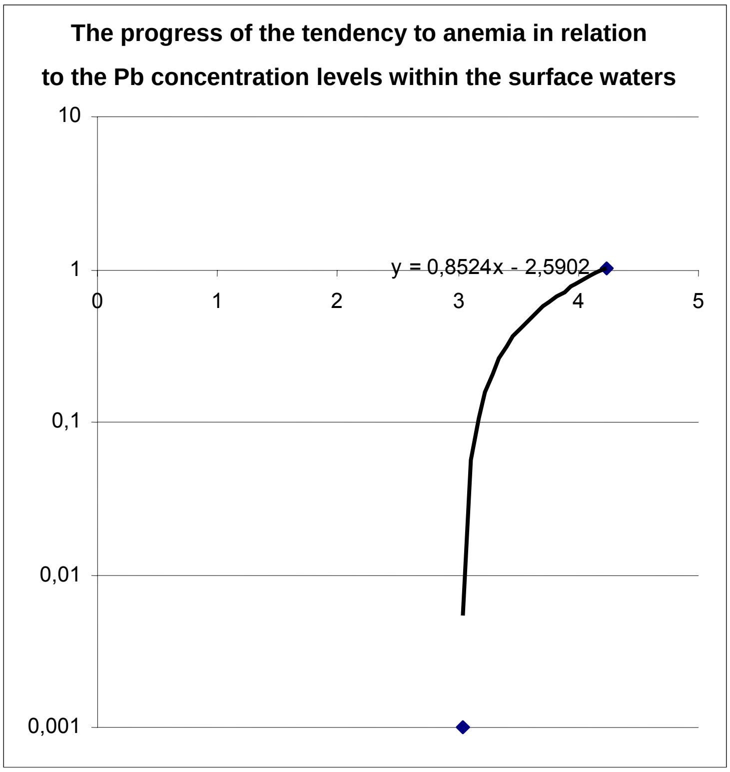


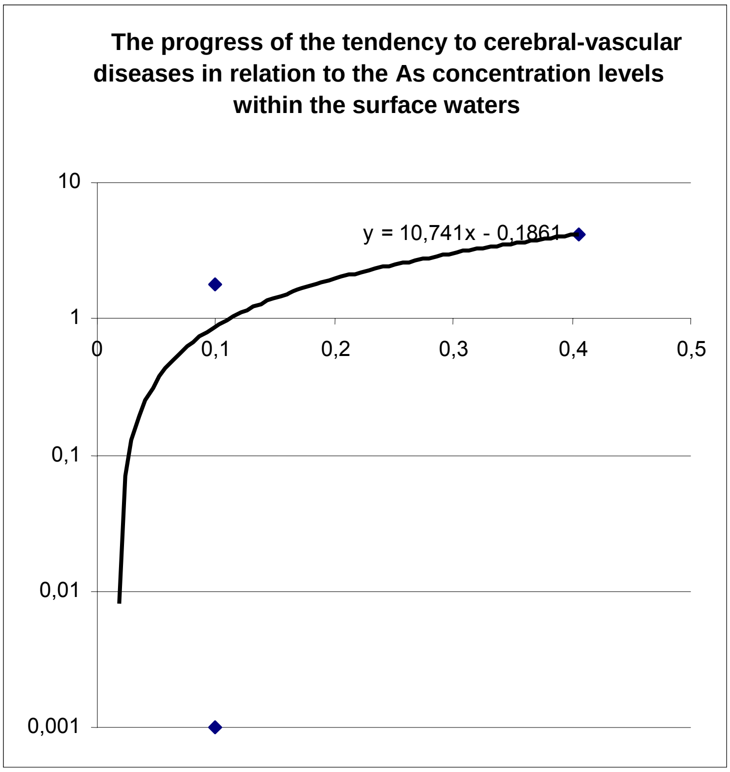
The progress of the tendency to cerebral-vascular diseases in relation to the As concentration levels within the ground waters
y = 7,763x - 2,1008
10
1
0,1
0,01
0,001
0
0,2
0,4
0,6
0,8
1

The progress of the tendency to cerebral-vascular diseases in relation to the Pb concentration levels within the surface waters
y = 2,7323x - 7,4181
10
1
0,1
0,01
0,001
0
1
2
3
4
5


The progress of the tendency to anemia in relation
to the Pb concentration levels within the ground waters
10
1
0,1
0,01
0,001
0
1
2
3
4
5
6
y = 0,4614x - 1,6136


The progress of the tendency to anemia in relation
to the Pb concentration levels within the surface waters
10
1
0,1
0,01
0,001
0
1
2
3
4
5
y = 0,8524x - 2,5902

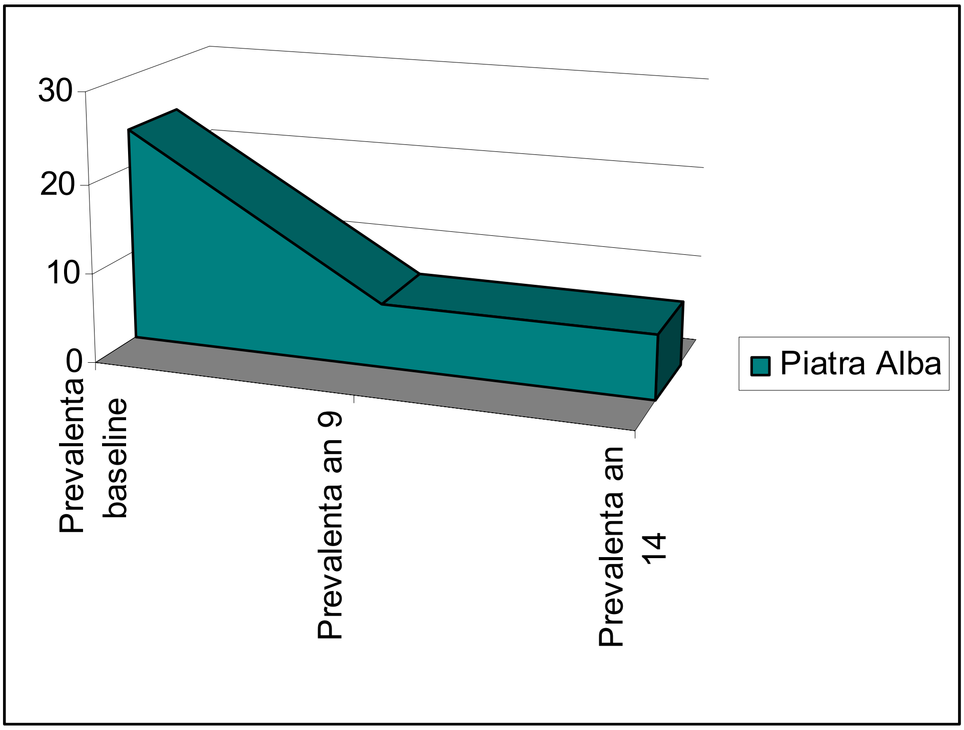

The progress of the tendency to cerebral-vascular diseases in relation to the As concentration levels within the surface waters
y = 10,741x - 0,1861
10
1
0,1
0,01
0,001
0
0,1
0,2
0,3
0,4
0,5

## 6.5 Baseline Prevalence in Rosia Montana and Predicted Prevalence Respectively for Year 9 of Operation (2018) and Year 14 of Operation (2023), Respectively, for the Displaced Population of Rosia Montana to Piatra Alba, for Various Diseases in the Case of Exposure to Diverse Environmental Pollutants

**Table 6-76. Prevalence of hypertension in relation to the hazardous substances investigated (lead in soil) in Piatra Alba**

| Pathology | Baseline prevalence | Year 9 prevalence | Year 14 prevalence |
|---|---|---|---|
| Prevalence of HTA in relation to the hazardous substances investigated (lead in soil) | 24.06 | 7.18 | 7.18 |

**Figure 6.20. Prevalence of hypertension in relation to the hazardous substances investigated (lead in soil) in Piatra Alba**



## Table 6-77. Prevalence of ischaemic heart disease in relation to the hazardous substances investigated (lead, mercury in soil) in Piatra Alba

| Pathology | Baseline prevalence | Year 9 prevalence | Year 14 prevalence |
|---|---|---|---|
| Prevalence of ischaemic heart disease in relation to the hazardous substances investigated (lead, mercury in soil) | 10.95 | 2.25 | 2.25 |

## Figure 6.21. Prevalence of ischaemic heart disease in relation to the hazardous substances investigated (lead, mercury in soil) in Piatra Alba

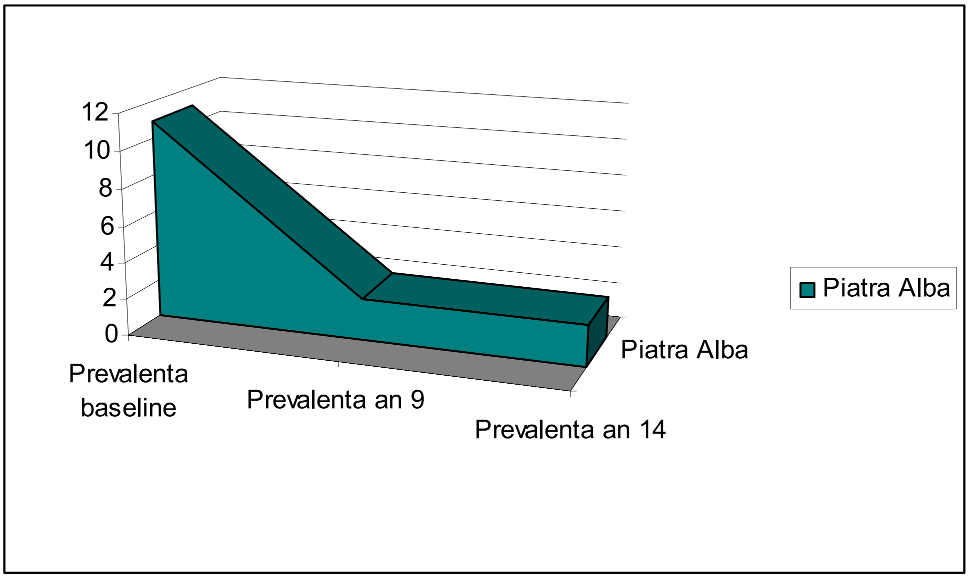


**Table 6-78. Prevalence of cerebrovascular disease in relation to the hazardous substances investigated (mercury in soil) in Piatra Alba**

| Pathology | Baseline prevalence | Year 9 prevalence | Year 14 prevalence |
|---|---|---|---|
| Prevalence of cerebrovascular disease in relation to the hazardous substances investigated (mercury in soil) | 4.16 | 0.34 | 0.34 |

**Figure 6.22. Prevalence of cerebrovascular disease in relation to the hazardous substances investigated (mercury in soil) in Piatra Alba**

