DEATH-RATE IN EUROPE

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Rezumat

Mortalitatea populației în Europa

În articol este examinată influența a 14 factori asupra mortalității populației în 16 țări din Europa Occidentală din cauza bolilor neinvazive. Este determinat faptul că dezvoltarea industriei automobilelor influențează dăunător asupra sănătății femeilor. Consumul de alcool şi tutun majorează mortalitatea datorată unor boli neinvazive. Mortalitatea populației este determinată preponderent de factori ecologici.

***Cuvinte-cheie:** mortalitate, boală necontagioasă, influență, factor, mediu.*

Резюме

Смертность населения в Европе

В данной статье изучено влияние 14 факторов на смертность населения в 16 странах Западной Европы. Замечено, что развитие автомобильной промышленности отрицательно влияет главным образом на здоровье женщин. Употребление алкоголя влияет на смертность от рака и инсульта. Смертность населения определяется в основном экологическими факторами.

***Ключевые слова:** смертность, незаразная болезнь, влияние, фактор, среда.*

Introduction

In the following work we have regarded the influence of natural, ecological and technological development factors on the population mortality level as a result of different non-catching diseases.

For the analysis there have been used the statistical data received by Eurostat [1]. The analysis of correlation and regression concerning the influence of 13 factors on the mortality of 14 groups of patients in 16 countries of Western Europe has been carried out (Austria, Belgium, Denmark, Finland, France, Germany, Great Britain, Greece, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Sweden and Switzerland).

In total 3456 data observed during 8 years from 1983 to 1990 were included and processed [2]. Matrix of the initial data have 128 lines.

The author also wanted to introduce into the analysis the emission of CO into the atmosphere. The data about emission of CO are in the report [1], but they are rather incomplete. Some countries (Belgium, Germany and Greece) haven't presented the necessary information. In spite of the lack of information (matrix of the initial data have remained only in 104 lines), author has succeeded in introducing the factor of emission of CO, the factor, that is connected with the automobile industry development. It has been observed, that this factor has the most serious influence on cancer disease in general (the number of the deceased per year, 100000 inhabitants, woman). Two models have been constructed: a linear model, coefficient of multiple regression R=0,95619, t-criterion Student t(14)=9,738 and a multitude model, R=0,98426, t(14)=15,068. It has been observed that the factor of CO-emission has the most influence on women's diseases.

The research was carried out separately for men and women. Not only influences of separated factors have been studied, but also interaction of such factors as alcohol drinking and smoking with other factors.

Ecological factors, in absence of catching diseases, famine, and cold, have today become the main reason of population mortality, except Y_3 and Y_4 – cerebral vascular diseases (men and women), where principal importance have factors X_1 – alcohol consuming and X_{13} – climatic factor (precipitation level). This question have been mathematically proved in the following work.

Methods

For the analysis there have been used the statistical methods of multiple correlation and regression. There have been used two matrix X of initial data:

1) with 128 lines (number of observation) and 13 columns (factors);
2) with 104 lines and 14 columns.

Interpretation of the function and factors

I. ***The function (depended variables)***

Y_1 – cardiac diseases (num. of the deceased per year per 100000 inhabitants, men);

Y_2 – cardiac diseases (num. of the deceased per year per 100000 inhabitants, women);

Y_3 – cerebral vascular diseases (num. of the deceased per year per 100000 inhabitants, men);

Y_4 – cerebral vascular diseases (num. of the deceased per year per 100000 inhabitants, women);

Y_5 – cancer in general (num. of the deceased per year per 100000 inhabitants, men).

Y_6 – cancer in general (num. of the deceased per year per 100000 inhabitants, women);

Y_7 – cancer of the lungs, trachea and bronchial tubes (num. of the deceased per year per 100000 inhabitants, men);

Y_8 – cancer of the lungs, trachea and bronchial tubes (num. of the deceased per year per 100000 inhabitants, women);

Y_9 – urinary and genital organs diseases (num. of the deceased per year per 100000 inhabitants, women);

Y_{10} – urinary and genital organs diseases (num. of the deceased per year per 100000 inhabitants, men);

Y_{11} – support and locomotors system diseases (num. of the deceased per year per 100000 inhabitants, men);

Y_{12} – support and locomotors system diseases (num. of the deceased per year per 100000 inhabitants, women);

Y_{13} – respiratory organs diseases (num. of the deceased per year per 100000 inhabitants, men);

Y_{14} – respiratory organs diseases (num. of the deceased per year per 100000 inhabitants, women)

II. ***The factors (independent variables)***

X_1 – alcohol consuming (in litres per 1 inhabitant per year).

X_2 – cigarette consuming (in tens of cigarettes per 1 inhabitant per year).

X_3 – number of divorces (per 1000 inhabitants per year).

X_4 – population density (num. inhabitants per square km of the area).

X_5 – emission of SO_2 in atmosphere (in kg per 1 inhabitant per year).

X_6 – emission of NO_2 in atmosphere (in kg per 1 inhabitant per year).

X_7 – emission of CO_2 in atmosphere (in tons per year).

X_8 – general use of mineral fertilizers (in tons per 1 square km).

X_9 – use of insecticides (in tens of tons per year).

X_{10} – use of herbicides (in tens of tons per year).

X_{11} – standard of living (pure internal product in mil. ECU per 1000 inhabitants.).

X_{12} – climatic factor (medium temperature in October-March, (minimum values + 10).

X_{13} – climatic factor (precipitation level in mm).

X_{14} – emission of CO in atmosphere (in kg per 1 inhabitant per year).

Results

Regression equations (linear models)

$$Y_1 = 296.195 + 0.570X_1 - 0.417X_2 + 11.601X_3 - 0.685X_4 + +1.277X_5 + 1.356X_6 + 0.130X_7 + 2.696X_8 + 0.002X_9 - 0.047X_{10} + 0.391X_{11} - 3.003X_{12} - 0.053X_{13} \quad (1)$$

$$Y_2 = 117.286 + 1.942X_1 - 0.177X_2 + 3.346X_3 - 0.312X_4 + 0.505X_5 + 1.010X_6 + 0.067X_7 + 1.114X_8 + 0.001X_9 - 0.023X_{10} - 0.503X_{11} - 1.153X_{12} - 0.027X_{13} \quad (2)$$

$$Y_3 = 199.664 + 4.961X_1 - 0.087X_2 + 5.837X_3 - 0.114X_4 - 0.021X_5 + 0.217X_6 - 0.028X_7 - 0.784X_8 - 0.013X_9 - 0.010X_{10} - 9.262X_{11} - 2.497X_{12} + 0.031X_{13} \quad (3)$$

$$Y_4 = 171.535 + 1.427X_1 + 0.047X_2 + 3.942X_3 + 0.004X_4 + 0.009X_5 + 0.217X_6 - 0.026X_7 - 0.685X_8 - 0.103X_9 - 0.007X_{10} - 8.042X_{11} - 1.335X_{12} + 0.024X_{13} \quad (4)$$

$$Y_5 = 186.022 + 2.326X_1 - 0.070X_2 + 4.193X_3 + 0.125X_4 + 0.890X_5 - 1.208X_6 - 0.017X_7 + 0.934X_8 - 0.002X_9 + 0.010X_{10} + 3.796X_{11} - 2.033X_{12} - 0.005X_{13} \quad (5)$$

$$Y_6 = 64.546 + 2.890X_1 + 0.016X_2 + 1.784X_3 + 0.002X_4 + 0.293X_5 + 1.074X_6 - 0.186X_7 + 0.521X_8 - 0.004X_9 - 0.007X_{10} - 0.623X_{11} - 0.576X_{12} + 0.004X_{13} \quad (6)$$

$$Y_6(CO) = 119.121 - 1.812X_1 + 0.032X_2 - 2.093X_3 + 0.062X_4 + 0.570X_5 - 0.922X_6 + 0.028X_7 + 0.501X_8 - 0.003X_9 - 0.008X_{10} + 0.768X_{11} - 0.118X_{12} + 0.007X_{13} + 0.210X_{14} \quad (7)$$

$$Y_7 = 59.927 - 1.117X_1 + 0.027X_2 + 1.787X_3 + 0.128X_4 + 0.581X_5 - 0.663X_6 - 0.011X_7 + 0.469X_8 + 0.001X_9 + 0.002X_{10} + 1.402X_{11} - 1.058X_{12} - 0.011X_{13} \quad (8)$$

$$Y_7(CO) = 113.355 + 0.920X_1 - 0.125X_2 + 6.866X_3 + 0.044X_4 + 0.60X_5 - 1.710X_6 + 0.020X_7 + 0.854X_8 - 0.005X_9 + 0.004X_{10} - 2.593X_{11} - 2.186X_{12} + 0.017X_{13} - 0.032X_{14} \quad (9)$$

$Y_8 = -6.161 + 0.571X_1 - 0.005X_2 - 2.587X_3 - 0.007X_4 + 0.079X_5 + 0.334X_6 + 0.011X_7 + 0.034X_8 - 0.001X_9 - 0.003X_{10} + 0.066X_{11} + 0.535X_{12} - 0.002X_{13}$ (10)

$Y_8(CO) = 11.221 - 0.952X_1 - 0.018X_2 - 3.307X_3 + 0.020X_4 + 0.248X_5 - 0.464X_6 + 0.017X_7 + 0.059X_8 - 0.001X_9 - 0.004X_{10} + 0.721X_{11} + 0.541X_{12} + 0.002X_{13} + 0.077X_{14}$ (11)

$Y_9 = 15.705 - 0.450X_1 + 0.011X_2 + 0.313X_3 - 0.002X_4 + 0.033X_5 - 0.044X_6 - 0.005X_7 + 0.096X_8 + 0.001X_9 + 0.001X_{10} - 0.390X_{11} + 0.013X_{12} - 0.001X_{13}$ (12)

$Y_{10} = 24.876 - 0.663X_1 + 0.008X_2 - 1.122X_3 + 0.002X_4 + 0.034X_5 - 0.031X_6 - 0.058X_7 + 0.073X_8 + 0.001X_9 + 0.001X_{10} - 0.513X_{11} + 0.172X_{12} + 0.001X_{13}$ (13)

$Y_{11} = 574.350 + 5.188X_1 + 0.001X_2 + 37.891X_3 - 0.689X_4 + 1.763X_5 + 0.235X_6 + 0.016X_7 + 2.678X_8 - 0.011X_9 - 0.049X_{10} - 11.162X_{11} - 11.989X_{12} + 0.014X_{13}$ (14)

