

TERRITORY-DETERMINED FACTORS INFLUENCING THE ENROLMENT OF VETERINARY MEDICINE STUDENTS

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Summary

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The factors, influencing the enrolment of veterinary medicine students from all regions of the country were studied using statistical methods and data for students, admitted in the Trakia University – Stara Zagora. By the method of step regression, the impact of 3 out of 11 studied factors was outlined. Their correlation coefficients with the number of students from a given region were as followed: popularity of the speciality (0.812), population of the respective region (0.462) and distance to the educational centre (– 0.347).

The dependance of the total score of admitted students and the grades included in the score was also studied. A low correlation of the total score with the grade in biology from the secondary school diploma was shown. Its substitution with another grade from the diploma (for example – with that in mathematics, having the highest correlation coefficient with the total score) would increase the sensitivity of the total score as a measure of applicants' knowledge and minimize the influence of errors upon the evaluation.

Our results suggested a real possibility to influence the optimal distribution of veterinary specialists throughout the territory of the country not only by a qualified training. The university could also assist in the management of the complex social process of distribution of specialists throughout the country using only the modelling of the social interest.

Key words: education, evaluation, statistics, veterinary medicine

INTRODUCTION

At present, veterinary specialists in Bulgaria are trained in the Faculty of Veterinary Medicine at the Trakia University, Stara Zagora (about 75% of students) and at the University of Forestry, Sofia (about 25% of students).

The quality of veterinary activities depends on the distribution of specialists all throughout the country, which is related to their birthplace. Thus, the territorial distribution of veterinary specialists could be substantially changed by influencing the student's flow, trained in the principal educational centre. Therefore, the factors influencing this flow are essential and require to be known. Similar studies have

been performed by Vassilev et al. (2001), Bojkov and Ivanova (1983, 1984). The question for the significance of the various factors, influencing the flow of enrolled students remains however not fully elucidated.

The main aim of the study was to find out the dependence between the number of enrolled students from a given area and the factors, possibly influencing this number.

MATERIALS AND METHODS

The present study was performed on data for veterinary medicine students, admitted

in 1999 and 2000 – totally 350 students from both genders. The choice of a narrow time range was motivated by the concern to present the latest tendencies in the rapidly changing social situation in Bulgaria, that influenced the dynamics of the considerations for choosing a future profession. Data from the first admission classification were used because they were thought to reveal the studied tendencies with the highest precision, i.e. before the interference of the information for admission in another specialty or higher school.

All students were divided in groups according to the region they came from (28 administrative regions). The students from the capital and the region of Sofia formed one group, so the number of groups was 27. The potential factors of influence were characterized by the following parameters: popularity of the speciality in the region, population of the region, distance from the educational centre (Stara Zagora), average grade from secondary school diploma, the grades in biology from both the written admission examination and the diploma, the grades in chemistry, mathematics, geography, Bulgarian language and total score. All factors were calculated for each group and presented as mean $\pm$ SEM (Table 1).

The popularity was characterized by a parameter, calculated as a ratio of the number of applicants for the speciality Veterinary Medicine in the Trakia University to the number of inhabitants in the respective region (in thousands). Thus, the popularity of the speciality is examined at a national level by means of the number of applicants at the Trakia University. The distance was calculated in kilometres from the regional administrative town to the university centre (Stara Zagora).

The analysis of data was done by the method of step regression (Bojanov and

Vuchkov, 1979) as it allowed the realization of several statistical aims:

- the method was a suitable filter for elimination of insignificant factors (those with little or no influence) from all factors with a possible effect;
- the relationship between the target function (the number of admitted students from a given region) and the parameters, characterizing the influencing factors was presented by a quantitative model (equation);
- the correlation coefficients between the target function and each parameter were calculated and thus, the influence of each factor could be objectively confirmed.

The step regression was calculated using the Statistica for Windows 4.5 statistical package (Statsoft Inc., 1993).

All statistical hypotheses were checked at a level of significance 0.05 (95% confidence level).

The inclusion of each factor to the group of significant factors in the regression model was done according to the F-test while the significance of t-coefficients – by the t-test (Bojanov and Vuchkov, 1979).