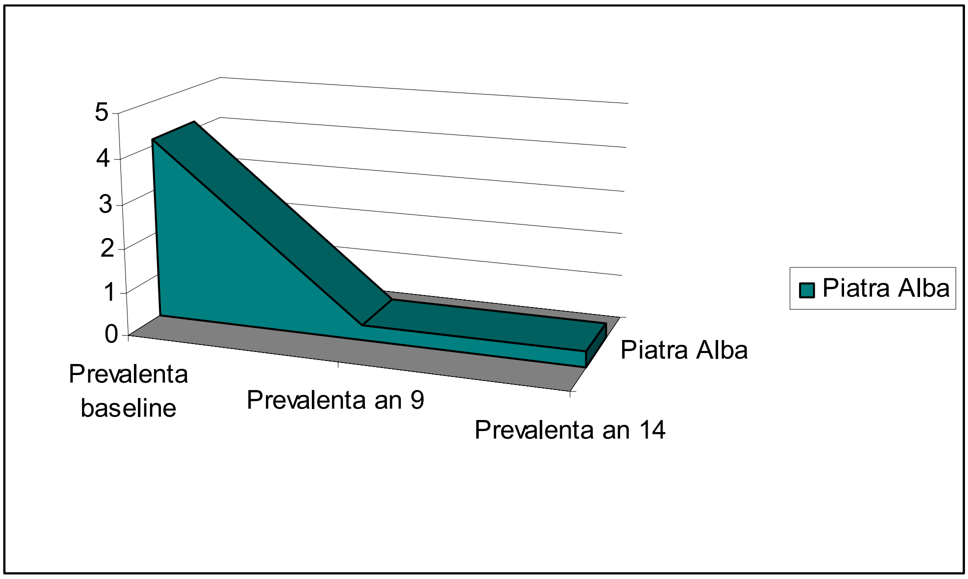


**Table 6-79. Prevalence of anaemias in relation to the hazardous substances investigated (lead in soil) in Piatra Alba**

| Pathology | Baseline prevalence | Year 9 prevalence | Year 14 prevalence |
|---|---|---|---|
| Prevalence of anaemias in relation to the hazardous substances (lead in soil) | 1.02 | 0.003 | 0.003 |

**Figure 6.23. Prevalence of anaemias in relation to the hazardous substances investigated (lead in soil) in Piatra Alba**

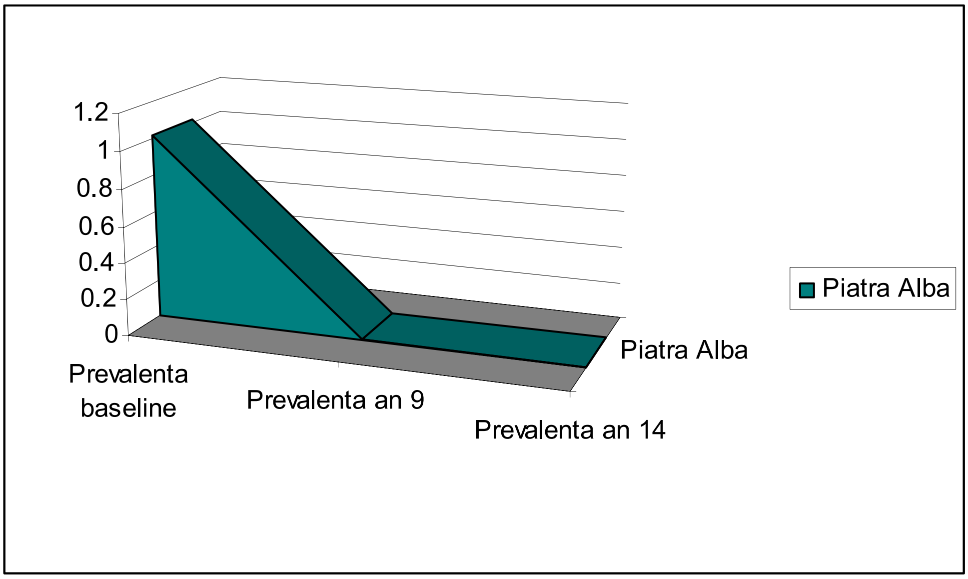
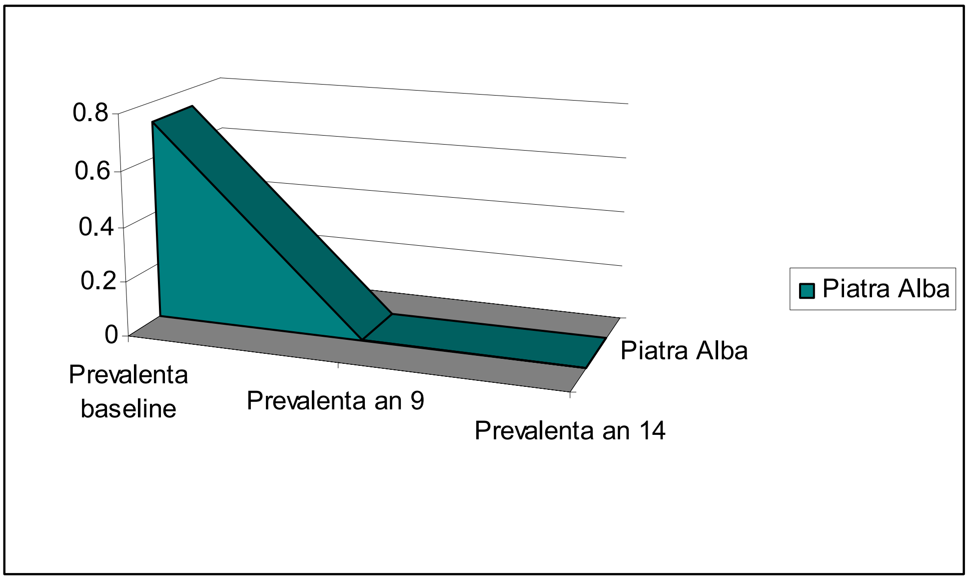
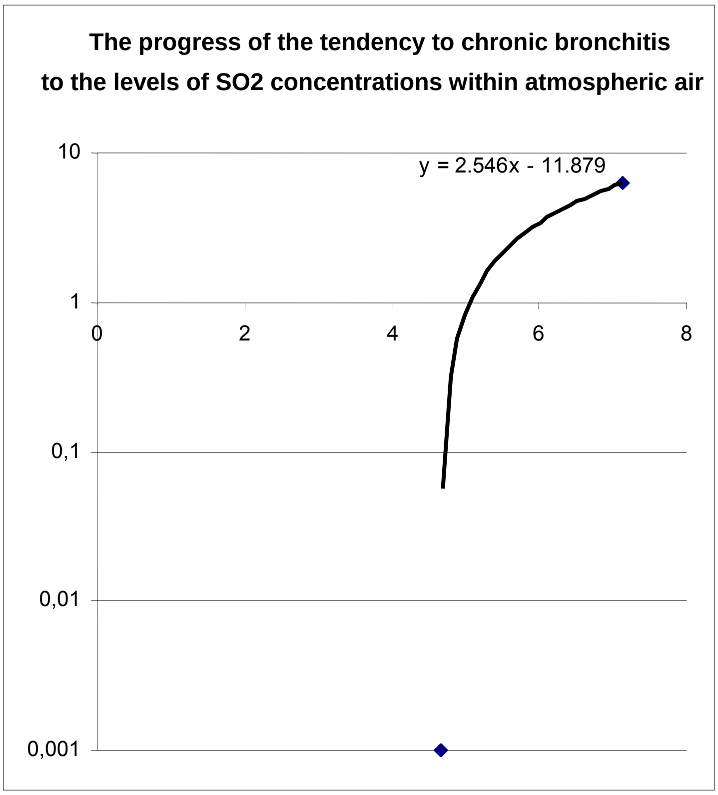


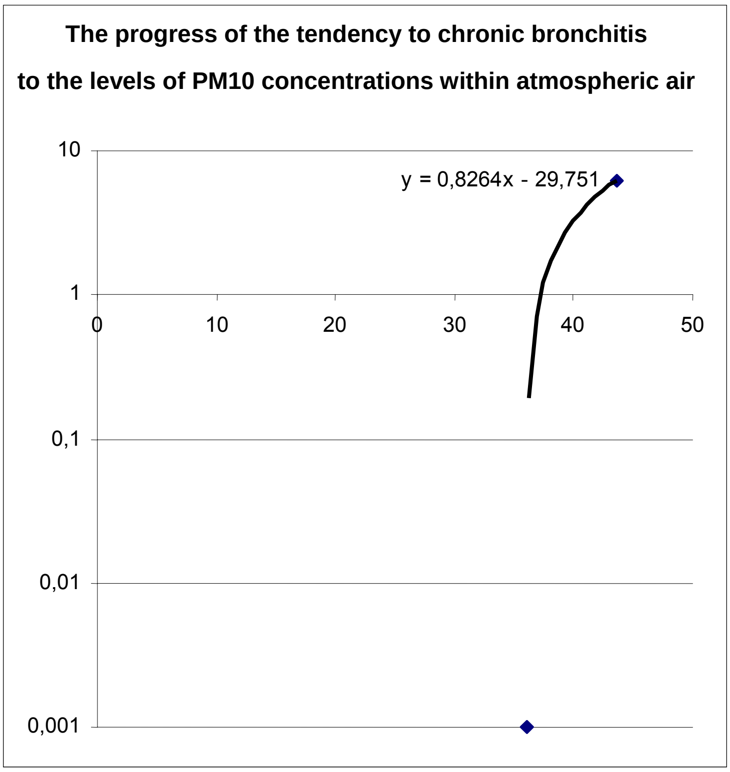
**Table 6-80. Prevalence of bone structure diseases in relation to the hazardous substances investigated (lead in soil) in Piatra Alba**

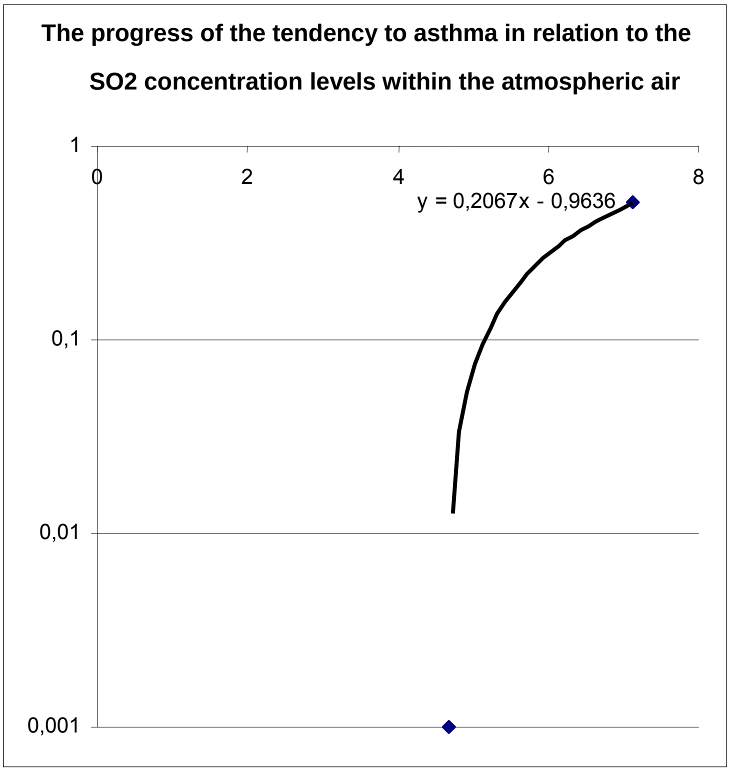
| Pathology | Baseline prevalence | Year 9 prevalence | Year 14 prevalence |
|---|---|---|---|
| Prevalence of bone structure diseases in relation to the hazardous substances (lead in soil) | 0.73 | 0.002 | 0.002 |