$Y_{12} = 389.477 + 2.388X_1 + 0.275X_2 + 20.177X_3 - 0.307X_4 + 0.544X_5 + 0.417X_6 - 0.010X_7 + 0.973X_8 - 0.005X_9 - 0.029X_{10} - 11.627X_{11} - 7.148X_{12} + 0.014X_{13}$ (15)

$Y_{13} = 117.028 + 1.990X_1 - 0.372X_2 - 11.801X_3 - 0.129X_4 + 1.083X_5 - 0.972X_6 + 0.059X_7 + 1.012X_8 + 0.001X_9 - 0.016X_{10} + 1.407X_{11} + 0.461X_{12} - 0.004X_{13}$ (16)

$Y_{14} = 55.384 + 0.066X_1 - 0.173X_2 - 8.790X_3 - 0.109X_4 + 0.475X_5 - 0.224X_6 + 0.035X_7 + 0.474X_8 - 0.001X_9 - 0.008X_{10} + 0.453X_{11} + 1.133X_{12} + 0.002X_{13}$ (17)

The given linear equations serve not so much for calculation and forecasting of sizes of death rate of the population depending on values of those or other factors, as for the determination of the importance of factors themselves. The importance of factors is determined, as is known by t criterion Student. The size of this criterion can change from – 1 up to + 1. We are only interested in positive values of the criterion, that is the more – the more. The more the value of the criterion, the more is the influence of the factor on a disease and on the death rate of the population. So that the data on ranging factors were authentic, it is necessary, that the equations were statistically significant. The importance of the equations is determined by the factors of plural correlation and determination which change from 0 up to 1. The higher these coefficients the more the importance of the models. The same purpose serve both Fisher's criterion and the residual sum of squares. Fisher's criterion should be maximal, while the sum of squares – minimal. The importance of the criterion of Fisher is checked with the help of the table.In table 1 have been presented the symbols concerning the quality of linear models.

From the *table 1* it is clear, that characteristics of the equations meet all requirements stated above. Coefficients of plural correlation and determination, are basically more than 0.9, Fisher's criteria are maximum and the residual sums of squares are minimal.

Table 1

Symbols, concerning quality of linear models

	Functions Y	*Multiple correlation coef. R*	*Multiple determina-Tion coef. R^2*	*F – criterion*	*Residual sum of squares $SS^2_{res.}$*
1	2	3	4	5	6
1	Y_1	0.950	0.903	81.49	120125.2
2	Y_2	0.929	0.863	55.16	35258.7
3	Y_3	0.938	0.879	64.06	28446.8
4	Y_4	0.950	0.903	80.46	15700.3
5	Y_5	0.938	0.879	63.64	19239.8
6	Y_6	0.789	0.622	14.45	29325.7
7	$Y_6(CO)$	0.956	0.914	67.83	3794.6
8	Y_7	0.952	0.906	84.47	6191.6
9	$Y_7(CO)$	0.963	0.927	81.52	3583.2
10	Y_8	0.696	0.485	8.25	4122.0
11	$Y_8(CO)$	0.921	0.848	35.43	804.0
12	Y_9	0.918	0.843	47.22	190.5
13	Y_{10}	0.903	0.815	38.68	448.1
14	Y_{11}	0.871	0.759	27.55	261798.0
15	Y_{12}	0.926	0.857	52.58	51932.9
16	Y_{13}	0.858	0.736	27.43	31777.2
17	Y_{14}	0.838	0.702	20.68	14463.1

In *table 2* have been presented factors' arrangement according to t-criterion of Student From the table it is clear that factors have decisive influence on diseases and death rate in the countries of Western Europe, as factors are placed in decreasing order. Basically, it is ecological factors.

For examples for Y_7 (CO) and Y_8 (CO) have been presented other forms models with symbols, concerning quality of this non-linear models and factors' arrangement according to t-criterion of Student.

Table 2

Factors' arrangement according to t-criterion of Student

Rank		1	2	3	4	5	6	7	8
Code	Y_1	X_4	X_8	X_{10}	X_5	X_{13}	X_2	X_7	X_{12}
t-crit.		-9.43	+8.972	-6.47	+4.88	-4.639	-4.07	+3.71	-3.04
Code	Y_2	X_4	X_8	X_{10}	X_{13}	X_5	X_2	X_6	X_{12}
t-crit.		-7.93	+6.846	-5.96	-4.36	+3.563	-3.19	+2.48	-2.16
Code	Y_3	X_{11}	X_9	X_1	X_{13}	X_8	X_{12}	X_{10}	X_2
t-crit.		-12.898	-6.482	+5.613	+5.530	-5.359	-5.201	-2.893	-1.735
Code	Y_4	X_{11}	X_9	X_8	X_{13}	X_{12}	X_{10}	X_1	X_7

t-crit.		-15.08	-6.840	-6.301	+5.753	-3.742	-2.701	+2.171	-2.042
Code	Y_5	X_5	X_8	X_{11}	X_{12}	X_4	X_6	X_{10}	X_1
t-crit.		+8.503	+7.769	+6.427	-5.150	+4.281	-4.022	+3.475	+3.196
Code	Y_6	X_8	X_1	X_6	X_5	X_{10}	X_9	X_{12}	X_{11}
t-crit.		+3.508	+3.218	+2.896	+2.266	-1.853	-1.753	-1.182	-0.855
Code	Y_6 (CO)	X_{14}	X_5	X_8	X_{10}	X_1	X_9	X_4	X_{13}
t-crit.		+9.738	+7.256	+5.941	-3.973	-3.029	-2.596	+2.495	+2.464
Code	Y_7	X_5	X_4	X_8	X_{12}	X_{13}	X_{11}	X_6	X_1
t-crit.		+9.781	+7.776	+6.878	-4.724	-4.428	+4.184	-3.890	-2.706
Code	Y_7 (CO)	X_8	X_{12}	X_5	X_6	X_{11}	X_{13}	X_9	X_2
t-crit.		+10.431	-8.336	+7.955	-7.821	+7.541	-5.916	+4.740	-4.032
Code	Y_8	X_{12}	X_6	X_{10}	X_7	X_1	X_3	X_5	X_9
t-crit.		+2.926	+2.472	-2.342	+1.722	+1.697	+4.184	+1.635	-1.441
Code	Y_8 (CO)	X_{14}	X_5	X_6	X_{11}	X_{12}	X_{10}	X_3	X_7
t-crit.		+7.801	+6.860	-4.480	+4.423	+4.357	-3.993	-3.662	+3.624
Code	Y_9	X_8	X_{11}	X_1	X_7	X_9	X_5	X_2	X_{13}
t-crit.		+8.00	-6.631	-6.228	-3.448	+3.262	+3.152	+2.59	-1.912
Code	Y_{10}	X_1	X_{11}	X_8	X_{10}	X_{12}	X_7	X_3	X_5
t-crit.		-5.972	-5.689	+3.998	+3.049	+2.847	-2.730	-2.201	+2.116
Code	Y_{11}	X_{12}	X_8	X_4	X_{11}	X_{10}	X_5	X_3	X_1
t-crit.		-8.232	+6.038	-6.417	-5.124	-4.632	+4.567	+3.076	+1.933
Code	Y_{12}	X_{11}	X_{12}	X_4	X_{10}	X_8	X_2	X_3	X_5
t-crit.		-11.99	-11.019	-6.421	-6.186	+4.925	+4.083	+3.678	+3.161
Code	Y_{13}	X_5	X_2	X_8	X_{10}	X_7	X_3	X_6	X_1
t-crit.		+8.049	-7.058	+6.549	-4.366	+3.311	-2.750	-2.520	+2.128
Code	Y_{14}	X_5	X_2	X_8	X_4	X_{10}	X_{12}	X_3	X_7
		+5.238	-4.864	+4.544	-4.308	-3.317	+3.310	-3.036	+2.408

The ecological factors in *table 2* are underlined.

Multiplicative models

$$Y_7 = 520.16380 \;.\; X_1^{0.22424} \;.\; X_2^{-0.06556} \;.\; X_3^{.0.06107} \;.\; X_4^{-0.10132} \;.\; X_5^{-0.03184} \;.\; X_6^{-0.01767} \;.\; X_7^{.0.13181} \;.\; X_8^{.0.45562} \;.\; X_9^{.0.18797} \;.\; X_{10}^{-0.29990} \;.\; X_{11}^{-0..00434} \;.\; X_{12}^{-0.08134} \;.\; X_{13}^{-0.37619} \;.\; X_{14}^{.0.02179} \quad (18)$$

$$Y_8 = 107.03780 \;.\; X_1^{-0.43287} \;.\; X_2^{0.01761} \;.\; X_3^{-0.23844} \;.\; X_4^{0.06121} \;.\; X_5^{-0.13531} \;.\; X_6^{-0.23908} \;.\; X_7^{0.35727} \;.\; X_8^{0.01261} \;..\; X_9^{-0.04151} \;.\; X_{10}^{-0.35210} \;.\; X_{11}^{-0.24263} \;.\; X_{12}^{0.06365} \;.\; X_{13}^{-0.18308} \;.\; X_{14}^{0.44958} \quad (19)$$

In *table 3* have been presented the symbols, concerning quality of this multiplicative models:

Table 3

The symbols, concerning quality of multiplicative model

	Functions Y	*Multiple correlation coef. R*	*Multiple determination coef. R^2*	*F – criterion Fisher*	*Residual sum of squares SS^2_{res}*
1	2	3	4	5	6
1	Y_7 (CO)	0.963	0.927	92.65	3152.9
2	Y_8 (CO)	0.981	0.962	175.54	175.5

This data show, that multiplicative models have the higher grade of quality then the linear models.

Table 4

Factors' arrangement according to t-criterion of Student for multiplicative models

Rank		1	2	3	4	5	6	7	8
Code	Y_7 (CO)	X_8	X_{13}	X_9	X_{10}	X_7	X_{12}	X_4	X_3
t-crit.		11.752	-10.14	+8.61	-8.514	+4.07	-4.022	-2.653	+2.49
Code	Y_8 (CO)	X_{14}	X_7	X_{10}	X_3	X_{13}	X_1	X_{11}	X_{12}
t-crit.		13.341	10.717	-9.715	-9.454	-4.798	-4.128	-3.671	+3.06

The ecological factors in *table 4* are underlined.

Mutual interaction influence

Models with mutual interaction influence X_1 and X_2 on other factors.

