

DIRECTIONAL ANALYSIS OF THE REGIONAL TRAFFIC ACCIDENT RATE

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***Summary:** The connection between road accidents and regional socio-economical factors is considered in the article.*

***Key words:** accident rate, regional and social aspects, directional analysis, factors.*

According to the World Health Organization in the world annually in road traffic accidents (RTA) kills about 1.3 million people and more than 50 million - are injured.

Over a long period of time in most developed countries the total number of accidents increases with a decrease in the number of people killed in these incidents. Compared with 2004, in Austria, Germany, Spain, Portugal, Italy, the number of deaths decreased by 1.4 - 1.8 times.

The highest number of deaths in road accidents are characterized by India, China and Russia.

In Russia the chance of injury in an accident is three or more times higher than in Austria, Great Britain, Hungary, Germany, Spain, Iceland, Ireland, Netherlands, Norway, Portugal, Spain, Sweden. In some cases it is possible to speak about the relationship in the accident in different countries (Table 1).

To test the hypothesis of independence (dependence) performance in this paper used the Spearman rank correlation test, which is based on rank statistics.

In Russia, the situation with the accident many years remains stable unsatisfactory (Fig. 1). This is confirmed by the results of the analysis of test samples in random sequences of the accident data for different periods of time: the number of deaths in road accidents - a random variable distributed according

to the normal law. It should be noted that the implemented in Russia Federal Program "Improving road safety in 2006–2012 years", did not provide significant improvement with the accident.

Table 1. The results of testing the hypothesis of independence the number of fatalities in road accidents in some countries

	The value of rank correlation coefficient, ρ	Number of observations n , year	The limit value ρ	The conclusion about the hypothesis, α ($\alpha = 0.95$)
France and Spain	-0.82846	25	0.329	Rejected
Russia and France	-0.57636	40	0.31	Rejected
Russia and Spain	0.34221	40	0.31	Rejected
Russia and Finland	-0.14758	31	0.352	Accepted
Russia and Austria	0.45263	20	0.44	Rejected

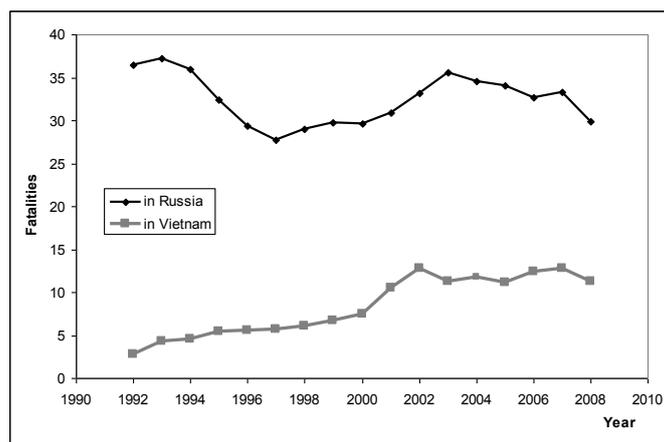


Figure 1. The number of road deaths (thous.) in the Russian Federation and in the Socialist Republic of Vietnam in the period 1992-2008.

In 2009, the World Health Organization, together with the World Bank prepared a report containing information on the status of road safety in 178 countries. An important conclusion of the report was information on the ratio of the number of fatalities in road accidents, the level of car ownership and income of the population, with over 90% of fatal accidents occur in low-and middle-income countries.

Russia is characterized by the identity of the processes in the areas of road safety and the fight against criminal offenses.

The analysis revealed the presence of the general patterns of change in the number of fatalities in road accidents and the number of suicides, homicides, robberies, etc. (table 2).

Table 2. The results of testing the hypothesis of independence, the number of fatalities in road accidents and indicators

№ п/п	Data	The value of rank correlation coefficient, ρ	Number of observations n , years	The limit value, ρ	The conclusion about the hypothesis, α
1.	The number of murders in Russia	0.79	41	0.27	Rejected, $\alpha = 0.95$
2.	Solar Activity	0.37438	29	0.24	Rejected, $\alpha = 0.9$
3.	The number of robberies	0.81289	41	0.27	Rejected $\alpha = 0.95$
4.	The number of serious injuries	0.86951	41	0.27	Rejected $\alpha = 0.95$
5.	The death toll in the fire	0.71872	29	0.24	Rejected $\alpha = 0.9$

This similarity suggests that the processes in these areas have the same nature and are related to social factors.