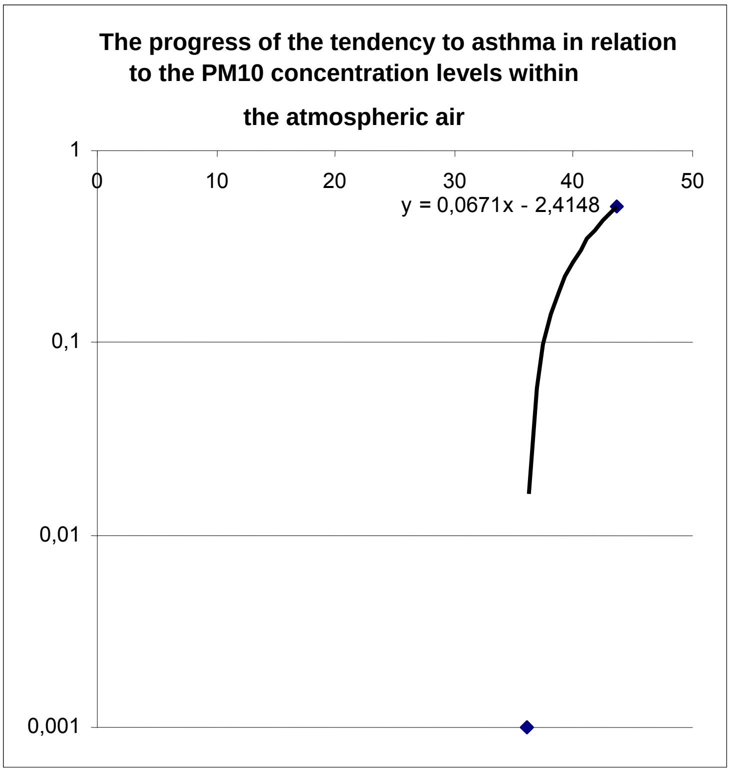
**Figure 6.24. Prevalence of bone structure diseases in relation to the hazardous substances investigated (lead in soil) in Piatra Alba**

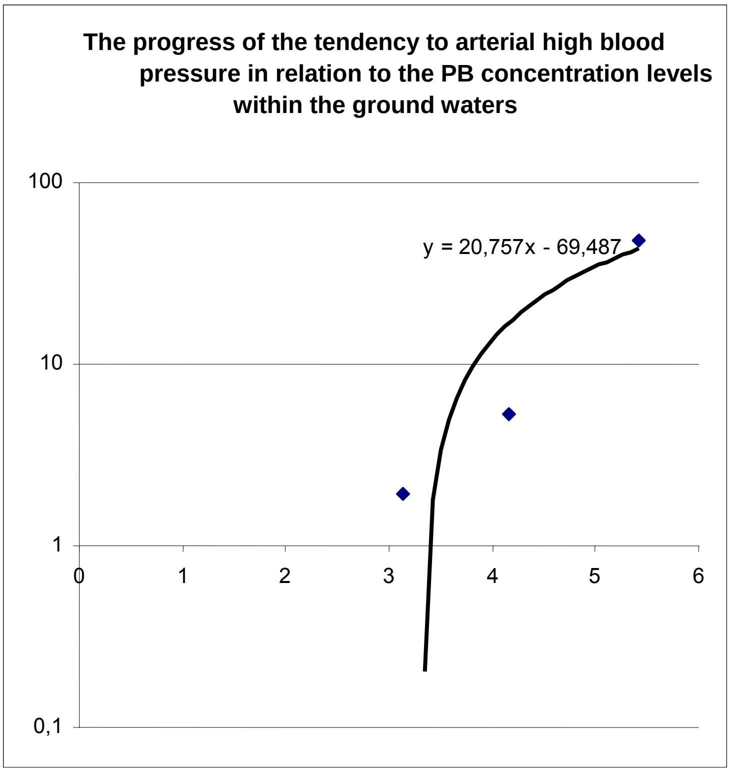


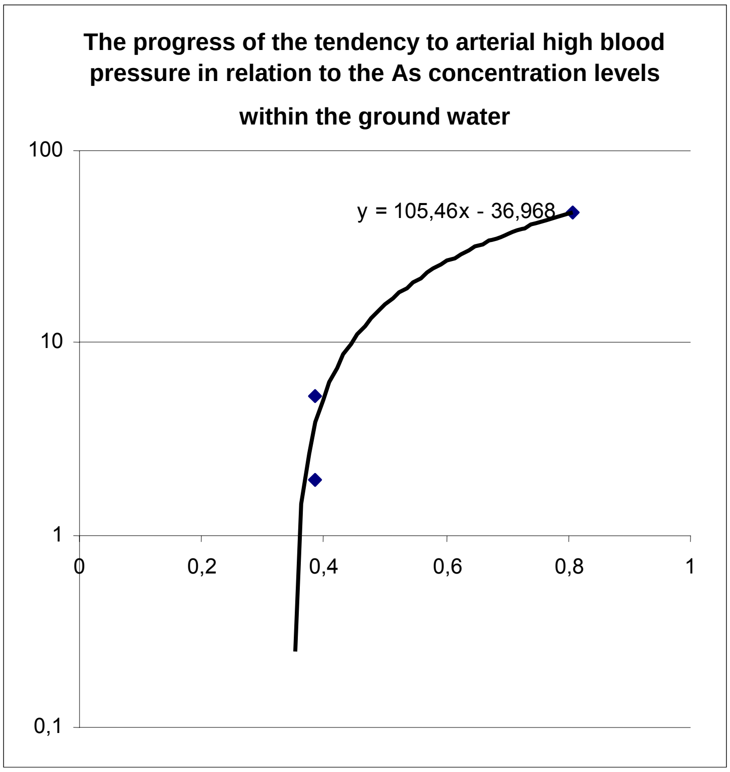



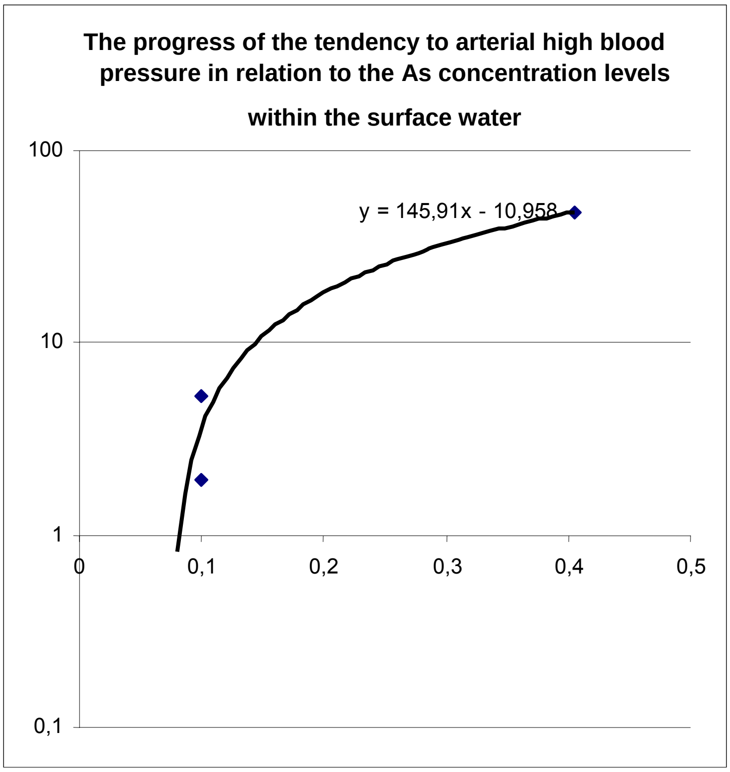

The progress of the tendency to chronic bronchitis
to the levels of PM10 concentrations within atmospheric air
y = 0,8264x - 29,751
10
1
0,1
0,01
0,001
0
10
20
30
40
50

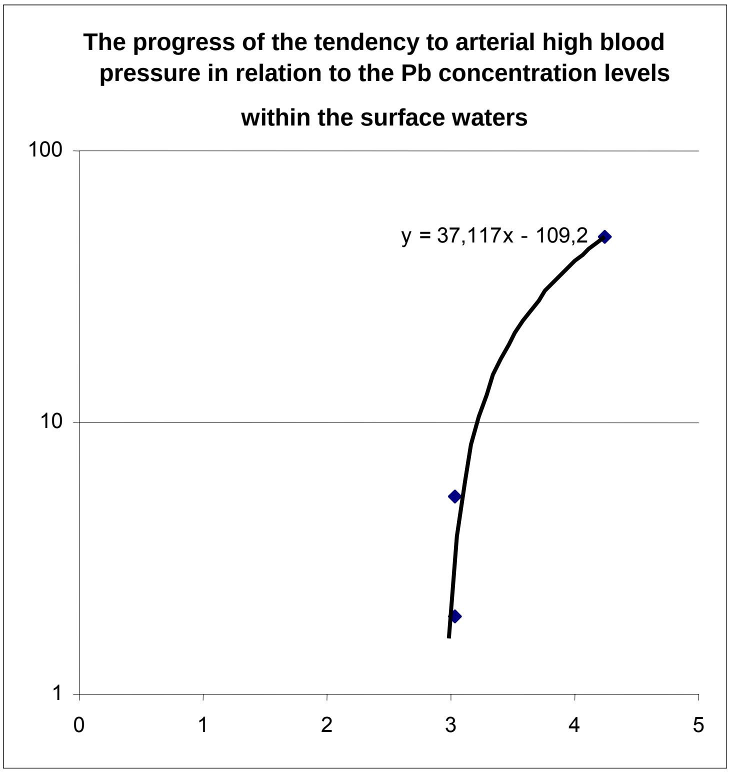

The progress of the tendency to asthma in relation to the
SO2 concentration levels within the atmospheric air
y = 0,2067x - 0,9636
1
0,1
0,01
0,001
0
2
4
6
8