In *table 5* and *6* have been presented the coefficients of regression B and symbols, concerning quality of two models (Y_7 (CO) and Y_8 (CO)) with mutual interaction influence X_1 – alcohol consuming and X_2 – cigarette consuming on other factors. Thus the attempt is made to check up the influence of smoking and the use of alcohol on people's health in a different way, through the interaction with other factors.

Table 5

Model $Y_{7(CO)}$ with mutual interaction influence

Regression Summary for Dependent Variable: Y_7 (men)
R= .99530974 RI= .99064148 Adjusted RI= .98493864
F(39.64)=173.71 Std.Error of estimate: 2.6913

	BETA	**St. Err. of BETA**	**B coef. of regres.**	**St. Err. Of B**	**t(64)**	**p-level**
Intercept			-54.1967	66.78679	-0.81149	0.420093
X_1	-0.84791	0.915178	-5.52636	5.96479	-0.9265	0.357669
X_2	2.263655	1.131682	1.096297	0.548078	2.000257	0.049719
X_3	-0.45799	0.533488	-11.7589	13.69731	-0.85848	0.393831

X_4	-0.35975	0.699088	-0.08068	0.156782	-0.5146	0.608607
X_5	1.023282	0.39011	1.187943	0.452885	2.623057	0.010881
X_6	-1.06987	0.523818	-1.89844	0.929495	-2.04245	0.045232
X_7	0.81458	0.597524	0.077514	0.056859	1.36326	0.177577
X_8	1.895074	0.616664	1.975873	0.642956	3.073105	0.003111
X_9	2.193861	0.887182	0.030935	0.01251	2.472842	0.016071
X_{10}	-0.69374	0.831999	-0.0141	0.016915	-0.83382	0.407485
X_{11}	1.841475	0.428987	8.75902	2.040487	4.292612	6.1E-05
X_{12}	-0.39282	0.517273	-1.94689	2.563681	-0.75941	0.450394
X_{13}	-0.03234	0.332418	-0.00147	0.015093	-0.09728	0.922805
X_{14}	0.645892	0.3916	0.240162	0.145609	1.649366	0.103973
$X_1 X_2$	0.690948	0.507659	0.017631	0.012954	1.361049	0.178272
$X_1 X_3$	-0.91543	0.480325	-2.13147	1.118375	-1.90587	0.061161
$X_1 X_4$	1.80902	0.693080	0.0364	0.01393	2.61012	0.011259
$X_1 X_5$	-0.76317	0.455692	-0.0746	0.044543	-1.67474	0.098865
$X_1 X_6$	0.28217	0.299954	0.063273	0.06726	0.940711	0.35039
$X_1 X_7$	-0.38461	0.679244	-0.00292	0.005159	-0.56624	0.573213
$X_1 X_8$	-1.47725	0.48903	-0.13137	0.043487	-3.02079	0.003621
$X_1 X_9$	-0.64768	0.530015	-0.00062	0.000503	-1.222	0.22619
$X_1 X_{10}$	0.305359	0.532297	0.000392	0.000684	0.573662	0.568207
$X_1 X_{11}$	0.756149	0.570986	0.300023	0.226554	1.324287	0.190118
$X_1 X_{12}$	1.556546	0.514523	0.473246	0.156433	3.025225	0.003575
$X_1 X_{13}$	-1.04503	0.888399	-0.00298	0.002535	-1.1763	0.243831
$X_1 X_{14}$	0.579199	0.438141	0.01931	0.014608	1.321946	0.190892
$X_2 X_3$	1.58492	0.431296	0.219133	0.059632	3.674784	0.000489
$X_2 X_4$	-1.06847	0.645297	-0.00147	0.000887	-1.65578	0.102661
$X_2 X_5$	-0.08662	0.564526	-0.00055	0.003559	-0.15343	0.878542
$X_2 X_6$	0.192742	0.436059	0.00207	0.004684	0.442009	0.659973
$X_2 X_7$	-0.27023	0.929459	-0.00014	0.000468	-0.29073	0.772195
$X_2 X_8$	-0.09282	0.438339	-0.00051	0.002406	-0.21175	0.832975
$X_2 X_9$	-1.51356	0.569285	-0.00011	4.05E-05	-2.65871	0.009898
$X_2 X_{10}$	0.207456	0.815578	2.31E-05	9.06E-05	0.254367	0.800028
$X_2 X_{11}$	-2.93103	0.587494	-0.06316	0.01266	-4.98904	4.92E-06
$X_2 X_{12}$	-1.12704	0.568813	-0.02561	0.012925	-1.98139	0.051847
$X_2 X_{13}$	0.266668	0.814453	5.43E-05	0.000166	0.32742	0.744419
$X_2 X_{14}$	-1.48915	0.398289	-0.00315	0.000841	-3.73888	0.000397

Table 6

Model $Y_{8(CO)}$ with mutual interaction influence

Regression Summary for Dependent Variable: Y_8 (women)
R= 0.99463493 RI=0.98929865 Adjusted RI=0.98277751
F(39.64)=151.71 Std.Error of estimate: 0.94010

	BETA	St. Err. of BETA	B regr.coef.	St. Err. Of B	t(64)	p-level
Intercept			-81.1139	23.32959	-3.47687	0.000917
X_1	3.96315	0.978637	8.437827	2.083587	4.049664	0.000141
X_2	-0.32288	1.210153	-0.05108	0.191451	-0.26681	0.790471
X_3	0.754553	0.57048	6.328502	4.784668	1.322663	0.190655
X_4	1.413901	0.747563	0.103582	0.054766	1.891347	0.063105
X_5	0.20312	0.417161	0.077029	0.158199	0.486911	0.627985
X_6	-0.20154	0.56014	-0.11683	0.324686	-0.35981	0.720174
X_7	3.237547	0.638956	0.100638	0.019862	5.066933	3.68E-06
X_8	0.326906	0.659424	0.111341	0.224594	0.495744	0.621773
X_9	-0.62933	0.9487	-0.0029	0.00437	-0.66337	0.509479
X_{10}	0.582005	0.88969	0.003865	0.005909	0.654167	0.515348

X_{11}	0.925835	0.458733	1.438546	0.712772	2.018243	0.047761
X_{12}	2.082166	0.553141	3.371009	0.895531	3.764258	0.000365
X_{13}	0.731706	0.355468	0.010853	0.005272	2.058429	0.043625
X_{14}	-0.11877	0.418754	-0.01443	0.050863	-0.28362	0.777618
$X_1 X_2$	0.007177	0.54286	5.98E-05	0.004525	0.013221	0.989493
$X_1 X_3$	0.276858	0.513631	0.210576	0.390665	0.539021	0.591743
$X_1 X_4$	-2.03355	0.741138	-0.01335	0.004865	-2.74382	0.00787
$X_1 X_5$	-0.08204	0.48729	-0.00262	0.01556	-0.16835	0.866837
$X_1 X_6$	-0.00185	0.320753	-0.00014	0.023495	-0.00578	0.995406
$X_1 X_7$	-2.03385	0.726343	-0.00505	0.001802	-2.80013	0.006746
$X_1 X_8$	-0.37356	0.522939	-0.01085	0.015191	-0.71435	0.477608
$X_1 X_9$	0.708662	0.566766	0.00022	0.000176	1.250361	0.21572
$X_1 X_{10}$	-0.10899	0.569207	-4.6E-05	0.000239	-0.19148	0.848757
$X_1 X_{11}$	-1.9916	0.610578	-0.25814	0.079139	-3.26183	0.001777
$X_1 X_{12}$	-2.6687	0.5502	-0.26505	0.054644	-4.85042	8.23E-06
$X_1 X_{13}$	-1.60797	0.950001	-0.0015	0.000885	-1.6926	0.095395
$X_1 X_{14}$	0.681954	0.468522	0.007427	0.005103	1.455543	0.150407
$X_2 X_3$	-1.58609	0.461202	-0.07164	0.02083	-3.43903	0.001032
$X_2 X_4$	0.119501	0.690042	5.36E-05	0.00031	0.173179	0.863057
$X_2 X_5$	-0.03184	0.60367	-6.6E-05	0.001243	-0.05274	0.958104
$X_2 X_6$	0.113542	0.466295	0.000398	0.001636	0.243499	0.808398
$X_2 X_7$	-0.75573	0.993908	-0.00012	0.000163	-0.76036	0.44983
$X_2 X_8$	0.36569	0.468733	0.000656	0.000841	0.780166	0.438169
$X_2 X_9$	-0.18862	0.60876	-4.4E-06	1.42E-05	-0.30985	0.757683
$X_2 X_{10}$	-0.50365	0.87213	-1.8E-05	3.17E-05	-0.57749	0.565636
$X_2 X_{11}$	1.57695	0.628231	0.011101	0.004422	2.510142	0.014607
$X_2 X_{12}$	0.227037	0.608255	0.001685	0.004515	0.373259	0.710189
$X_2 X_{13}$	0.19941	0.870927	1.33E-05	5.79E-05	0.228963	0.819628
$X_2 X_{14}$	-0.19311	0.425906	-0.00013	0.000294	-0.4534	0.651791

Table 5 and *6* shows that mutual interactions don't have a high influence on Y_7 (CO) and Y_8 (CO).

Table 7 shows that the countries situation is: the worth situation in Denmark and the best situation in Switzerland (for Y_8 (CO)).