Given the above, based on data from state and departmental statistics, was a list of indicators of the socio-economic impacts in the regions of Russia and held rank correlation analysis of the relationship of these parameters with the number of road deaths (table 3).

The hypothesis of independence of the number of people killed in road accidents and indicators listed in the table are rejected, which confirms the existence of the relationship of accidents and socio-economic indicators.

We denote the population in the region (the land), and a number of vehicles. Then the estimate of the number of potential dangerous situations "man – vehicle".

Table 3. The results of testing the hypothesis of independence the number of fatalities in road accidents in the regions of the Russian Federation and the analyzed parameters (2009)

№ п/п	Analyzed indicator	The value of rank correlation coefficient, ρ	The number of observations (regions), n	The limit value, ρ	The conclusion of the hypothesis, ($\alpha = 0.95$)
1.	The share of roads with improved surface in the length of roads paved public (in percent by year-end)	0,30561	78	0,23	Rejected
2.	The number of people with incomes below the subsistence level (in percent / x of the total population of the subject)	0,43914	79	0,22	Rejected
3.	The number of crimes committed by juveniles and their complicity	0,71249	80	0,22	Rejected
4.	Consumer spending on average per capita (rubles per month)	0,37327	79	0,22	Rejected
5.	Per capita income (rubles per month)	0,25224	79	0,22	Rejected
6.	The passenger of public buses (million passenger-kilometers)	0,84341	80	0,22	Rejected
7.	The number of students in state and municipal educational secondary vocational education institutions per 10 000 population (the man at the beginning of the school year)	0,22076	79	0,22	Rejected
8.	The number of spectators theaters on 1000 population (persons)	0,25536	79	0,22	Rejected

As a result of the optimization problem, we obtain the following relation for y_1 (use an array of crash data for the period 2008 – 2011):

$$y_1 = 0.406136(x_1^{0.636282} x_2^{0.318144})$$

Where y_1 - the number of deceased in the region; x_1 - population in the region, thousands; x_2 - number of vehicles, thousands.

In international practice, such relationships are essentially a kind of standard in the field of road safety.

To account for the above-noted relationship accidents and socio-economic indicators, an attempt to identify a number of generic factors influencing the accident.

For the integrated assessment of quality of life and social development of the regions of

Russia takes into account the levels of living (low incomes and high inequality of income), employment (unemployment) , health (low life expectancy and child health). To assess the living conditions are taken into account the environmental conditions, and the mean annual air temperature.

Based on regression analysis, an estimate of the number of fatalities in road accidents in the region (y) as $y_1 = 0.406136(x_8^{0.636282}x_9^{0.318144}) \cdot (2.2011 - 2.4679x_2 + 0.1074x_5 + 0.000667x_6 + 0.000764x_7 + 0.000939x_{10})$.

The main "contribution" to bring the accident population, number of vehicles, the quality of life.

Where x_8 - population in the region, thousand; x_9 - number of vehicles, thousands; x_2 - quality of life index; x_5 - the final assessment of environmental conditions; x_6 - average annual air temperature; x_7 - density of public roads paved; x_{10} - sale of beer (per capita, l.).

For a number of European countries there is a large value of the coefficient of rank correlation number of people killed in road accidents and solar activity (Wolf number): Russia - 0.61 (threshold value - 0.24), Austria - 0.53 (0.44), Belgium - 0.69 (0.44), UK - 0.51 (0.44), Spain - 0.66 (0.44), Italy - 0.72 (0.44), France - 0.54 (0.44), etc. The foregoing shows the relationship of these characteristics.

CONCLUSION

Russia is typical for a strong impact on accident socio-economic factors. The relationship fatalities, population, number of vehicles in the regions is almost identical to Russia and other countries. Some impact on the reporting process provides solar activity.

Thus, along with the differences, there are common patterns and trends that define the character of the process in the countries.

It may be noted that the problem of road accidents is not only national, but also inter-ethnic character.

It is necessary to involve experts from the scientific community, business community, civil society and other stakeholders to the solution of this issue. It is helpful to ensure the transparency of information on road traffic accidents and other information necessary to solve the problem. It is also advisable to strengthen communication experts from different countries.

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