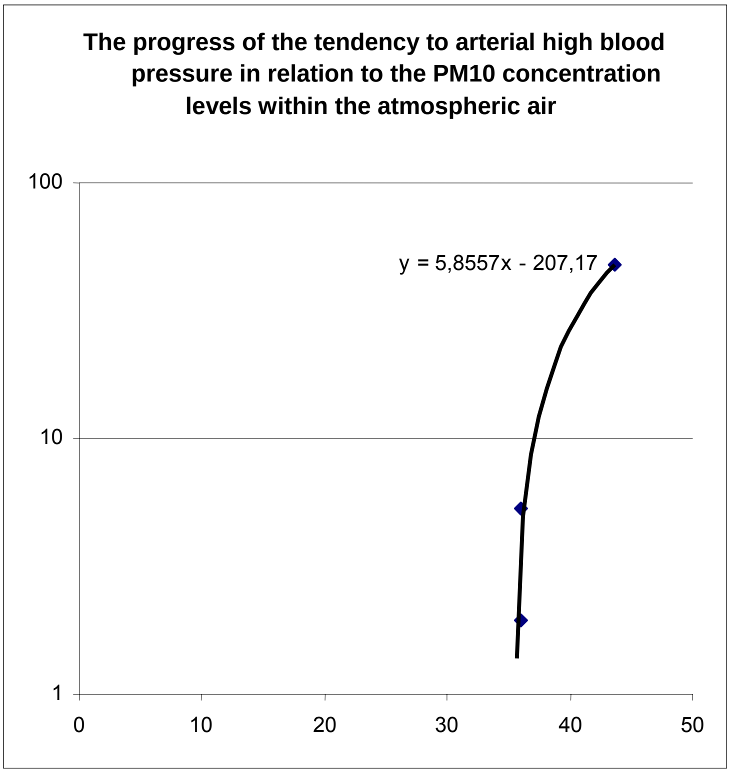

The progress of the tendency to asthma in relation to the PM10 concentration levels within
the atmospheric air
1
0,1
0,01
0,001
0
10
20
30
40
50
y = 0,0671x - 2,4148

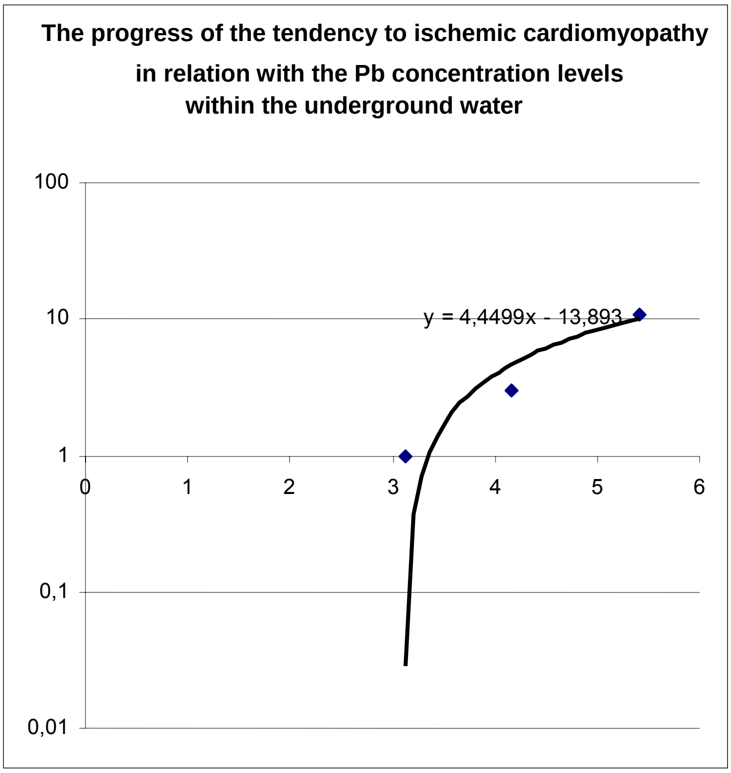

The progress of the tendency to arterial high blood pressure in relation to the PB concentration levels within the ground waters
100
10
1
0,1
0
1
2
3
4
5
6
y = 20,757x - 69,487

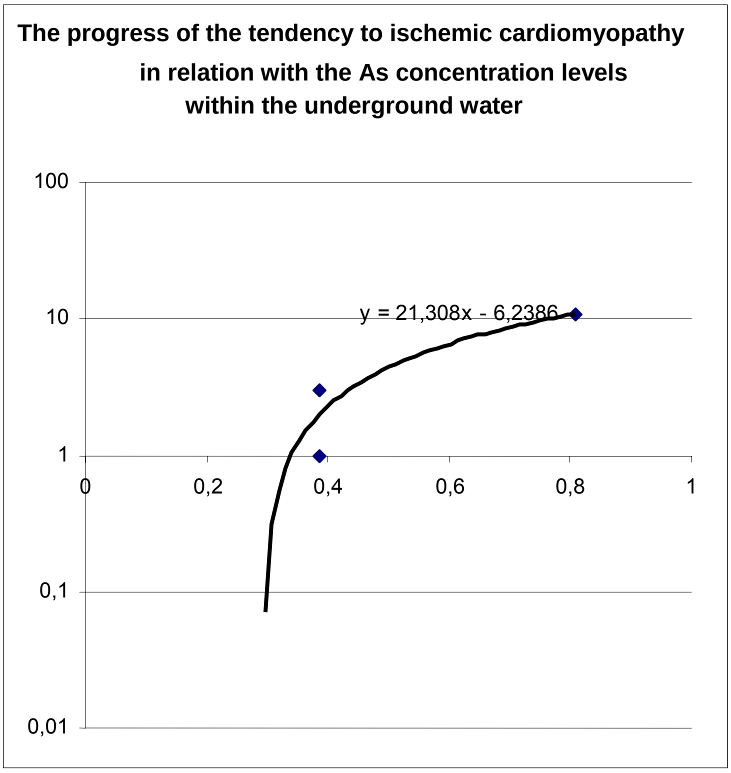

The progress of the tendency to arterial high blood pressure in relation to the As concentration levels within the ground water
100
10
1
0,1
0
0,2
0,4
0,6
0,8
1
y = 105,46x - 36,968

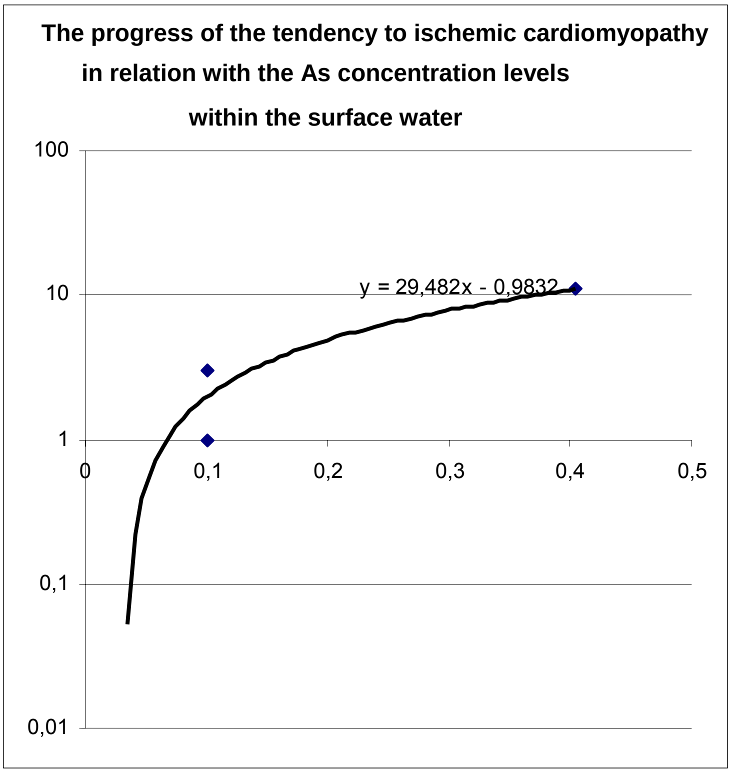

The progress of the tendency to arterial high blood pressure in relation to the As concentration levels within the surface water
100
10
1
0,1
0
0,1
0,2
0,3
0,4
0,5
y = 145,91x - 10,958

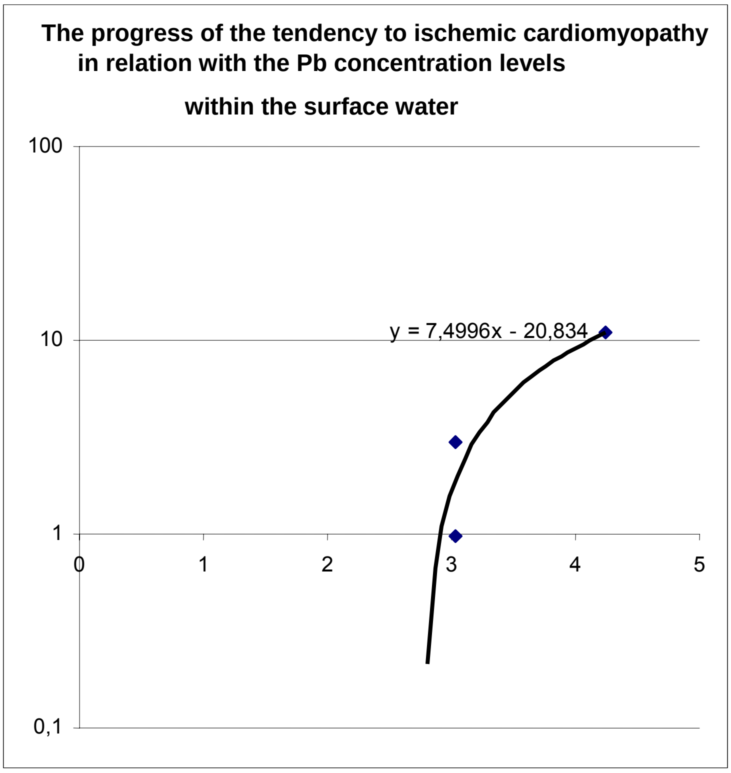

The progress of the tendency to arterial high blood pressure in relation to the Pb concentration levels within the surface waters
100
10
1
y = 37,117x - 109,2
0
1
2
3
4
5

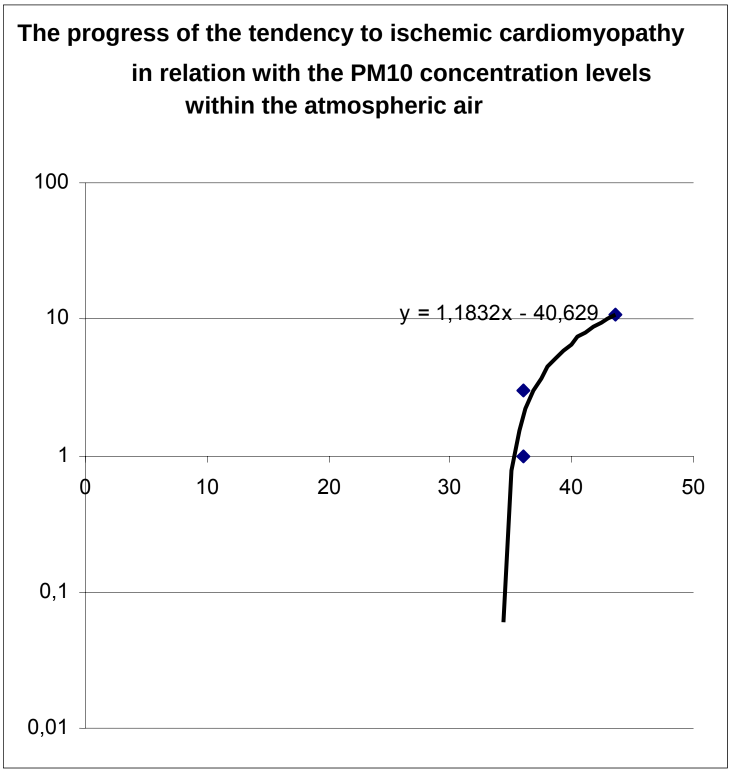

The progress of the tendency to arterial high blood pressure in relation to the PM10 concentration levels within the atmospheric air
100
10
1
y = 5,8557x - 207,17
0
10
20
30
40
50