Table 7

The countries situation (functionY_8 CO)

No	X14t=7,8	X5t=6,9	X11t=4,4	X12t=4,3	X7t=3,6	Y8	The general num. of point
1	Spain 1086	Denmark 349	Switzerland 117,67	Denmark 98,6	Denmark 2381	Norway 124	Denmark 3826,69 (1)
2	Finland1062	Spain 320	Finland 115,22	Austria 97,6	Sweden 2135	France 116	Sweden 3702,92 (2)
3	Sweden 1045	France 319	Sweden 111,92	Nether- lands 96,3	Ireland 1916	Switzerland 116	Ireland 3429,25 (3)
4	U.K 1039	Nether- lands 301	Portugal 107,32	Portugal 95,1	Nether- lands 1732	Finland 110	Finland 3374,32 (4)
5	Switzerland 1034	Italy 295	Italy 104,00	Ireland 93,0	Austria 1731	Netherlands 109	Spain 3187,77 (5)
6	Italy 1015	Portugal 291	Spain 102,47	Switzer- land 91,3	Finland 1731	U.K. 109	Netherlands 3181,20 (6)
7	Portugal 998	U.K. 279	U.K. 101,03	Norway 88.7	Norway 1672	Italy 102	Norway 3168,34 (7)
8	Ireland 975	Finland 270	Norway 92,64	Sweden 88,0	Italy 1557	Denmark 101	Italy 3158,50 (8)
9	Norway 924	Norway 267	Ireland 91,25	Finland 86,1	Spain 1523	Sweden 100	Portugal 3084,42 (9)
10	France 919	Ireland 264	Austria 85,77	Italy 85,5	Portugal 1500	Portugal 93	Austria 2980,37 (10)
11	Netherlands 869	Austria 232	France 83,99	Spain 85,3	U.K. 1348	Austria 92	U.K. 2954,23 (11)
12	Denmark 829	Sweden 223	Netherlands 73,90	France 83,5	France 1195	Ireland 90	France 2716,49 (12)
13	Austria 742	Switzer- land 202	Denmark 68,09	U.K. 78,2	Switzer- land 1022	Spain 71	Switzerland 2582,97 (13)

Discussion

The harmful factors:

Y_1
1).X_8 – general use of mineral fertilizers (in tons per 1 square km).
2).X_5 – emission of SO_2 in atmosphere (in kg per 1 inhabitant per year).
3).X_7 – emission of CO_2 in atmosphere (in tons per year).

Y_2
1).X_8 – general use of mineral fertilizers (in tons per 1 square km).
2).X_5 – emission of SO_2 in atmosphere (in kg per 1 inhabitant per year).
3).X_6 – emission of NO_2 in atmosphere (in kg per 1 inhabitant per year).

Y_3
1).X_1 – alcohol consuming (in litres per 1 inhabitant per year).
2).X_{13} – climatic factor (precipitation level in mm).

Y_4
1).X_{13} – climatic factor (precipitation level in mm).
2).X_1 – alcohol consuming (in litres per 1 inhabitant per year).

Y_5
1).X_5 – emission of SO_2 in atmosphere (in kg per 1 inhabitant per year).
2).X_8 – general use of mineral fertilizers (in tons per 1 square km).
3).X_{11} – standard of living (pure internal product in mil. ECU per 1000 inhabitants).
4).X_4 – population density (num. inhabitant per square km of the area).
5).X_{10} – use of herbicides (in tens of tons per year).
6).X_{1-} alcohol consuming (in litres per 1 inhabitant per year).

Y_6
1).X_8 – general use of mineral fertilizers (in tons per 1 square km).
2).X_1 – alcohol consuming (in litres per 1 inhabitant per year).
3).X_6 – emission of NO_2 in atmosphere (in kg per 1 inhabitant per year).
4).X_5 – emission of SO_2 in atmosphere (in kg per 1 inhabitant per year).

Y_6 (CO)

1).X_{14} – emission of CO in atmosphere (in kg per 1 inhabitant per year).
2).X_5 – emission of SO_2 in atmosphere (in kg per 1 inhabitant per year).
3).X_8 – general use of mineral fertilizers (in tons per 1 square km).
4).X_4 – population density (num. inhabitant per square km of the area).
5).X_{13} - climatic factor (precipitation level in mm).

Y_7
1).X_5 – emission of SO_2 in atmosphere (in kg per 1 inhabitant per year).
2).X_4 – population density (num. inhabitant per square km of the area).
3).X_8 – general use of mineral fertilizers (in tons per 1 square km).
4).X_{11} – standard of living (pure internal product in mil. ECU for 1000 inhabitants).

Y_7 (CO)
1).X_8 – general use of mineral fertilizers (in tons per 1 square km).
2).X_5 – emission of SO_2 in atmosphere (in kg per 1 inhabitant per year).
3).X_{11} – standard of living (pure internal product in mil. ECU per 1000 inhabitants).
4).X_9 – use of insecticides (in tens of tons per year).

Y_8
1).X_{12} – climatic factor(medium temperature in October-March, minimum values + 10).
2).X_6 – emission of NO_2 in atmosphere (in kg per 1 inhabitant per year).
3).X_7 – emission of CO_2 in atmosphere (in tons per year).
4).X_1 – alcohol consuming (in litres per 1 inhabitant per year).
5).X_5 – emission of SO_2 in atmosphere (in kg per 1 inhabitant per year).

Y_8 (CO)
1).X_{14} – emission of CO in atmosphere (in kg per 1 inhabitant per year).
2).X_5 – emission of SO_2 in atmosphere (in kg per 1 inhabitant per year).
3).X_{11} – standard of living (pure internal product in mil. ECU per 1000 inhabitants).
4).X_{12} – climatic factor(medium temperature in October-March, minimum values + 10).
5).X_7 – emission of CO_2 in atmosphere (in tons per year).

Y_9
1).X_8 – general use of mineral fertilizers (in tons per 1 square km).

2).X_9 – use of insecticides (in tens of tons per year).
3).X_5 – emission of SO_2 in atmosphere (in kg per 1 inhabitant per year).
4).X_2 – cigarette consuming (in tens of cigarettes per 1 inhabitant per year).

Y_{10}

1).X_8 – general use of mineral fertilizers (in tons per 1 square km).
2).X_{10} – use of herbicides (in tens of tons per year).
3).X_{12} – climatic factor(medium temperature in October-March, minimum values + 10).
4).X_5 – emission of SO_2 in atmosphere (in kg per 1 inhabitant per year).

Y_{11}

1).X_8 – general use of mineral fertilizers (in tons per 1 square km).
2).X_5 – emission of SO_2 in atmosphere (in kg per 1 inhabitant per year).
3).X_3 – number of divorces (per 1000 inhabitant per year).
4).X_1 – alcohol consuming (in litres per 1 inhabitant per year).

Y_{12}

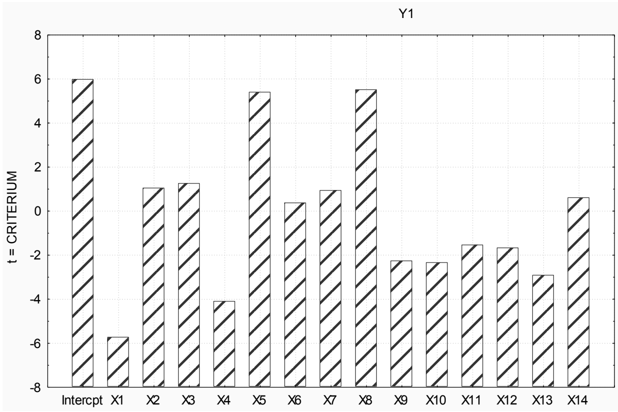
1).X_8 – general use of mineral fertilizers (in tons per 1 square km).
2).X_2 – cigarette consuming (in tens of cigarettes per 1 inhabitant per year)
3).X_3 – number of divorces (per 1000 inhabitant per year).
4).X_5 – emission of SO_2 in atmosphere (in kg per 1 inhabitant per year).

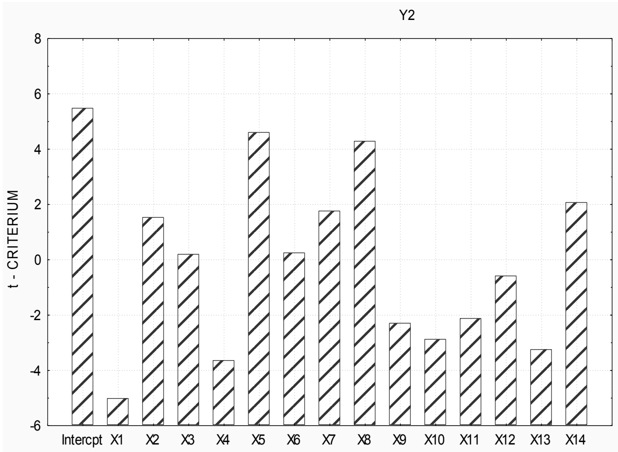
Y_{13}

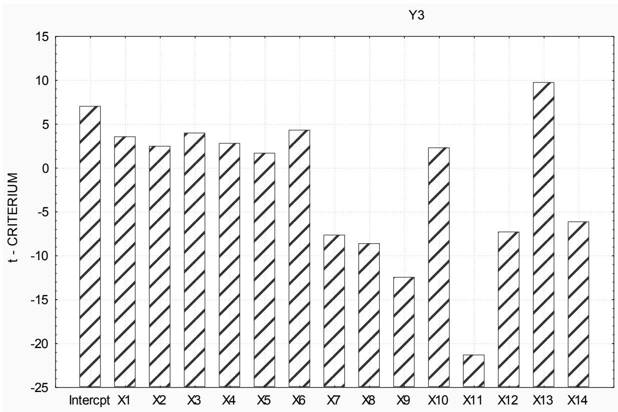
1).X_5 – emission of SO_2 in atmosphere (in kg per 1 inhabitant per year).
2).X_8 – general use of mineral fertilizers (in tons per 1 square km).
3).X_7 – emission of CO_2 in atmosphere (in tons per year).
4).X_1 – alcohol consuming (in litres per 1 inhabitant per year).

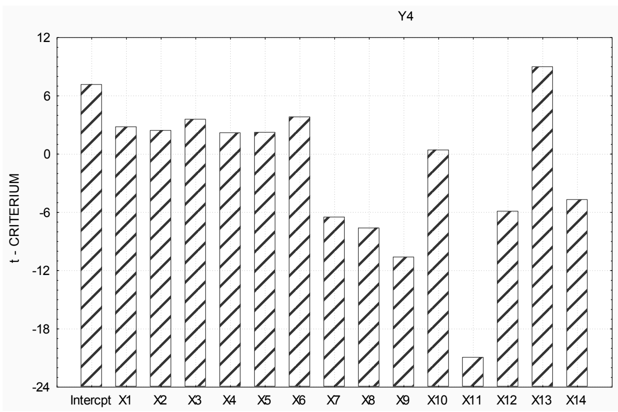
Y_{14}

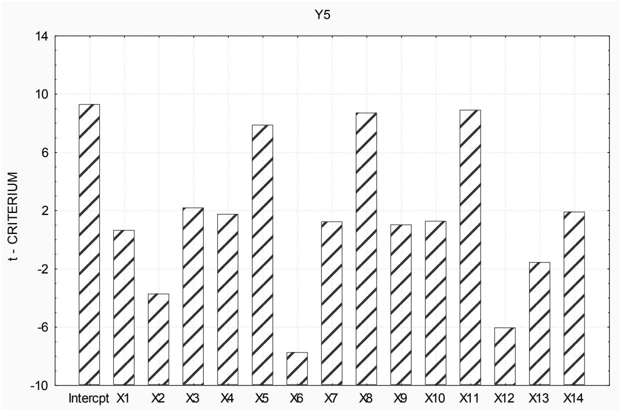
1).X_5 – emission of SO_2 in atmosphere (in kg per 1 inhabitant per year).
2).X_8 – general use of mineral fertilizers (in tons per 1 square km).
3).X_{12} – climatic factor(medium temperature in October-March, minimum values + 10).
4).X_7 – emission of CO_2 in atmosphere (in tons per year).

