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Simulation of Regional Mortality Rate in Road Accidents

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Abstract

The paper gives the results of scientific research, which, being based on probabilistic and statistical modeling, identifies the relationship of certain socio-economic factors and the number of people killed in road accidents in the Russian Federation regions. It notes the identity of processes in various fields, in which there is loss of life. Scientific methods and techniques were used in the process of data processing and study findings: systematic approach, methods of system analysis (algorithmization, mathematical programming) and mathematical statistics. The scientific novelty lies in the formulation, formalization and solving problems related to the analysis of regional road traffic accidents, its modeling taking into account the factors of socio-economic impact.

*Keywords:*Road traffic accidents, modeling, loss of life in accidents, correlation, statistical analysis, socio-economic aspect, factors.

1.   Introduction

Improving road safety is one of the priorities of state policy of the Russian Federation, the economic and social importance of which cannot be overestimated.

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Bringing transport and social indicators of road safety in the Russian Federation to the European average values will help save thousands of human lives, qualitatively improve the security of the social environment of the state.

The road accidents analysis takes one of the leading places in forming a set of measures aimed providing road safety in the conditions of intensive motorization. Identifying the causes of accidents is the main component of the study, as well as the most important stage of analytical work, providing assessment of an emergency condition involving vehicles to determine the set of conditions and circumstances that influenced the occurrence of road accidents and the severity of their consequences, the removal of which would greatly reduce the likelihood of accidents.

The impact of motorization on the accident rate has been the subject of research since late 1940s. Until recently, the analysis of traffic safetyhasbeen mainly confined to the study of dynamics and structure of accidents by separate indicators. Currently, however, when the traffic safety problem worsened, requirements as to the quality of the analysis and the preparation of proposals for management solutions increased significantly. Mathematical statistics give the opportunity to build models for statistical information. Indeed, the characteristics of accidents, obtained by processing a sufficiently large group of accidents, are subject to statistical regularities. The existence of statistical regularities is determined by the fact that although each particular accident is the result of a combination of many factors and therefore may have a random nature, but these factors take a sustained nature for sufficiently large sets of traffic accidents, which creates prerequisites for building mathematical models obtained using methods of correlation and regression analysis, in order to develop and validate a set of measures aimed at improving traffic safety.

The authors conducted analysis of statistical data on deaths for various reasons,which found their significant dependence and the overall pattern of change over time.

On this basis, it has been hypothesized that there was an interdependence of road safety and the socio-economic and climatic factors that influences the state of road traffic accidents, in particular: the quality of life index; the final assessment of the natural environment; the sales of beer (per capita); the average annual air temperature; the density of paved public roads and other.

2.   Factors under consideration

Studies have shown the ability to use (besides thoseindicators already mentioned above) the comparison of the results of investment policy indicators of the subjects of Russian Federation for making some regions attractive [RIA Rejting (2014)]to simulate the state of the road and transport accidents.

Two relatively independent characteristics are used as constituting components of the investment policy: investment potential and investment risk [EXPERT RA (2014)].

Investment potential is a quantitative characteristic that takes into account the region's saturation with natural resources, labor, fixed assets, and other infrastructure, as well as consumer demand and other factors that affect the potential volume of investment in the region.

Investment potential is the amount of nine private capacities (eight, up to 2005). Each of them, in turn, is characterized by a group of parameters:
- natural resources (average supply of balance reserves of basic natural resources);
- labor (human resources and their level of education);
- production (aggregate result of population and economic activity in the region);
- innovation (level of development of science and implementation of scientific and technological progress in the region);
- institutional (degree of development of the leading institutions of the market economy);
- infrastructure (economic and geographical situation of the region and its infrastructure security);
- financial (amount of the tax base, profitability of companies in the region and personal income);