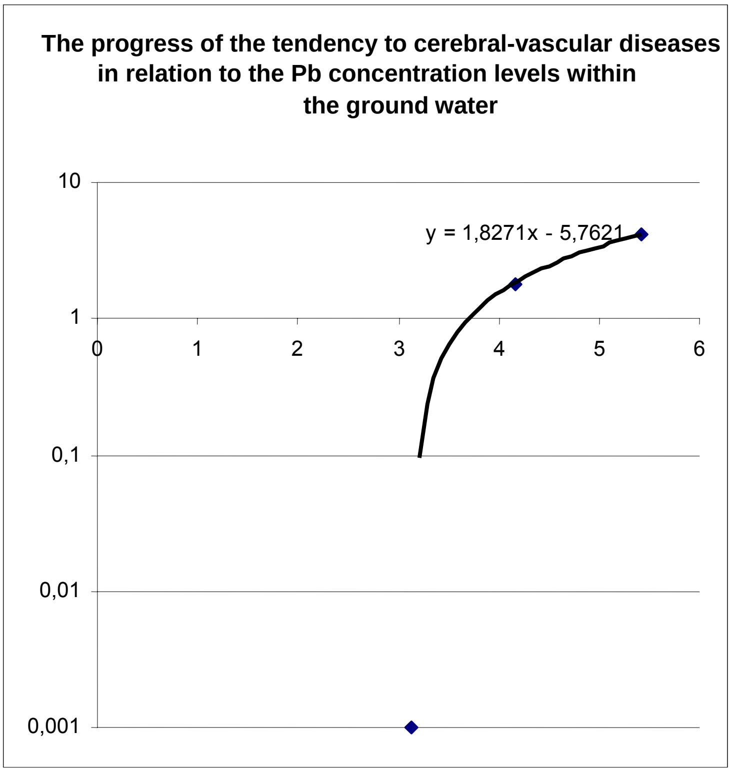

The progress of the tendency to ischemic cardiomyopathy
in relation with the Pb concentration levels
within the underground water
100
10
1
0,1
0,01
0
1
2
3
4
5
6
y = 4,4499x - 13,893

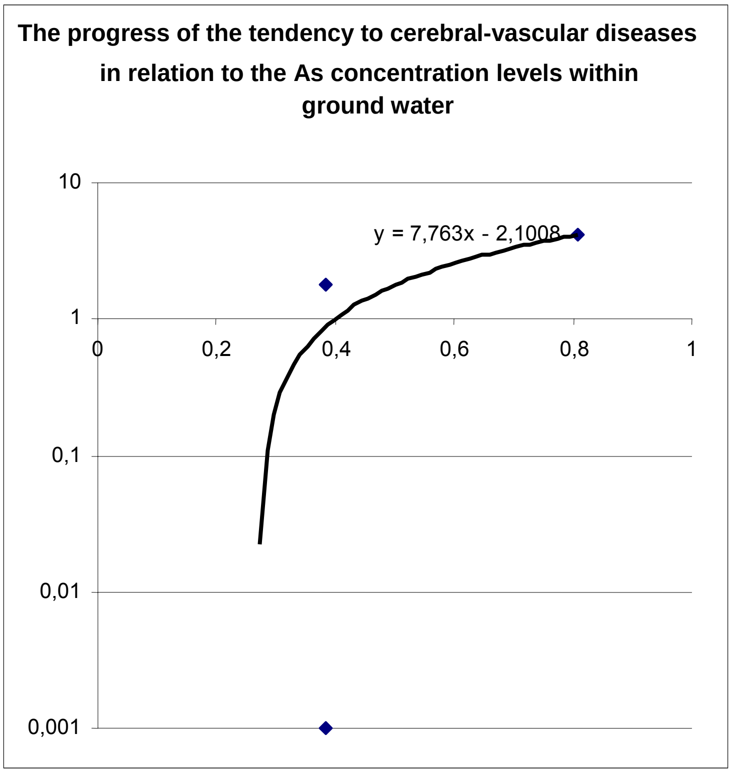

The progress of the tendency to ischemic cardiomyopathy
in relation with the As concentration levels
within the underground water
100
10
1
0,1
0,01
0
0,2
0,4
0,6
0,8
1
y = 21,308x - 6,2386

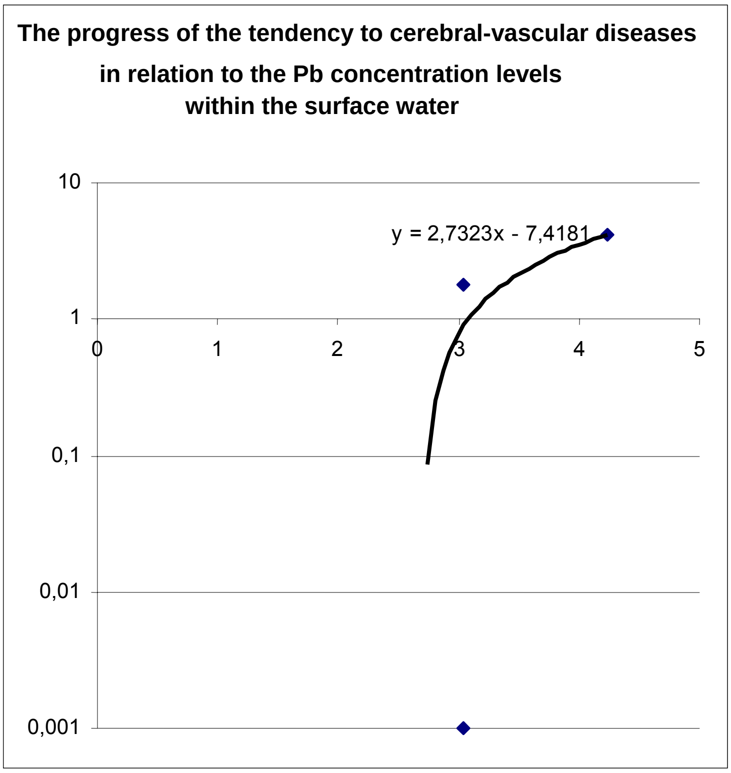

The progress of the tendency to ischemic cardiomyopathy
in relation with the As concentration levels
within the surface water
100
10
1
0,1
0,01
0
0,1
0,2
0,3
0,4
0,5
y = 29,482x - 0,9832

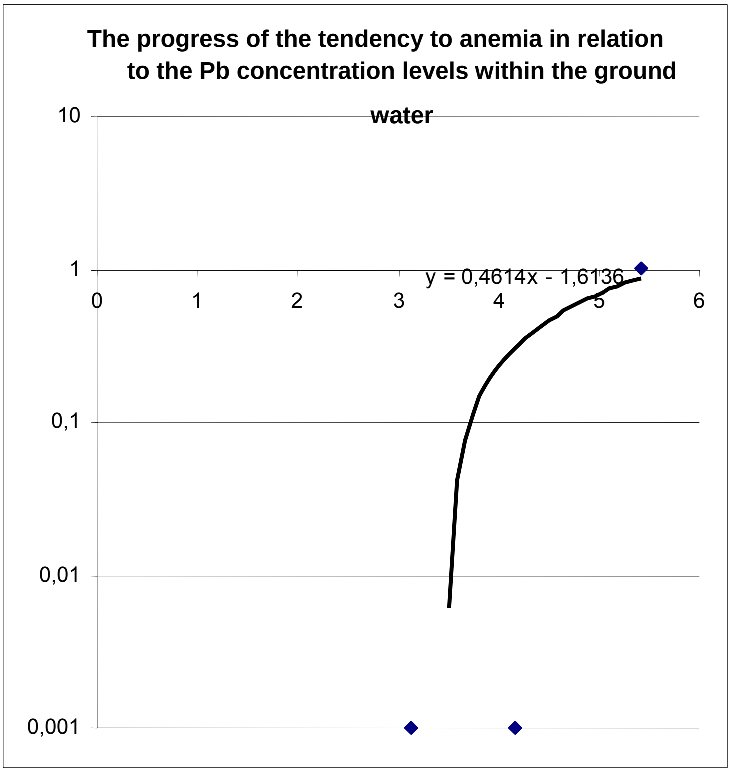

The progress of the tendency to ischemic cardiomyopathy
in relation with the Pb concentration levels
within the surface water
100
10
1
0,1
0
1
2
3
4
5
y = 7,4996x - 20,834

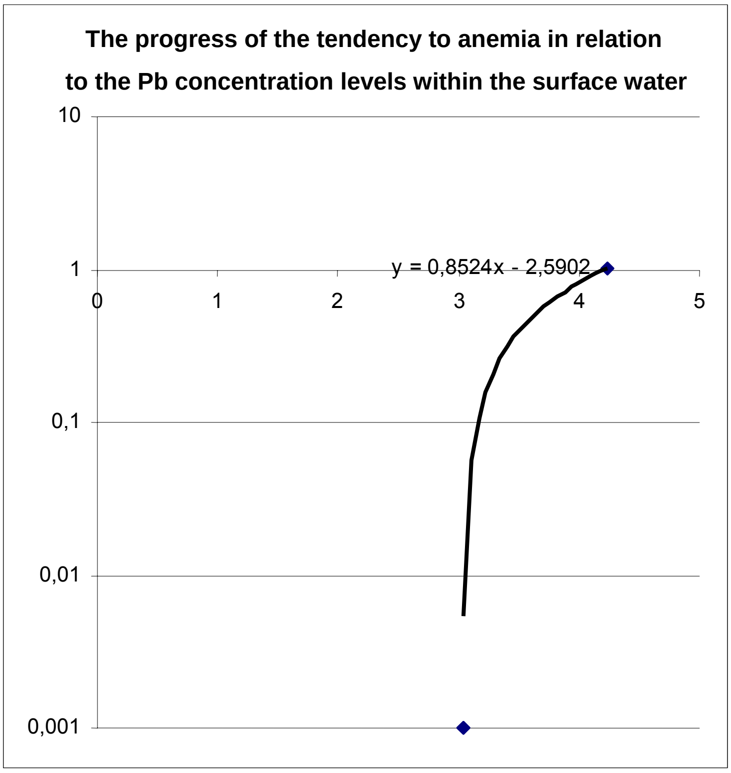

The progress of the tendency to ischemic cardiomyopathy
in relation with the PM10 concentration levels
within the atmospheric air
y = 1,1832x - 40,629
100
10
1
0,1
0,01
0
10
20
30
40
50