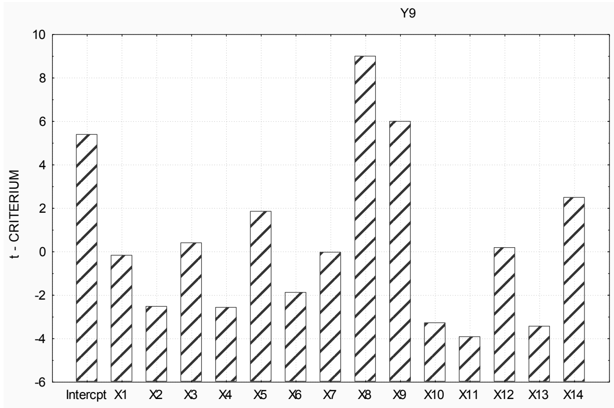


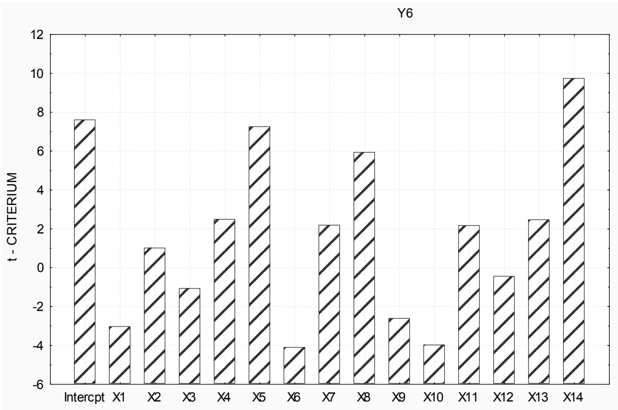


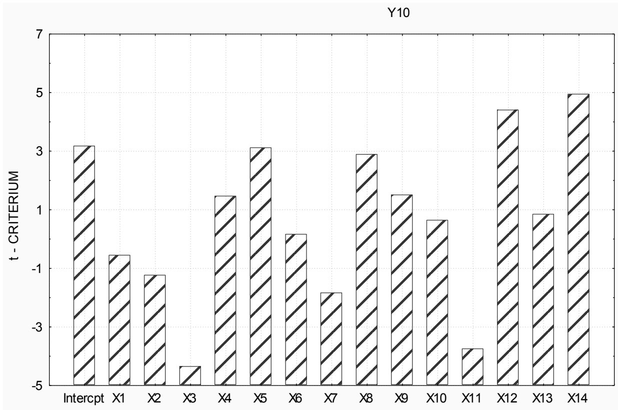


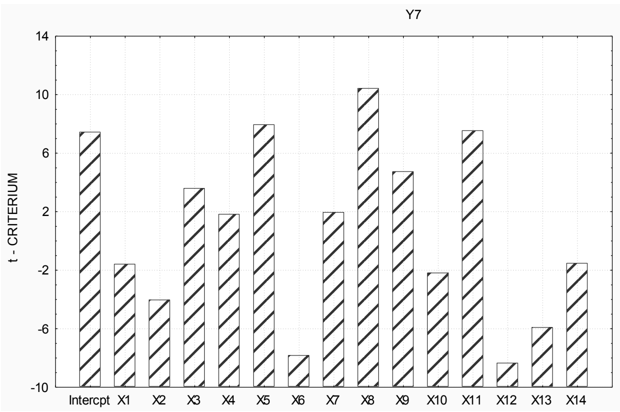


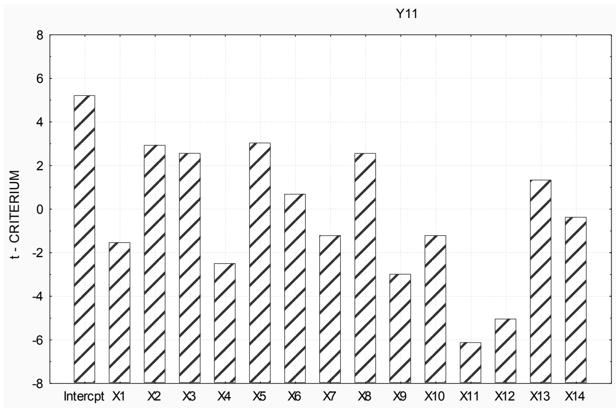

Y5
t - CRITERIUM
14
10
6
2
-2
-6
-10
Intercpt X1 X2 X3 X4 X5 X6 X7 X8 X9 X10 X11 X12 X13 X14

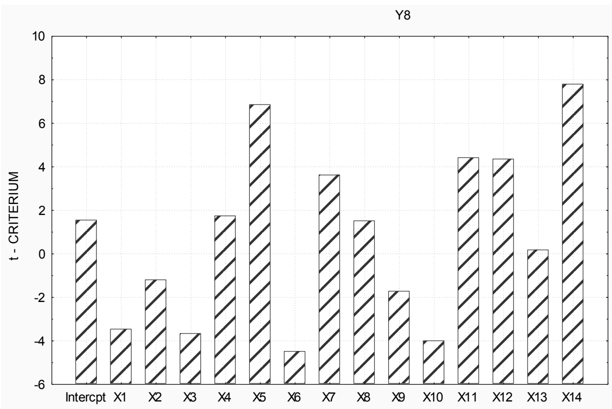

Y9
t - CRITERIUM
10
8
6
4
2
0
-2
-4
-6
Intercpt X1 X2 X3 X4 X5 X6 X7 X8 X9 X10 X11 X12 X13 X14

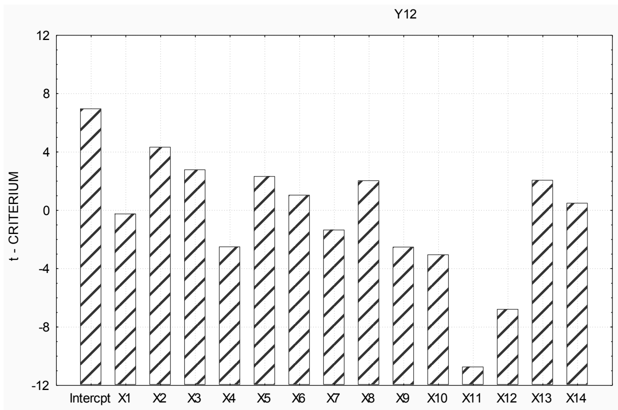

Y6
t - CRITERIUM
12
10
8
6
4
2
0
-2
-4
-6
Intercpt X1 X2 X3 X4 X5 X6 X7 X8 X9 X10 X11 X12 X13 X14

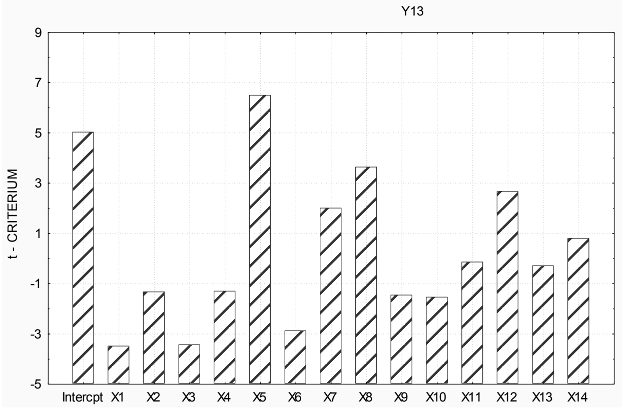

Y10
t - CRITERIUM
7
5
3
1
-1
-3
-5
Intercpt X1 X2 X3 X4 X5 X6 X7 X8 X9 X10 X11 X12 X13 X14


Y7
t - CRITERIUM
14
10
6
2
-2
-6
-10
Intercpt X1 X2 X3 X4 X5 X6 X7 X8 X9 X10 X11 X12 X13 X14


Y11
t - CRITERIUM
8
6
4
2
0
-2
-4
-6
-8
Intercpt X1 X2 X3 X4 X5 X6 X7 X8 X9 X10 X11 X12 X13 X14


Y8
t - CRITERIUM
10
8
6
4
2
0
-2
-4
-6
Intercpt X1 X2 X3 X4 X5 X6 X7 X8 X9 X10 X11 X12 X13 X14


Y12
t - CRITERIUM
12
8
4
0
-4
-8
-12
Intercpt X1 X2 X3 X4 X5 X6 X7 X8 X9 X10 X11 X12 X13 X14



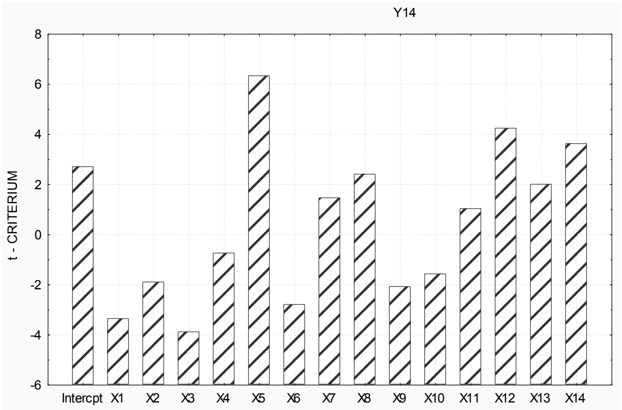


Fig. gives the graphical interpretation of factors' influence on dependent variables.

The influence of CO emission in atmosphere. Diseases, for which CO factor is statistically significant:

Y_2 – cardiac diseases (num. of the decease per year per 100000 inhabitants, women); t = 2,072,

Y_6 – cancer in general (num. of the decease per year per 100000 inhabitants, women); t = 9,738,

Y_8 – cancer of the lungs, trachea and bronchial tubes (num. of the decease per year per 100000 inhabitants, women); t = 7,801,

Y_9 – urinal and genital organs diseases (num. of the decease per year per 100000 inhabitants, women); t = 2,508,

Y_{10} –urinal and genital organs diseases (num. of the decease per year per 100000 inhabitants, men); t = 4,951,

Y_{14} – organs of respiration diseases (num. of the decease per year per 100000 inhabitants, women) t = 3,637.