RESULTS AND DISCUSSION

Although a certain tendency towards decreased popularity with distance was observed, the dependance was not straightforward (Fig. 1). All regions could be allocated conditionally to four zones taking into consideration the popularity of veterinary medicine (shown with dotted lines on Fig. 1). A low popularity (less than 0.05) was observed in the west regions – those of Sofia, Pernik, Kyustendil, Blagoevgrad, Vratsa as well as in North-east Bulgaria: the regions of Silistra and Varna. The latter are not the most distant from the university centre. Fig. 2, using

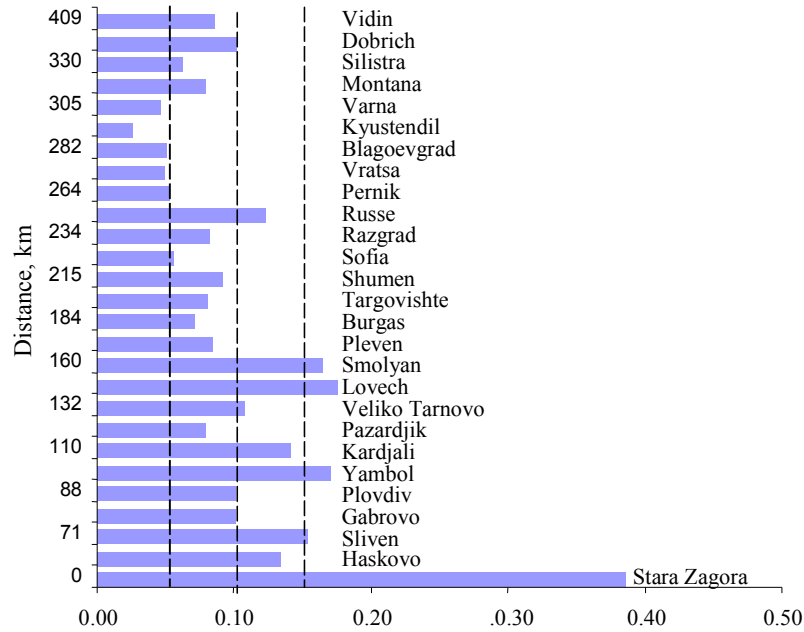


Fig. 1. Correlation of the popularity and the distance. The dotted lines differentiate four zones of popularity.

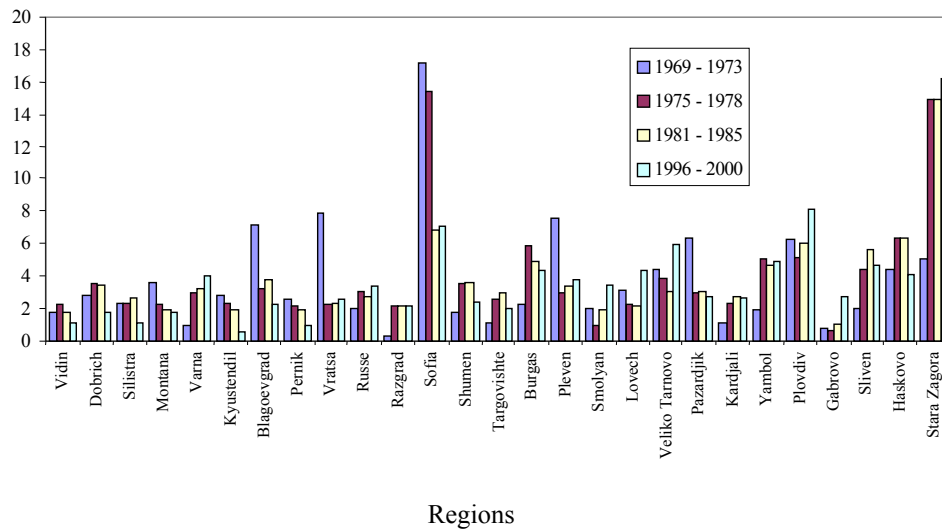


Fig. 2. Percentage of veterinary students by regions.

the results of Vassilev et al. (2001) and Bojkov and Ivanova (1983, 1984), presents the number of veterinary students by regions for various periods of time:

- 1969–1973. The only veterinary training institution in Bulgaria was the Higher Institute of Veterinary Medicine in Sofia;
- 1974–1978. The first years after the foundation of the Higher Institute of Zootechnics and Veterinary Medicine in Stara Zagora, including the only veterinary training institution as well;
- 1981–1985. No changes compared to the previous period.
- 1996–2000. The data reflected the number of students admitted at the Trakia University after the creation of veterinary medicine training at the University of Forestry, Sofia.