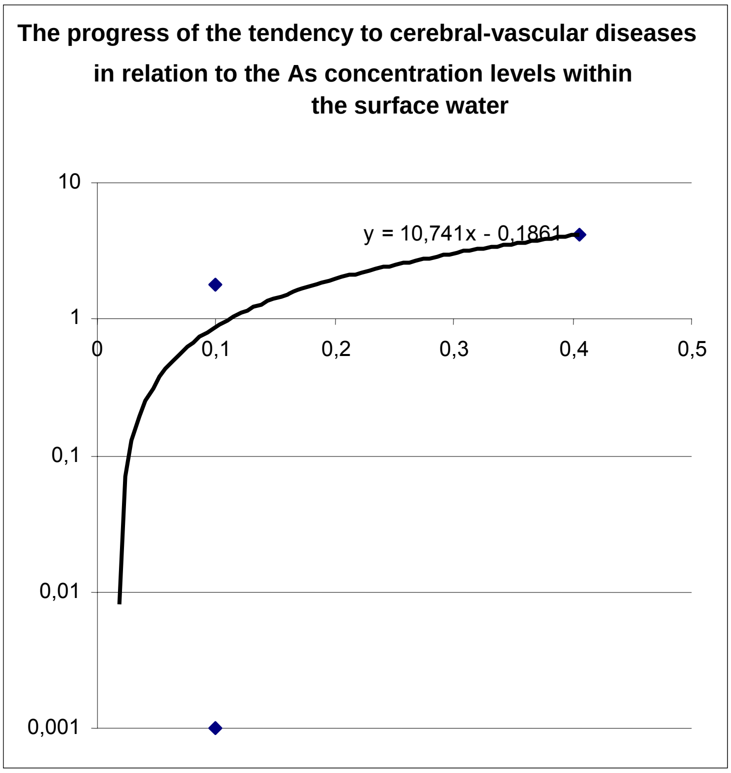

The progress of the tendency to cerebral-vascular diseases
in relation to the Pb concentration levels within
the ground water
y = 1,8271x - 5,7621
10
1
0,1
0,01
0,001
0
1
2
3
4
5
6


The progress of the tendency to cerebral-vascular diseases
in relation to the As concentration levels within
ground water
y = 7,763x - 2,1008
10
1
0,1
0,01
0,001
0
0,2
0,4
0,6
0,8
1


The progress of the tendency to cerebral-vascular diseases
in relation to the Pb concentration levels
within the surface water
y = 2,7323x - 7,4181
10
1
0,1
0,01
0,001
0
1
2
3
4
5


The progress of the tendency to anemia in relation to the Pb concentration levels within the ground water
10
1
0,1
0,01
0,001
0
1
2
3
4
5
6
y = 0,4614x - 1,6136


The progress of the tendency to anemia in relation to the Pb concentration levels within the surface water
10
1
0,1
0,01
0,001
0
1
2
3
4
5
y = 0,8524x - 2,5902




## 6.6 Results and Discussion

Taking into account the health baseline and current and predicted environmental conditions, assumed to be year 0 of the operation (probably 2009), in the Rosia Montana area, health prediction was processed for the year 9 of the operation (probably 2008) and for year 14 (probably 2023).

If permit is released, mining operation start in 2009, assumed to be year 0 of operation in the assessment. Health related environment was assumed to be similar with the baseline (current situation).

Year 9 (2018) is expected to be the highest one in terms of minig operations in the area and year 14 (2023) is the year start of the ecological reconstruction.

Tain into account the health baseline situation, environmental current and predicted conditions and resetllement of the population as well, health predictions were elaborated for the year 9 and year 14 of the operation.

In the health risk prediction model, based on the changes of hazardousesubstances levels in the environment, it was assumed a linear correlation of the health status with the environmental conditions. In other words, an increase of hazardouses substances concentrations in the environment will result in a correlated increase of the diseases, while a decrease of hazardouse substances concentrations in the environment will result to a correlated decrease of the diseases in the investigated area.

The Rosia Montana area, with the 27 localities considered in the global current state of health description was divided into three zones, with zone 1 upstream of Rosia Montana, zone 2 downstream and zone 3 in Rosia Montana.

The zones assessed by the prediction model include the following localities (11 in number) where measurements and predictions of environmental pollutants were carried out:

Zone 1: Campeni, Bistra, Gura Rosiei, Carpenis;

Zone 2: Abrud, Corna, Gura Cornei, Bucium

Zone 3: Rosia Montana, Tarina, Balmosesti.

The same prediction model was used in the case of the ressetled population from Rosia Montana area to the new locality of Piatra Alba. The population exposed to the current levels of hazardouse substances in Zone 3 will be exposed to a lower levels of those hazardouse substances as aresult of the ressetlement process. The predictions were processed taking into account the health baseline (prevalence of the investigated diseases) and the environmental measurements and predictions of the investigated hazardouse substances.

Exposure was characterised for each locality included in the study, by calculating the geometric averages for hazardouse substances concentrations in the soil, groundwater and surface water (As, Cd, Cr, Ni, Hg, Pb) and cyanides in the soil. Averages were calculated for the air pollutants (NO2, SO2, suspended particles - PM10).

The relation between environmental conditions and health status in Rosia Montana area and the other investigated areas, for the current situation (baseline, year 0) was expressed by the correlation coeficients.

Area 3 repressented by Rosia Montana was characterised in terms of health related environment (as a baseline) by the following:

**Risk in Zone 3 in year 0**

### *6.6.1 Pollutants in the SOIL:*

The risk to develop hypertension is statistically significant correlated to the level of chromium (Cr), cadmium (Cd) and mercury (Hg) in the enviroment, and Cd concentrations in the soil increase the risk of osteoporosis and urolithiasis, and Hg of polyneuropathies. Correlation and statistical significance ($p<0.05$ is statistically significant).

- Cr - HTA (p=0.042)
- Cd - HTA (p=0.042)
- Hg - HTA (p=0.019)
- Cd - osteoporosis (p=0.0001)
- Cd - urolithiasis (p=0.0001)
- Hg - polyneuropathy (p=0.023)

### *6.6.2 Pollutants in the surface WATER:*

Hypertension is correlated with arsenic (As) and lead level in surface waters, while anaemias with lead in environment.

- As - HTA (p=0.042)
- Pb - HTA (p=0.042)
- Pb - anaemias (p=0.0001)

### *6.6.3 Pollutants in the ground WATER:*

Hypertension is correlated with arsenic (As) level in ground waters, while cerebrovascular diseases with Pb in environment.

- As - HTA (p=0.042)
- Pb-cerebrovascular diseases (p= 0.017)

#### 6.6.4 Pollutants in the AIR:

There is a significat increased of chronic bronchitis, asthma and HTA correlated to the concentration of particullate matter 10 microns in diameter, while chronic bronchitisincrease with the increase of Sulphur dioxide (SO2).

- SO2 – chronic bronchitis (p= 0.0001)
- PM10 – chronic bronchitis (p= 0.0001)
- PM10 – asthma (p= 0.0001)
- PM10 - HTA (p=0.042)

#### 6.6.5 Risk in the whole Rosia Montana area (Zone 1+2+3) in year 0

When health related approach is refered to the entirely area there is one significant correlation between hypertension and arsenic in soil.

- As-HTA (p= 0.011)

**Risk in Zone 1 in year 0** There were no statistically significant correlatons.

**Risk in Zone 2 in year 0** There were no statistically significant correlatons.

**CYANIDE CONCENTRATIONS** in the soil for all the areas did not show statistically significant correlations for any of the investigated diseases.

#### 6.6.6 Prediction for the Rosia Montana area (in the three zones) in year 9 and year 14 of the operation

Predictions were performed for the global zone (zone 1+2+3) showing the disease (prevalence) trend in each of the three zones included (zone 1, zone 2, zone 3).

All the situations where correlation between exposure (pollutant concentration) and the disease were positive in year 0 were considered, even if not statistically significant.

Population exposure in zones 1 and 2 was calculated as follows: to the year 0 concentrations, we added the concentrations for years 9 and 14, generated from the operations, for all the air, water and soil pollutants.

Exposure for the population remaining in zone 3 (Rosia Montana historic area) was evaluated considering the environmental estimations received, i.e. that 50% of the population will be ressetled and as a consequence, the background pollution from socio-economic activities in the community will be reduced by 50%. To this was added the pollution from estimated operation in years 9 and 14.

Drinking water sources will be controlled (central water supply) and exposure to pollutants in the surface and ground water will be controlled and avoid.

The predicted values of pollutants in the soil were estimated by the environmental assessor.

Disease prevalence in zones 1 and 2 **decreased** as follows:

- Prevalence of asthma in relation to sulphur dioxide, respirable particles, chromium in soil
- Prevalence of hypertension in relation to lead in groundwater, mercury, arsenic in the soil, respirable particles
- Prevalence of ischaemic heart disease in relation to lead in groundwater, mercury, arsenic in the soil

- Prevalence of cerebrovascular diseases in relation to lead in groundwater and surface waters, mercury, arsenic in the soil
- Prevalence of diabetes mellitus in relation to chromium in soil
- Prevalence of urolithiasis in relation to cadmium in soil

Disease prevalence **in zones 2 and 3** **increased in years 9 and 14** as follows:

In Zone 2 (Abrud)

- Prevalence of anaemia increases in relation to lead in groundwater and lead in the soil from 0.62 to 0.75
- Prevalence of dermatitis increases in relation to chromium in soil from 0.06 to 0.17

In Zone 3 (RM all the 3 localities if the population stays in place)

- Prevalence of polyneuropathies increases in relation to mercury in soil from 0.14 to 0.38

### *6.6.7 Prediction for the Rosia Montana area (historic area) in year 9 and year 14 of the operation*

The predictions consider current prevalence of diseases in RM, assimilated to disease prevalence in RM (historic area). The prediction is for the remaining population after ressetlement.

**Disease prevalence decreases in the predictions for years 9 and 14 as follows:**

- Prevalence of asthma in relation to chromium in soil
- Prevalence of HTA in relation to lead, cadmium, mercury, arsenic in soil
- Prevalence of ischaemic heart disease in relation to lead, cadmium, mercury, chromium, arsenic in soil
- Prevalence of anaemias in relation to lead in soil
- Prevalence of dermatitis in relation to chromium in soil
- Prevalence of diabetes mellitus in relation to chromium in soil
- Prevalence of bone structure diseases in relation to cadmium and lead in soil

**Disease prevalence decrease tremendiously in the predictions for years 9 and 14 as follows:**

- Chronic bronchitis in relation to SO2 and PM10
- Asthma in relation to SO2 and PM10
- HTA in relation to Pb in surface and ground water, As in surface and ground water, PM10
- Chronic ischaemic heart disease in relation to Pb in surface and ground water, As in surface and ground water, PM10
- Cerebrovascular diseases in relation to Pb in surface and ground water, As in surface and ground water
- Anaemias in relation to Pb concentrations in the surface and ground water

**Disease prevalence <u>does not very</u> in the predictions for years 9 and 14 in the case of:**

- Prevalence of polyneuropathies in relation to mercury in soil

**Disease prevalence <u>increases</u> in the predictions for years 9 and 14 for:**

- Prevalence of cerebrovascular disease increases insignificantly in relation to cadmium, mercury, arsenic in soil, from 4.16 to 4.17
- Prevalence of urolithiasis increases insignificantly in relation to chromium in soil from 0.65 to 0.66

### *6.6.8 Predictions For The Ressetled Population Of Rosia Montana To The New Locality Of Piatra Alba For Various Diseases In The Case Of Exposure To Diferent Environmental Pollutants In Year 9 And Year 14 Of Operation*

Prevalence of the investigated diseases showed a decrease of prevalence in the case of ressetled population from zone 3 elsewhere, in this case to the new locality of Piatra Alba.