We remind, that in the work are given all necessary symbols, concerning quality of models. They are:

R – multiple correlation coefficient, which varies from 0 to 1. Nearly for all models R is more than 0.9.

R^2 – multiple determination coefficient, which shows percentage of variability of Y functions dependent on selected combination of X factors. If R^2 is equal to 0.9 it means, that selected combination of X factors insures 90% of Y function variation.

SS^2_{res} – residual sum of squares may serve to compare the quality of prediction for different types of models for one and the same dependant variable Y. For example if we take Y_7 we can see that its residual sum of squares for the linear form is SS^2_{res} = 3583.195, but for the multiplicative form it's SS^2_{res} = 3152.934 consequently multiplicative form has better prediction quality (the less SS^2_{res}, the better).

Student t-criteria for each factor give the possibility to range factors according to their significance and to their influence on Y function. Table value t is: $t_{(89;\,5\,\%)}$ = 1.66.

Fisher F-criteria for each models give the possibility for estimation general quality of models. Table value F is: $F_{(13;89)}$ = 2.4. For all models in this work R is more than that. R shows how much higher the quality of model prediction is than simple medium meaning, so that the models reflect the real ecological situation in Western Europe.

Table 8

Results of calculation. Y_7 – linear model

Regression Summary for Dependent Variable: Y_7
R= ,96315056 RI= ,92765900 Adjusted RI= ,91627952
F(14,89)=81,520 p<,00000 Std.Error of estimate: 6,3451

	BETA	St. Err. of BETA	B	St. Err. of B	t(89)	p-level
Intercept			113,3539	15,22475	7,445372	5,88E-11
X_1	-0,14121	0,089217	-0,92038	0,581484	-1,58282	0,11701
X_2	-0,25848	0,064111	-0,12518	0,031049	-4,03169	0,000117
X_3	0,26743	0,074267	6,866259	1,906808	3,600919	0,000521
X_4	0,196176	0,107009	0,043996	0,023999	1,833266	0,070106
X_5	0,52293	0,065737	0,607077	0,076315	7,954867	5,38E-12
X_6	-0,96351	0,123202	-1,70972	0,218616	-7,82062	1,01E-11
X_7	0,208183	0,106442	0,01981	0,010129	1,955838	0,053621
X_8	0,819301	0,078542	0,854233	0,08189	10,43142	4,13E-17
X_9	0,357777	0,075481	0,005045	0,001064	4,739989	8,06E-06
X_{10}	-0,20169	0,092244	-0,0041	0,001875	-2,1865	0,031402
X_{11}	0,545222	0,072301	2,593363	0,343901	7,541005	3,76E-11
X_{12}	-0,44111	0,052917	-2,18618	0,262262	-8,33588	8,86E-13
X_{13}	-0,36667	0,061976	-0,01665	0,002814	-5,91631	6,02E-08
X_{14}	-0,08593	0,056372	-0,03195	0,020961	-1,52436	0,130964

Table 9

Predicted & Residual Values. Dependent variable: Y_7

	Value	Predicted Value	Residual	Standard Pred. V.	Standard Residual	Std.Err. Pred.Val	Mahalns. Distance	Deleted Residual	Cook's Distance
1	74	82,18976	-8,18976	0,586238	-1,29071	2,251714	11,98086	-9,36973	0,018307
2	55	62,52205	-7,52205	-0,34494	-1,18548	3,104094	23,66009	-9,88864	0,038752
3	63	67,09178	-4,09178	-0,12859	-0,64487	2,712543	17,83348	-5,0068	0,007586
4	74	71,0597	2,9403	0,059277	0,463394	2,506314	15,08001	3,483864	0,003136
5	84	87,71416	-3,71416	0,847795	-0,58536	2,385885	13,57274	-4,32578	0,004381
6	115	114,1812	0,818794	2,100897	0,129043	2,397476	13,71459	0,955159	0,000216
7	31	28,27637	2,723629	-1,96633	0,429247	3,418766	28,91121	3,837755	0,00708
8	103	99,34489	3,655113	1,39846	0,57605	2,395516	13,69055	4,262689	0,004289
9	73	66,21153	6,788467	-0,17026	1,06987	2,330448	12,90384	7,84699	0,013754
10	92	88,33395	3,666046	0,877139	0,577773	2,421054	14,00523	4,290727	0,004438
11	41	47,53741	-6,53741	-1,0544	-1,0303	2,489138	14,8605	-7,72645	0,015213
12	36	45,49655	-9,49655	-1,15103	-1,49667	2,133414	10,65371	-10,707	0,02146
13	74	62,84571	11,15429	-0,32962	1,757927	2,39269	13,65593	13,00332	0,039813
14	73	82,79201	-9,79201	0,614752	-1,54323	2,272561	12,22217	-11,2329	0,026802
15	58	60,70139	-2,70139	-0,43114	-0,42574	2,313931	12,70759	-3,11575	0,002138
16	65	64,46433	0,535667	-0,25299	0,084422	2,276627	12,26948	0,614817	8,06E-05
17	77	70,36007	6,639931	0,026153	1,04646	2,314229	12,71111	7,658727	0,01292
18	84	92,4109	-8,4109	1,070165	-1,32557	2,352846	13,1722	-9,75177	0,021652
19	117	123,1648	-6,16484	2,526233	-0,97159	2,684052	17,44013	-7,50837	0,016704
20	32	33,45042	-1,45042	-1,72136	-0,22859	2,776178	18,72705	-1,79381	0,00102
21	101	97,35867	3,641335	1,304421	0,573878	2,292002	12,44919	4,187759	0,003789
22	75	68,73206	6,267937	-0,05093	0,987833	2,251457	11,97791	7,170779	0,01072
23	87	88,42535	-1,42535	0,881467	-0,22464	2,409989	13,86848	-1,66564	0,000663
24	43	47,79525	-4,79525	-1,0422	-0,75574	2,438201	14,2184	-5,62597	0,007739
25	38	42,66346	-4,66346	-1,28516	-0,73497	2,183468	11,2065	-5,28986	0,005487
26	71	64,509	6,491005	-0,25087	1,022989	2,364685	13,31509	7,537934	0,013068
27	75	81,78079	-6,78079	0,566875	-1,06866	2,25695	12,04126	-7,76297	0,012625
28	59	60,86628	-1,86628	-0,42334	-0,29413	2,34163	13,0375	-2,16053	0,001053
29	66	63,15614	2,843864	-0,31492	0,448196	2,115728	10,46145	3,199606	0,001885
30	77	67,80347	9,196526	-0,09489	1,449382	2,141203	10,73889	10,37838	0,02031
31	86	87,48158	-1,48158	0,836783	-0,2335	2,478137	14,7207	-1,74824	0,000772
32	117	119,9921	-2,99209	2,376017	-0,47156	2,655621	17,05174	-3,6275	0,003817
33	35	38,94483	-3,94483	-1,46122	-0,62171	2,570105	15,90847	-4,71907	0,00605
34	100	96,47739	3,522614	1,262696	0,555168	2,283781	12,35295	4,046874	0,003513
35	71	65,59689	5,403107	-0,19936	0,851535	2,250792	11,97025	6,180852	0,00796
36	87	87,48941	-0,48941	0,837154	-0,07713	2,373256	13,41898	-0,56901	7,5E-05
37	44	47,31065	-3,31065	-1,06514	-0,52176	2,36465	13,31466	-3,84461	0,003399
38	37	43,67737	-6,67737	-1,23716	-1,05236	2,011345	9,359339	-7,42328	0,009169
39	73	66,79774	6,202255	-0,14251	0,977482	2,335425	12,96325	7,174153	0,011546
40	73	79,79341	-6,79341	0,472781	-1,07065	2,292683	12,45717	-7,81354	0,013199
41	60	60,75111	-0,75111	-0,42879	-0,11838	2,341707	13,03841	-0,86955	0,000171
42	68	64,02573	3,974266	-0,27375	0,626349	2,200472	11,39721	4,517587	0,004064
43	78	77,9985	0,001495	0,3878	0,000236	2,306596	12,62089	0,001723	6,5E-10
44	84	88,82459	-4,82459	0,900369	-0,76036	2,928323	20,94743	-6,13027	0,013254
45	117	116,0312	0,968842	2,188484	0,15269	2,465404	14,55966	1,141118	0,000326
46	35	42,59216	-7,59216	-1,28854	-1,19653	2,230417	11,73666	-8,66253	0,015353
47	97	97,78866	-0,78866	1,324779	-0,12429	2,227865	11,70756	-0,89956	0,000165
48	70	62,58805	7,411945	-0,34182	1,168131	2,07523	10,02724	8,299747	0,012201
49	80	80,4022	-0,4022	0,501605	-0,06339	2,255915	12,02931	-0,46039	4,44E-05
50	46	38,88971	7,110287	-1,46383	1,120589	2,206498	11,46515	8,088397	0,0131
51	35	41,60941	-6,60941	-1,33507	-1,04165	2,150717	10,84335	-7,46734	0,010608
52	72	73,16862	-1,16862	0,159126	-0,18418	2,14177	10,7451	-1,31889	0,000328