Both our data and those from Fig. 2 are indicative for the popularity of the speciality for the last 30 years. It is seen that the part of newly admitted students from the regions of Sofia, Pernik, Kyustendil and Blagoevgrad decreased after the movement of the educational centre to Stara Zagora as well as after the establishment of a new veterinary training institution in Sofia, suggesting that the low popularity of the speciality was due to the appearance of alternative training in the University of Forestry. For the predominant part of regions (Fig. 2), the popularity of the speciality in the Trakia University remained stable and even increased after the start of veterinary training in the University of Forestry.

For the second part of regions with popularity between 0.05 and 1 (Fig. 1), there is no relationship between the popularity and the distance because within the group, there are adjacent regions (Plovdiv and Gabrovo), more distant regions (Shoumen and Razgrad) as well as some

of the most far-away regions (Montana, Dobrich, Vidin). The highest popularity of the speciality was observed in some adjacent regions – Yambol, Sliven and Haskovo but also in some others located at a medium distance (Kardjali, Smolyan, Lovech and Russe). The highest popularity of the speciality was in Stara Zagora. The existence of a veterinary secondary school in the region was related to a high popularity in the regions of Stara Zagora and Lovech, to a medium popularity - in the region of Dobrich and to a low popularity – in the region of Sofia. The applicants coming from vocational secondary schools, mostly veterinary, are only 24% from all applicants of veterinary medicine (Fig. 3).

The hypothesis for the normal distribution of the target function was further confirmed by arranging the data on a normal probability plot since the normal distribution of the target function is a prerequisite for the application of the regression analysis.

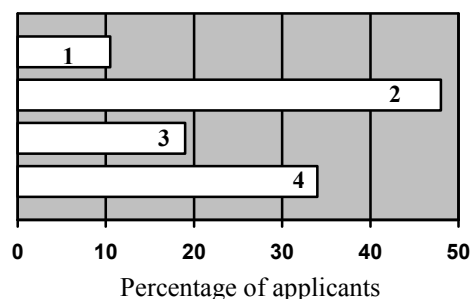


Fig. 3. Distribution of veterinary medicine applicants according to the type of the secondary school: 1 = ordinary secondary school; 2 = specialized secondary school; 3 = school of general education; 4 = vocational school.

The regression model coefficients of the secondary school diploma grades, the written admission examination grade in

biology and the total score were insignificant, i.e. there was no significant difference among groups towards the grades or the total score. The number of students in the region groups depended on the popularity of the specialty, the population of the region and the distance to the university centre:

$$\text{Number of students} = 119.9 \times \text{popularity} + 0.0214 \times \text{population} - 0.0291 \times \text{distance}$$

This model has a regression coefficient (R^2) of 0.95. The latter shows the adequacy of the model and the data (in perfect cases it equals 1.00). So, the model is with a good adequacy and therefore, the conclusions based on it - with a good reliability.

The impact of each factor could be assessed by the correlation coefficient of the respective parameter to the number of students. The contribution of important factors is evaluated by comparison of the correlation coefficients of their characteristic parameters (the standardized coefficients of the regression equation) with the number of students.

The most important factor was the popularity (correlation coefficient 0.812) followed by the population of the region (0.462) and the distance to the educational centre (-0.367) i.e. the number of students from a given region increased the most significantly with increase in the popularity, less significantly with increase in the population and decreased (the least significantly, compared to the other factors) with increase in the distance to the university.

The performed statistical analysis showed that as far as the most important factor (popularity) could be changed (unlike the other two factors), the flow of trained students could be influenced too. Thus, the distribution of veterinary spe-

cialists throughout the territory of the country could be altered by increasing the popularity of the speciality in regions, where its popularity is lower (Fig. 1).

The popularity is related to the predominant means of livelihood and the professional traditions in a given region in a complex way, yet it could be influenced by means of publicity and the provision of sufficient, non-sporadic information about the speciality to potential applicants. Thus, several methods of information could be used – active participation in centres for applicant's information, especially in the regions with a low popularity, regular supply of the secondary schools with information about the speciality. The university could also contribute to the organization of visits of potential applicants, their parents and teachers in the establishment, for instance within the frames of open days of the speciality. Also, the university could organize meetings with teachers, providing them with information materials and encouraging those with a real contribution to the orientation of future applicants to veterinary medicine. The presence in the national radio and TV programmes with information for the speciality at every occasion could also play a role for increase of specialty popularity.