This will mainly be achieved by controlling drinking water supply from a controlled source and decreased exposure to surface water contaminants, due to the hilly surface area. Air pollutant will also be below detection limits, as the area is forested.

Population exposure to environmental pollutants will be dramatically decreased.

**Thus, disease prevalence <u>decreases</u> in the predictions for years 9 and 14 as follows:**

- Prevalence of HTA in relation to lead in soil
- Prevalence of ischaemic heart disease in relation to lead, mercury, in soil
- Prevalence of cerebrovasclar diseases in relation to mercury in soil
- Prevalence of anaemias in relation to lead in soil
- Prevalence of bone structure diseases in relation to lead in soil

**Disease prevalence <u>decresed tremendiously</u> in the predictions for years 9 and 14 as follows:**

- Chronic bronchitis in relation to SO2 and PM10
- Asthma in relation to SO2 and PM10
- HTA in relation to Pb in surface and ground water, As in surface and ground water, PM10
- Chronic ischaemic heart disease in relation to Pb in surface and ground water, As in surface and ground water, PM10
- Cerebrovascular diseases in relation to Pb in surface and ground water, As in surface and ground water
- Anaemias in relation to Pb concentrations in the surface and ground water

## 6.7 Conclusions

1) There are significant positive correlations between the environmental conditions (represented by certain concentrations of the investigated hazardous substances) and the health status of the population (characteristic diseases for the investigated exposures) in Rosia Montana area compared to vecinity and farther away areas, where such correlations were not identified.
2) Decreasing exposure of the investigated population (as represented by the environmental assessor in the spatial distribution of the substances of concern) most of the cases result in a significant positive change, sometimes nonsignificantly negative with regard to predicted prevalence in zones 1 and 2 (farther away from Rosia Montana – see discussions).
3) Decreasing exposure of the investigated population (as represented by the environmental assessor in the spatial distribution of the substances of concern) most of the cases result in a significant and/or strongly significant positive change, sometimes nonsignificantly negative with regard to predicted prevalence in Rosia Montana area. As compared to zones 1 and 2, the decrease of predicted prevalence is more obvious.
4) Decreasing exposure of the investigated population (as represented by the environmental assessor in the spatial distribution of the substances of concern) most of the cases result in a significant, and strongly significant positive change of the predicted prevalence for the ressetlement area of Piatra Alba.

# 7 Noise

## 7.1 The Noise Situation in the European Union

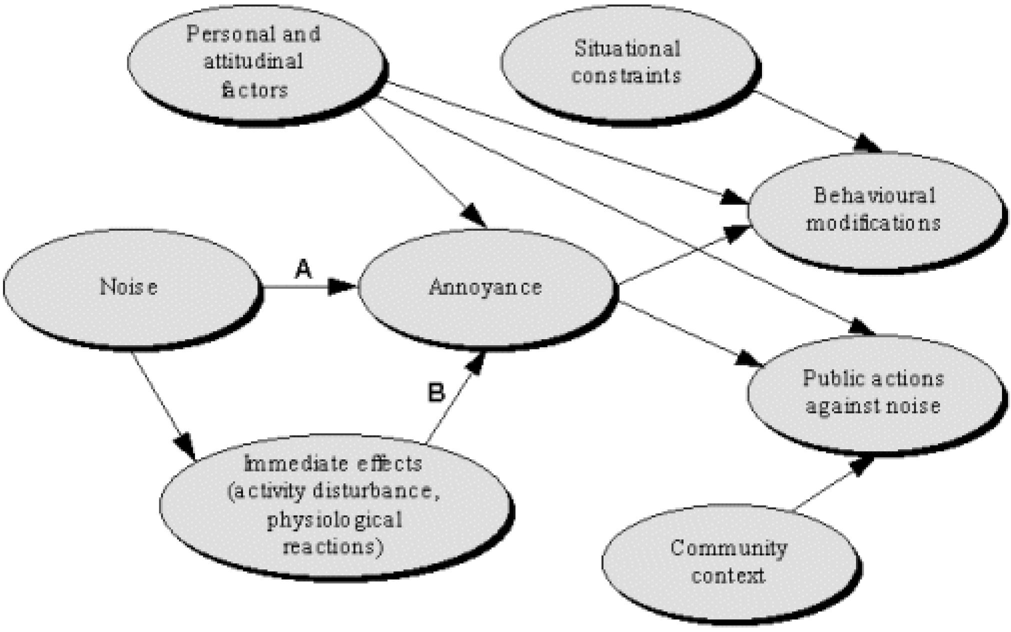
The data available on noise exposure is generally poor in comparison to that collected to measure other environmental problems and often difficult to compare due to the different measurement and assessment methods. However it has been estimated that around 20 percent of the Union's population or close on 80 million people suffer from noise levels that scientists and health experts consider to be unacceptable, where most people become annoyed, where sleep is disturbed and where adverse health effects are to be feared. An additional 170 million citizens are living in so-called 'grey areas' where the noise levels are such to cause serious annoyance during the daytime.

Most Member States have adopted legislation or recommendations setting immission limits for noise exposure in sensitive areas. These are often integrated into national abatement laws and used in land use plans especially for new infrastructure developments. A survey done for the Commission has shown a considerable degree of convergence between Member States in the establishment of such quality criteria for road, rail and industrial noise. The situation for aircraft noise indices and exposure levels is more divergent.

## 7.2 Annoyance

Annoyance has been defined as *"a feeling of displeasure evoked by a noise"* (WHO 80) It is the most common and most researched effect of noise on people and can often be related to the potentially disruptive effects of intrusive noise on a broad range of activities, although people can be annoyed by noise simply because they feel it to be inappropriate to the situation in which it is heard. It can only be measured by a subjective report, although techniques have been investigated based on observing behaviour assumed to be related to annoyance. Noise annoyance is simple in concept, but since it can only be defined subjectively, comparative studies are often defeated to some extent by the problems of comparing annoyance scales using different verbal or numeric descriptors. The extent of noise annoyance, however described or reported, is clearly influenced by numerous non-acoustic factors such as personal, attitudinal, and situational factors in addition to the amount of noise per se.

**Figure 7.1. Noise annoyance in a community setting (from NELSON 87)**



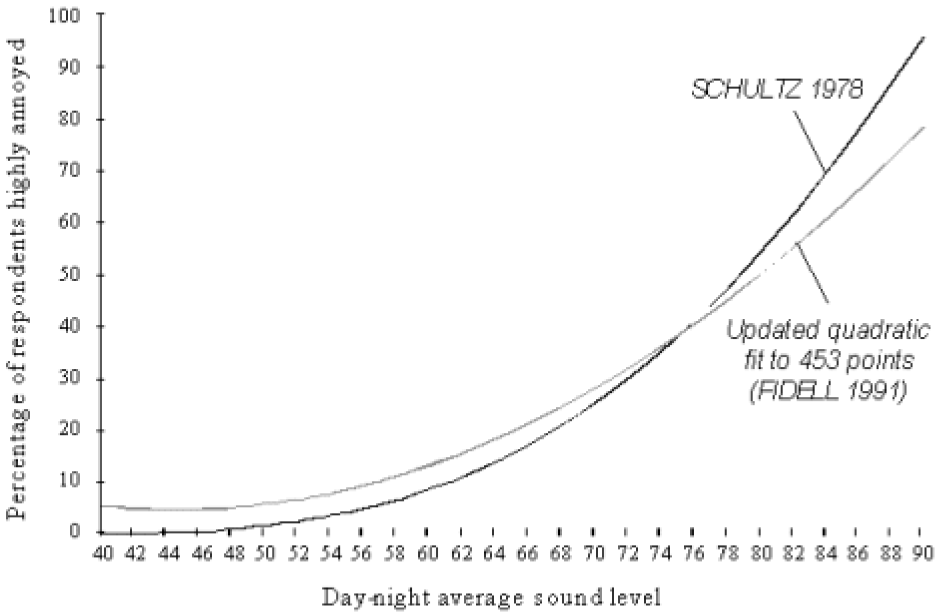

### *7.2.1 Noise Threshold Level which Affect Health*

Both field and laboratory data has been used to derive a number of standard dose-effect curves showing very little response at around 40 LDN up to around 100% highly annoyed at around 90 LDN.

Figure 7.2 shows the Schultz curve and its later update relating percent highly annoyed to day-night average sound level (FIDELL, 91).

All curves follow the same generic shape regardless of the particular effect being considered. Due to the scatter of individual data points above and below the curves, the precise shape is often determined more by the method of statistical analysis used than by the actual data. In principle however, noise effects are, or can be assumed to be, low or negligible at low noise levels. At increasing noise levels the effects start to increase slowly at first and then more rapidly. Finally the upper end of the effects scale flattens out at 100%. It is meaningless to consider further increases in the effects of noise above this point where 100% of the population are affected or where individuals are 100% affected.

**Figure 7.2. Percentage highly annoyed versus noise level (from FIDELL 91)**




Guideline threshold noise exposure values below which reviews report that an effect is unlikely to be observed presented below in Table 7-1).