53	73	76,54729	-3,54729	0,319091	-0,55906	2,45416	14,41815	-4,17131	0,00431
54	63	59,54905	3,450947	-0,4857	0,543873	2,339523	13,01227	3,993911	0,003591
55	68	62,91689	5,083107	-0,32625	0,801103	2,264833	12,13245	5,825284	0,007159
56	70	73,36418	-3,36418	0,168385	-0,5302	2,225906	11,68524	-3,83629	0,002999
57	87	89,13618	-2,13618	0,915121	-0,33666	2,545743	15,58962	-2,54602	0,001728
58	114	109,1418	4,858154	1,862304	0,76565	2,358565	13,24113	5,637022	0,00727
59	38	40,36798	-2,36798	-1,39384	-0,3732	2,295751	12,49319	-2,72466	0,001609
60	94	92,71712	1,282875	1,084664	0,202182	2,16203	10,96818	1,451385	0,000405
61	69	62,57323	6,426765	-0,34252	1,012865	1,984123	9,081084	7,12329	0,008216
62	80	75,1191	4,880898	0,251473	0,769235	2,310823	12,67082	5,627258	0,006955
63	46	37,96758	8,032417	-1,50749	1,265918	2,235924	11,79958	9,171252	0,017295
64	36	41,0604	-5,0604	-1,36106	-0,79752	2,188833	11,26652	-5,74392	0,006501
65	68	75,58678	-7,58678	0,273615	-1,19569	2,257995	12,05333	-8,68687	0,015824
66	74	75,34071	-1,34071	0,261965	-0,2113	2,601702	16,32654	-1,61168	0,000723
67	66	60,36887	5,63113	-0,44689	0,887472	2,17996	11,16735	6,384764	0,007968
68	69	63,53909	5,460911	-0,29679	0,860645	2,23375	11,77473	6,233441	0,007974
69	74	69,48528	4,514725	-0,01527	0,711525	2,24683	11,92465	5,161979	0,005532
70	87	85,82393	1,176071	0,7583	0,18535	2,281762	12,32937	1,350747	0,000391
71	115	110,2459	4,754097	1,914577	0,749251	2,416555	13,94955	5,560659	0,007427
72	36	42,50853	-6,50853	-1,2925	-1,02575	2,563762	15,82517	-7,77841	0,016356
73	93	91,51939	1,480614	1,027956	0,233346	2,227474	11,7031	1,688729	0,000582
74	68	64,10296	3,897041	-0,27009	0,614178	2,111282	10,41337	4,382224	0,003521
75	77	77,79443	-0,79443	0,378138	-0,1252	2,656546	17,06432	-0,96328	0,000269
76	46	37,8911	8,108902	-1,51111	1,277972	2,165799	11,00991	9,178237	0,016252
77	36	47,06407	-11,0641	-1,07681	-1,74371	2,040922	9,665967	-12,3409	0,026091
78	68	75,805	-7,805	0,283947	-1,23008	2,301632	12,56236	-8,98759	0,0176
79	74	75,59711	-1,59711	0,274104	-0,25171	2,587642	16,13988	-1,91572	0,001011
80	67	61,00358	5,996422	-0,41684	0,945042	2,260481	12,08207	6,868101	0,009913
81	69	65,63772	3,362282	-0,19743	0,529899	2,372443	13,4091	3,908725	0,003537
82	72	75,54498	-3,54498	0,271636	-0,55869	2,395767	13,69363	-4,13439	0,004035
83	86	80,51472	5,485275	0,506932	0,864485	2,478874	14,73005	6,47326	0,01059
84	110	102,2325	7,76754	1,535174	1,224173	2,384399	13,55461	9,044785	0,019129
85	35	43,09015	-8,09015	-1,26496	-1,27502	2,385812	13,57185	-9,42228	0,020784
86	89	91,92132	-2,92132	1,046986	-0,4604	2,170939	11,06694	-3,30863	0,002122
87	67	64,10908	2,890923	-0,2698	0,455612	2,309925	12,6602	3,332591	0,002437
88	72	70,1102	1,889801	0,014322	0,297835	3,083426	23,33291	2,474043	0,002393
89	44	36,21079	7,789207	-1,59067	1,227587	2,216353	11,57667	8,871638	0,015901
90	34	44,33784	-10,3378	-1,20589	-1,62926	2,346416	13,09489	-11,9755	0,032474
91	66	79,58468	-13,5847	0,462898	-2,14096	2,456912	14,45272	-15,9807	0,063404
92	72	55,25722	16,74278	-0,6889	2,63868	4,150529	43,08158	29,26462	0,606789
93	68	60,36434	7,635658	-0,4471	1,203388	2,365896	13,32974	8,868672	0,018107
94	68	63,86458	4,135418	-0,28138	0,651746	2,360808	13,26821	4,79988	0,005281
95	71	76,51698	-5,51698	0,317656	-0,86948	2,632189	16,73475	-6,66373	0,012654
96	84	82,18003	1,819969	0,585777	0,286829	2,498024	14,97387	2,153791	0,001191
97	104	101,465	2,535004	1,498838	0,399519	2,517833	15,22806	3,008766	0,00236
98	40	39,80367	0,196327	-1,42056	0,030941	2,518203	15,23283	0,233031	1,42E-05
99	88	89,09215	-1,09215	0,913037	-0,17212	2,244727	11,90049	-1,24839	0,000323
100	67	67,09155	-0,09155	-0,1286	-0,01443	2,535124	15,45159	-0,10893	3,14E-06
101	73	64,96487	8,035133	-0,22929	1,266346	2,793447	18,97311	9,966926	0,031882
102	44	35,89378	8,106224	-1,60568	1,27755	2,382124	13,52686	9,436201	0,020781
103	36	45,53591	-9,53591	-1,14917	-1,50287	2,358668	13,24238	-11,0649	0,028014
104	67	79,0676	-12,0676	0,438417	-1,90187	2,564924	15,84041	-14,4247	0,0563
Min.	31	28,27637	-13,5847	-1,96633	-2,14096	1,984123	9,081084	-15,9807	6,5E-10
Max.	117	123,1648	16,74278	2,526233	2,63868	4,150529	43,08158	29,26462	0,606789
Mean	69,807	69,80769	2,2E-07	8,78E-09	3,63E-08	2,393227	13,86539	0,069516	0,015694
Median	71	67,44763	-0,04502	-0,11174	-0,0071	2,341668	13,03796	-0,05361	0,007017

Table 10

Results of calculation. Y_8 – linear model

Regression Summary for Dependent Variable: Y_8 R= ,92080581 RI= ,84788333 Adjusted RI= ,82395487 F(14,89)=35,434 p<,00000 Std.Error of estimate: 3,0056						
		St. Err.		St. Err.		
	BETA	of BETA	B	Of B	t(89)	p-level
Intercept			11,22118	7,211852	1,555936	0,123272
X_1	-0,44723	0,129373	-0,95218	0,275445	-3,45688	0,00084
X_2	-0,11108	0,092967	-0,01757	0,014708	-1,19486	0,235317
X_3	-0,39435	0,107694	-3,30747	0,903241	-3,66178	0,000425
X_4	0,271145	0,155173	0,019864	0,011368	1,747365	0,084023
X_5	0,65391	0,095325	0,247981	0,03615	6,859801	8,82E-10
X_6	-0,80037	0,178654	-0,46394	0,103557	-4,48003	2,21E-05
X_7	0,559301	0,154351	0,017386	0,004798	3,623566	0,000483
X_8	0,172794	0,113893	0,058852	0,038791	1,517164	0,13277
X_9	-0,18812	0,109454	-0,00087	0,000504	-1,7187	0,089145
X_{10}	-0,53412	0,133763	-0,00355	0,000888	-3,99302	0,000134
X_{11}	0,463732	0,104843	0,720539	0,162904	4,423097	2,74E-05
X_{12}	0,334312	0,076734	0,541248	0,124232	4,356763	3,53E-05
X_{13}	0,016354	0,089872	0,000243	0,001333	0,181969	0,856021
X_{14}	0,637688	0,081744	0,077456	0,009929	7,80102	1,11E-11

Table 11

Predicted & Residual Values. Dependent variable: Y_8

	Observed Value	Predicted Value	Residual	Standard Pred. Val.	Standard Residual	Std.Err. Pred.Val	Mahalns. Distance	Deleted Residual	Cook's Distance
1	10	15,27883	-5,27883	0,373173	-1,7563	1,06662	11,98086	-6,0394	0,033897
2	6	6,800056	-0,80006	-0,91223	-0,26618	1,470387	23,66009	-1,05177	0,001954
3	6	10,19942	-4,19942	-0,39688	-1,39718	1,284912	17,83348	-5,13852	0,035611
4	27	25,65937	1,340626	1,946889	0,446036	1,187223	15,08001	1,588463	0,002905
5	10	4,599388	5,400612	-1,24586	1,796823	1,130177	13,57274	6,289945	0,04128
6	10	13,50158	-3,50158	0,103738	-1,165	1,135667	13,71459	-4,08475	0,017579
7	5	2,518374	2,481626	-1,56134	0,825655	1,619445	28,91121	3,496758	0,026195
8	27	26,97256	0,027441	2,145971	0,00913	1,134739	13,69055	0,032002	1,08E-06
9	12	12,72911	-0,72911	-0,01337	-0,24258	1,103916	12,90384	-0,84281	0,000707
10	8	14,52009	-6,52009	0,258146	-2,16928	1,146836	14,00523	-7,63108	0,062565
11	10	12,06329	-2,06329	-0,11431	-0,68647	1,179087	14,8605	-2,43857	0,006753
12	11	14,63336	-3,63336	0,275318	-1,20884	1,010583	10,65371	-4,09646	0,014
13	9	7,839831	1,160169	-0,7546	0,385997	1,1334	13,65593	1,352489	0,00192
14	10	14,88767	-4,88767	0,313872	-1,62616	1,076496	12,22217	-5,60691	0,02976
15	5	6,995784	-1,99578	-0,88256	-0,66401	1,096092	12,70759	-2,30192	0,0052
16	6	8,821308	-2,82131	-0,6058	-0,93867	1,078422	12,26948	-3,23818	0,009962
17	27	24,59818	2,401815	1,78601	0,799102	1,096233	12,71111	2,770338	0,007534
18	10	5,343163	4,656837	-1,1331	1,549364	1,114526	13,1722	5,399236	0,02958
19	12	14,14263	-2,14263	0,200922	-0,71287	1,271416	17,44013	-2,60958	0,008992
20	5	4,642322	0,357678	-1,23935	0,119002	1,315056	18,72705	0,44236	0,000276
21	29	27,02287	1,977127	2,153599	0,657805	1,085705	12,44919	2,273818	0,004978
22	13	13,17819	-0,17819	0,05471	-0,05928	1,066499	11,97791	-0,20386	3,86E-05
23	9	14,35277	-5,35277	0,23278	-1,78091	1,141594	13,86848	-6,25514	0,041654
24	11	11,89779	-0,89779	-0,1394	-0,2987	1,154958	14,2184	-1,05332	0,001209
25	12	14,38173	-2,38173	0,23717	-0,79242	1,034293	11,2065	-2,70165	0,006378
26	9	8,798902	0,201098	-0,6092	0,066907	1,120134	13,31509	0,233533	5,59E-05
27	10	13,85226	-3,85226	0,156902	-1,28168	1,069101	12,04126	-4,41025	0,01816
28	6	6,674904	-0,6749	-0,9312	-0,22455	1,109213	13,0375	-0,78131	0,000614