The written admission competition in biology also influences the flow of veterinary students. The admission of applicants is done on the basis of their total score. Its maximum value is of no importance, but its sensitivity has to be high, i.e. to change in the greatest extent from student to student in order to achieve a maximum differentiation and to decrease the repetitions in scores and the influence of errors in evaluations (those of the written examination and those of the diploma grades) (Takuchev, 1998). The sensitivity of the total

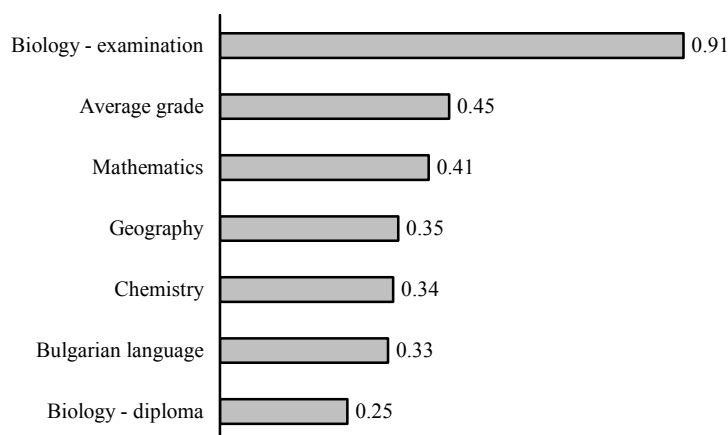


Fig. 4. Correlation coefficients of the grades from the examination and the secondary school diploma with the total score.

Table 1. Values of the grades from the diploma, the grade from the written examination and the total score (mean $\pm$ SEM)

Parameter	Mean $\pm$ SEM
Average grade of the diploma of secondary studies	5.76 $\pm$ 0.16
Grade of biology *	5.96 $\pm$ 0.10
Grade of chemistry *	5.84 $\pm$ 0.15
Grade of mathematics *	5.26 $\pm$ 0.58
Grade of geography *	5.72 $\pm$ 0.27
Grade of Bulgarian language *	5.66 $\pm$ 0.23
Grade in the written examination on biology	4.85 $\pm$ 0.34
Average entrance rating (total score)	27.26 $\pm$ 0.73

* from the secondary school diploma. A grade higher than 5.50 is considered as excellent.

score could be increased by the proper choice of grades, used for its calculation. For instance, there is no use to include grades, equal for all applicants because they would not contribute to the differentiation in the positioning. From a statistical point of view, such grades would not correlate with the final total score. Therefore, a more sensitive total score should comprise grades from the secondary school diploma with a greater deviation range.

The correlation of the total score for 1999 and 2000 with various grades from the secondary school diploma is presented on Fig. 4. It is seen that the lowest correla-

tion was that with the grade in biology from the diploma. From all grades that were not included in the score, the grade of mathematics had the biggest correlation coefficient. So, the substitution of the grade in biology (that for almost all applicants was excellent – see Table 1) with the grade in mathematics (or the grade in Bulgarian language – with a correlation coefficient close to that in chemistry) would increase the sensitivity of the total score. Moreover, the grade in biology is duplicating the grade of the written admission examination in biology that is highly correlating with the total score and pre-

sents consistently the preparation of applicants.

CONCLUSIONS

The statistical analysis of factors, influencing the distribution of veterinary medicine students throughout the territory of the country, based on data for enrolled students at the Trakia University – Stara Zagora, revealed 3 factors out of possible 11: the popularity of the speciality, the population of the region and the distance to the university. The correlation coefficients of those three factors with the number of students from a given region were 0.812, 0.462 and – 0.347, respectively. The increase in the first two factors resulted in increased number of enrolled students while the increase in the third – in lower number of students.

The study of the total score of admitted students and the grades included in it showed a low correlation of the total score with the diploma grade in biology. Its substitution with another grade from the diploma (for example – with that in mathematics, having the highest correlation coefficient with the total score) would increase the sensitivity of the total score as a measure of applicants's knowledge and minimize the influence of errors upon the evaluation.

Our results suggested that the university was really able to influence the optimal distribution of veterinary specialists throughout the territory of the country not only by a qualified training. It could also assist in the management of the complex social process of distribution of specialists throughout the country using only the mechanism of the social interest modelling.

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