Explicatie semnificatii: *1 (IEH 97), guideline value is the value above which an observable effect might be expected; *2 (NETHERLANDS 97), guideline value is the value of the lowest exposure at which on average an effect has been observed in epidemiological studies; *3 (MORREL 97); *4 (BERGLUND 96), value is based on (BERGLUND 95) and indicates the value above which an effect is observed

## 7.3 Linking the Actual Effects of Noise to an Overall Impact on Health

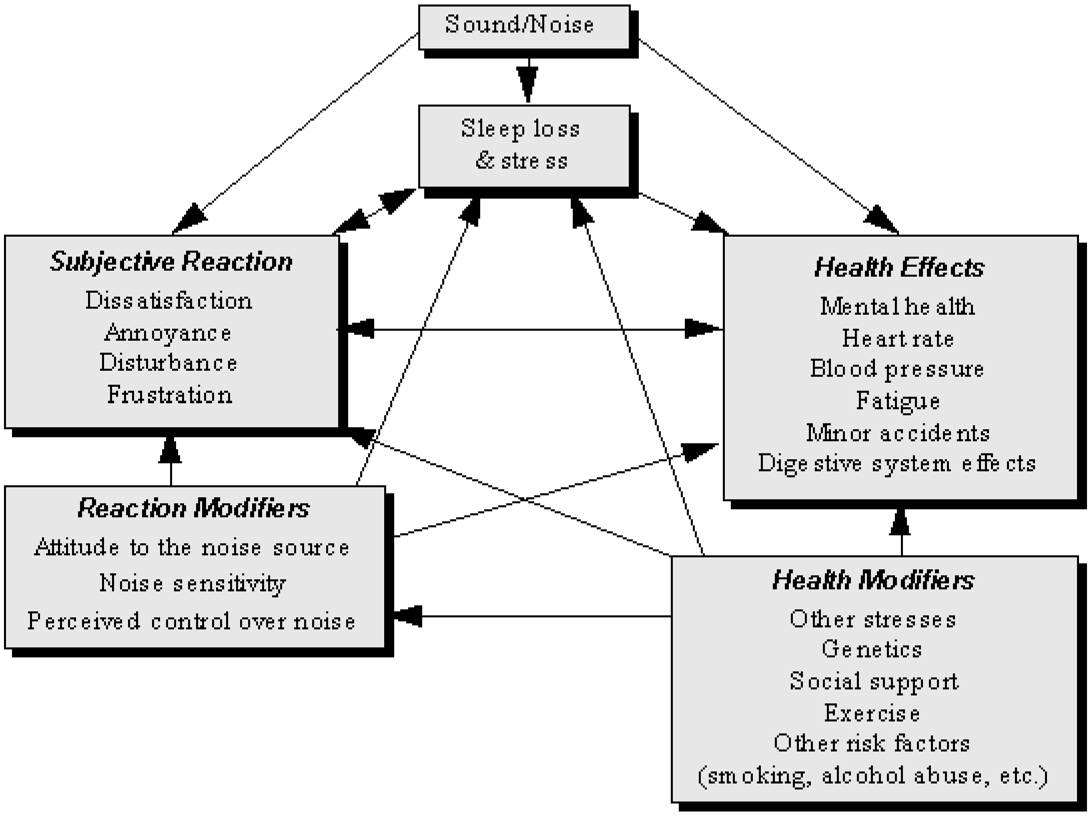
The actual situation is rather more complex. Exposure can lead to more than one effect, and community impacts depend on multiple effects.

There is no agreed method to combine everything into an overall response, even if this were meaningful when taken out of the context of the many and varied social and economic factors that often have much greater health impacts. Most reviewers avoid this problem completely by considering each effect separately, but this is not by any means a satisfactory solution (Figure 7.3).

**Table 7-1. Guideline threshold noise exposure values below which reviews report that an effect is unlikely to be observed**

| Effect | Guideline threshold value (dB(A)) |
|---|---|
| Annoyance | 40 (LAeq,24h: transportation noise) *1<br>42 (Ldn: outdoors) *2<br>55 (dB LAeq: outdoors, few seriously annoyed below this value) |
| | |
| speech communication | 45-55 (dB LAeq :for elderly or impaired)*4<br>55-65 (dB Laeq) *4 |
| | |
| | |
| Sleep | 30 (dB Lamax - for continuous noise to avoid serious effects) *4<br>45 (dB Lamax - for low background and non-continuous noise) *4 |
| | |
| waking during the night | 60 (SEL indoors) *1<br>60 (SEL indoors) *2<br>60 (dB LAmax )*4 |
| | |
| changes to sleep stages | 35 (SEL indoors) *2<br>40-45 (dB Lamax) *4 |
| | |
| subjective reports of sleep quality | 40 (LAeq, night) *1<br>40 (LAeq, night :outdoors)*2 |
| mood next day | 60 (LAeq, night) *1<br>60 (LAeq, night :outdoors)*2 |
| | |
| heart rate | 40 (SEL indoors) *2<br>45 (dB LAmax)*4 |
| | |
| Stress related health effects | |
| | |
| cardiovascular general effects | 65-75 (dB LAeq)*4 |
| | |
| hypertension | 70 (LAeq, 06-22h :outdoors for road and aircraft traffic noise in living environment) *2 |
| ischaemic heart disease | 70 (LAeq, :outdoors) *1<br>70 (LAeq,, 06-22h :outdoors for road and aircraft traffic noise in living environment) *2 |
| | |
| Hearing loss | 70 (LAeq, :indoors for living and recreational environment) *1<br>65-75 (dB LAeq: "negligible" risk for hearing loss for 8 hour exposure and 40 years age group) *4 |
| | |
| Performance | 55-65 (dB LAeq: for deteriorated reading acquisition in school children, people learning languages and the elderly)*4 |

**Figure 7.3. Inter-relationships**




It is debatable whether this really is a comprehensive model or merely a graphical representation of the various inter-relationships that need to be taken into account, but at least it shows that researchers are beginning to tackle some of these essentially quite difficult problems.

## 7.4 Balancing the Desirable and Affordable

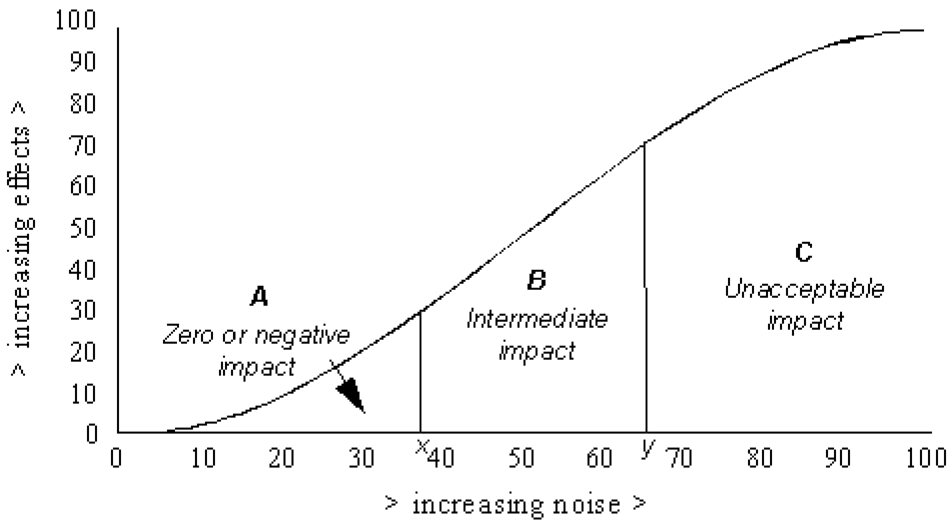
In general, practical noise targets or criteria are a compromise between the desirable and affordable. It is desirable for the noise environment to be as quiet as possible, but human activity itself generates sound. In setting targets we need to consider how much noise should be regarded as an acceptable by product of normal living.

Outcome class A: zero or negative noise impact where no action is required.

Outcome class B: intermediate noise impact in the range between zero and unacceptable outcome.

Outcome class C: completely unacceptable noise impact.

**Figure 7.4. Generic curve for noise effects versus noise exposure showing three assessment outcomes**




## 7.5 Guideline Values

The main premise underlying the two WHO-inspired noise guideline documents (1980 and 1995) is that excessive exposure to community and environmental noise damages health. It is well known that excessive noise exposure in an industrial context can damage hearing, but the true effects of community and environmental noise in a residential context are more controversial. The various WHO guideline values for the range of noise effects are given in Table 7-2.

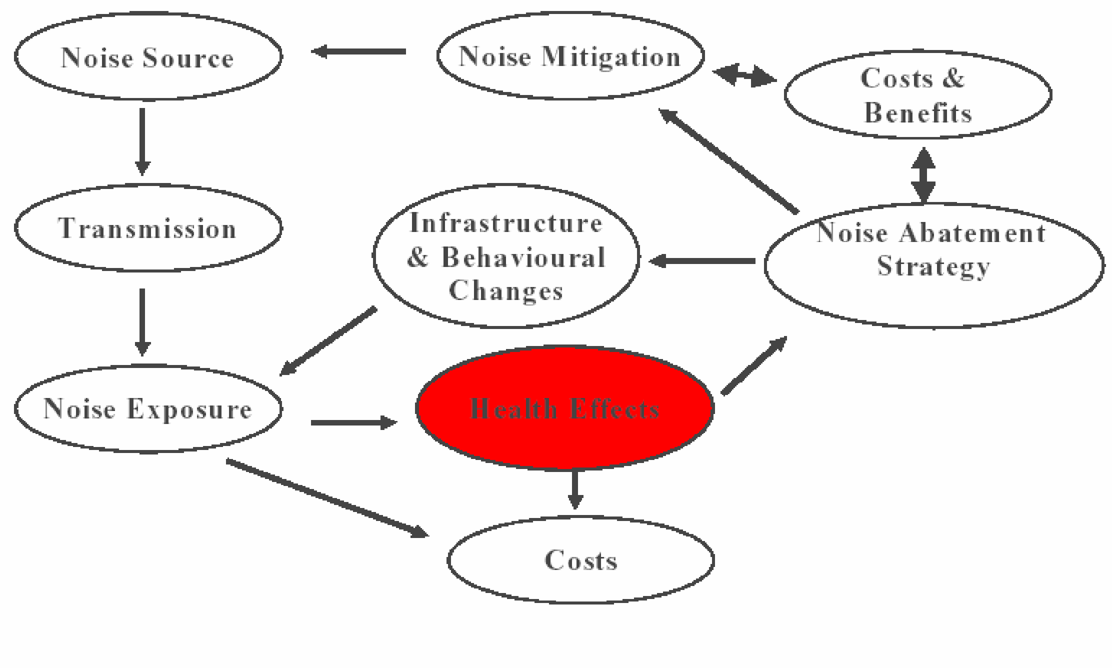
**Table 7-2. The WHO guideline values**

| Effect to be avoided | Effect criterion | 1980 | 1995 |
|---|---|---|---|
| speech interference | 100% intelligibility | 45 LAeq | 35 dBA |
| | reasonable intelligibility | | 45 dBA |
| | loud speech understood | | 55 dBA |
| | | | |
| noise induced hearing loss | negligible risk | 75 LAeq,8hrs | 75 LAeq,8hrs |
| | increasing risk | 140 dB | 130-150 dB(peak) |
| sleep disturbance | electrophysiological effects | 35 LAeq | 30 LAeq |
| | | | 45 LAmax |
| cardiovascular disease | | more research needed | More research needed |
| performance effects | cognitive tasks | | no specific criteria |
| | startle effects | | no specific criteria |
| | reading skills in children | | no specific criteria |
| thresholds of reported annoyance | moderate annoyance | | 50 LAeq |
| | serious annoyance | 50 LAeq | 55 LAeq |
| social behaviour | reduced helping behaviour | | 80 dBA |

## 7.6 Noise management

The goal of noise management is to maintain low noise exposure, such that human health and well-being are protected.

**Figure 7.5. Stages involved in the development of a noise abatement strategy**




The concept of environmental and environmental noise impact analysis is central to the philosophy of managing environmental noise. Such an analysis should be required before implementing any project that would significantly increase the level of environmental noise in a community (typically, greater than a 5 dB increase). The analysis should include: a baseline description of the existing noise environment; the expected level of noise from the new source; an assessment of the adverse health effects; an estimation of

the population at risk; the calculation of exposure-response relationships; an assessment of risks and their acceptability; and a cost-benefit analysis.

# Annex. Maps of the spatial distribution of acute and chronican diseases