29	6	8,042324	-2,04232	-0,7239	-0,6795	1,002205	10,46145	-2,2978	0,004332
30	25	24,24024	0,759756	1,731745	0,252776	1,014272	10,73889	0,857393	0,000618
31	10	4,682382	5,317618	-1,23328	1,76921	1,173876	14,7207	6,274734	0,044319
32	12	13,99297	-1,99297	0,178234	-0,66308	1,257948	17,05174	-2,41621	0,007547
33	6	4,184032	1,815968	-1,30883	0,604186	1,21744	15,90847	2,172383	0,005714
34	29	25,73607	3,263927	1,958517	1,085933	1,081811	12,35295	3,749688	0,013442
35	12	12,84522	-0,84522	0,004232	-0,28121	1,066184	11,97025	-0,96689	0,000868
36	10	15,17834	-5,17834	0,357938	-1,72287	1,124194	13,41898	-6,0206	0,037421
37	12	11,27169	0,728306	-0,23432	0,242313	1,120118	13,31466	0,84577	0,000733
38	12	14,60111	-2,60111	0,270428	-0,86541	0,95276	9,359339	-2,89167	0,0062
39	10	8,950901	1,049099	-0,58616	0,349043	1,106274	12,96325	1,213494	0,001472
40	11	12,9577	-1,9577	0,021284	-0,65134	1,086027	12,45717	-2,25168	0,004885
41	5	6,420293	-1,42029	-0,9698	-0,47254	1,109249	13,03841	-1,64424	0,002717
42	7	6,022464	0,977536	-1,03012	0,325233	1,042348	11,39721	1,111174	0,001096
43	26	26,45937	-0,45937	2,068171	-0,15284	1,092618	12,62089	-0,52932	0,000273
44	11	6,219143	4,780857	-1,0003	1,590626	1,387125	20,94743	6,074697	0,058001
45	13	13,55943	-0,55943	0,112507	-0,18613	1,167844	14,55966	-0,6589	0,000484
46	6	7,678707	-1,67871	-0,77902	-0,55852	1,056532	11,73666	-1,91538	0,003345
47	29	27,23539	1,764606	2,185818	0,587098	1,055324	11,70756	2,012739	0,003686
48	12	12,71292	-0,71292	-0,01583	-0,23719	0,983022	10,02724	-0,79831	0,000503
49	9	10,89039	-1,89039	-0,29213	-0,62895	1,068611	12,02931	-2,16392	0,004368
50	13	10,7286	2,271403	-0,31665	0,755713	1,045202	11,46515	2,583864	0,005958
51	13	14,19072	-1,19072	0,208213	-0,39616	1,018779	10,84335	-1,34528	0,001534
52	10	11,13624	-1,13624	-0,25485	-0,37803	1,014541	10,7451	-1,28234	0,001383
53	11	10,62763	0,372371	-0,33196	0,12389	1,162518	14,41815	0,437876	0,000212
54	6	5,943986	0,056014	-1,04201	0,018636	1,108215	13,01227	0,064827	4,22E-06
55	7	5,895804	1,104196	-1,04932	0,367374	1,072835	12,13245	1,265418	0,001506
56	24	25,82477	-1,82477	1,971964	-0,60711	1,054396	11,68524	-2,08085	0,003932
57	11	13,91113	-2,91113	0,165825	-0,96855	1,2059	15,58962	-3,46964	0,0143
58	13	14,24965	-1,24965	0,217147	-0,41577	1,117235	13,24113	-1,45	0,002144
59	6	6,752391	-0,75239	-0,91946	-0,25033	1,087481	12,49319	-0,86572	0,000724
60	30	26,98887	3,011126	2,148445	1,001824	1,024138	10,96818	3,406646	0,009943
61	13	11,69008	1,309924	-0,17089	0,435821	0,939865	9,081084	1,451892	0,001521
62	10	9,613137	0,386863	-0,48576	0,128712	1,09462	12,67082	0,44602	0,000195
63	12	11,07918	0,920816	-0,2635	0,306362	1,059141	11,79958	1,05137	0,001013
64	14	15,08324	-1,08324	0,343522	-0,3604	1,036835	11,26652	-1,22956	0,001328
65	10	11,74243	-1,74243	-0,16295	-0,57972	1,069596	12,05333	-1,99508	0,00372
66	11	8,783886	2,216114	-0,61148	0,737317	1,232408	16,32654	2,664	0,008805
67	5	6,262421	-1,26242	-0,99374	-0,42002	1,032631	11,16735	-1,43137	0,001785
68	7	5,63064	1,36936	-1,08952	0,455596	1,058111	11,77473	1,563077	0,002235
69	28	23,61465	4,385355	1,636903	1,45904	1,064307	11,92465	5,014062	0,023263
70	11	14,02701	-3,02701	0,183394	-1,00711	1,080854	12,32937	-3,4766	0,011535
71	14	14,70367	-0,70367	0,285977	-0,23412	1,144705	13,94955	-0,82305	0,000725
72	6	7,89669	-1,89669	-0,74598	-0,63104	1,214436	15,82517	-2,26676	0,00619
73	31	26,90653	4,093468	2,135962	1,361927	1,055138	11,7031	4,668845	0,019824
74	14	10,961	3,039004	-0,28142	1,011099	1,000099	10,41337	3,417361	0,009542
75	9	8,215446	0,784554	-0,69765	0,261027	1,258387	17,06432	0,951307	0,001171
76	15	12,23132	2,768684	-0,08884	0,921162	1,025923	11,00991	3,133796	0,008444
77	14	17,22299	-3,22299	0,667912	-1,07231	0,96677	9,665967	-3,59492	0,009867
78	10	10,947	-0,947	-0,28354	-0,31507	1,090267	12,56236	-1,09048	0,001155
79	12	9,70961	2,29039	-0,47113	0,76203	1,225747	16,13988	2,747303	0,009263
80	5	6,732265	-1,73227	-0,92251	-0,57634	1,070773	12,08207	-1,98408	0,003687
81	8	5,620318	2,379682	-1,09108	0,791737	1,123809	13,4091	2,766431	0,007896
82	30	24,76131	5,238689	1,81074	1,74295	1,134858	13,69363	6,109709	0,039272
83	11	14,04134	-3,04134	0,185566	-1,01188	1,174225	14,73005	-3,58913	0,014509
84	15	14,89507	0,104929	0,314994	0,034911	1,129473	13,55461	0,122183	1,56E-05

85	6	7,009002	-1,009	-0,88055	-0,3357	1,130142	13,57185	-1,17514	0,001441
86	31	26,47671	4,523293	2,070799	1,504933	1,028358	11,06694	5,122998	0,022672
87	13	10,39378	2,606224	-0,36741	0,86711	1,094195	12,6602	3,004397	0,008828
88	10	1,646889	8,353111	-1,69346	2,779141	1,460596	23,33291	10,93552	0,2084
89	14	13,04295	0,957054	0,034207	0,318419	1,04987	11,57667	1,090052	0,00107
90	14	15,05	-1,05	0,338482	-0,34934	1,11148	13,09489	-1,21633	0,001493
91	10	11,81814	-1,81814	-0,15148	-0,60491	1,163821	14,45272	-2,13883	0,005062
92	12	14,81871	-2,81871	0,303418	-0,93781	1,966076	43,08158	-4,92681	0,076646
93	5	6,827837	-1,82784	-0,90802	-0,60813	1,120708	13,32974	-2,123	0,004624
94	7	5,285125	1,714875	-1,1419	0,570552	1,118298	13,26821	1,990414	0,004047
95	27	25,08067	1,919329	1,859156	0,638575	1,246849	16,73475	2,318278	0,006825
96	11	15,14583	-4,14583	0,353011	-1,37935	1,183296	14,97387	-4,90627	0,027533
97	15	14,05704	0,942965	0,187946	0,313731	1,192679	15,22806	1,119194	0,001456
98	7	7,235246	-0,23525	-0,84625	-0,07827	1,192854	15,23283	-0,27923	9,06E-05
99	31	26,66602	4,333979	2,099499	1,441947	1,063311	11,90049	4,953991	0,022667
100	13	10,38686	2,613144	-0,36846	0,869412	1,20087	15,45159	3,109519	0,01139
101	10	2,622559	7,377441	-1,54555	2,454529	1,323236	18,97311	9,151113	0,119779
102	15	14,11089	0,889112	0,19611	0,295814	1,128395	13,52686	1,034987	0,001114
103	14	14,06915	-0,06915	0,189782	-0,02301	1,117284	13,24238	-0,08024	6,56E-06
104	11	11,84875	-0,84875	-0,14684	-0,28238	1,214986	15,84041	-1,01453	0,001241
Min.	5	1,646889	-6,52009	-1,69346	-2,16928	0,939865	9,081084	-7,63108	1,08E-06
Max.	31	27,23539	8,353111	2,185818	2,779141	1,966076	43,08158	10,93552	0,2084
Mean	12,81731	12,81731	-3,7E-08	7,12E-10	-1,1E-08	1,133654	13,86539	0,009729	0,013142
Median	11	11,98054	-0,34731	-0,12686	-0,11555	1,109231	13,03796	-0,40427	0,004496

Table 9 X_{14} – emission of CO into atmosphere (in kg per 1 inhabitant per year) is decisive factor (t-crit.= 7,80102) for women mortality from cancer of the lungs, trachea and bronchial tubes.

From *table 5* and *6* we can see which of the models with mutual interaction, R – multiple coef. of correlation are nearly equal to 1 (R_7 = 0,99530974 and R_8 = 0,99463493). This shows, that the models are almost functional.

Conclusions

Thus, 5 conclusions can be made from the material, given above:

1. Population mortality in Western Europe is caused basically by ecological factors.
2. Rapid development of automobile industry produces negative impact on women only, which with the use engines, working with CO emission will lead to abrupt deterioration of genetic fund and extermination of humanity.
3. Alcohol consuming have influence on Y_3 (third place), Y_4 (seventh place), Y_5 (eight place), Y_6 (second place), Y_8 (fifth place), Y_{11} (eighth place), Y_{13} (eighth place).
4. Cigarette consuming have influence only on Y_9 (seventh place), Y_{12} (sixth place), so it doesn't have an serious influence on the population mortality.
5. The countries situation is: the worth situation in Denmark and the best situation in Switzerland (look the table 7).

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