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APPLICATION OF A GEOGRAPHICAL INFORMATION SYSTEM TO THE EPIDEMIOLOGICAL SURVEILLANCE OF NOTIFIABLE DISEASES

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The Authors generated a set of indicators aimed to evaluate the dynamics of animal diseases and the delivery of veterinary services. For the generation of such indicators, data from monthly reports of outbreak notifications were used. The comparison of the various indicators generated is easily performed through the overlay of the respective thematic maps. In the case this comparison is performed for all priority diseases, it allows a quantification of the demand of veterinary services by the different municipalities and of the supply by the local Veterinary Services. The comparison of the values of Moran's index shows that a clear spatial clustering of disease incidence occurs only for SGB. This could be due to the extensive breeding of sheep and goats and the importance of grazing for both small ruminants breeding and diseases.

INTRODUCTION

Epidemiological surveillance in veterinary medicine can be defined as a system to monitor and evaluate population health status with the objective of planning actions and optimising the use of resources available. The use of indicators is one of the methods employed to quantify the need for intervention by veterinary services and to evaluate the adequacy of services supplied. An indicator is a synthetic expression capable to describe the state and the dynamics of a component of the system under study. The evaluation of geographical differences in both the demand and supply of veterinary services may be performed by a Geographical Information System (GIS).

Aim of the present paper is to report the work carried out to evaluate the possibility of generating a set of indicators using current data collected in routine activities of Veterinary Services. Furthermore thematic maps were generated to compare quantitatively indicators referred to different territorial administrative units (Municipalities).

MATERIALS AND METHODS

The data on disease outbreaks originate from a database developed to manage, at the Regional level, Local veterinary services (ULS) notifiable diseases reports. Outbreaks of Bovine Tuberculosis (BTb), Bovine Brucellosis (BBr) and Sheep and Goats Brucellosis (SGBr) notified in the Abruzzi Region over the 1984-1994 period, were used to calculate the following: prevalence, incidence, monthly rate of outbreaks extinction, disease outbreaks dynamics, incidence variation, variation of time span needed to extinguish outbreaks. These indicators were used to draw thematic maps and to calculate (where applicable) the Moran's index of spatial autocorrelation. Non-parametric Kruskal-Wallis analysis of variance was used to evaluate the association between disease outbreaks dynamics, variation of incidence and time needed to extinguish outbreaks.

RESULTS

The values calculated are reported in the following table.

Indicator	Mean	St. Dev.	Moran's Z_I	Indicator	Mean	St. Dev.	Moran's Z_I
BTb prevalence	2.69	7.97	-0.2544	BTb rate outb. ext.	n.a.	n.a.	1.0202
BBr prevalence	6.15	17.19	-0.5968	BBr rate outb. ext.	n.a.	n.a.	0.9360
SGBr prevalence	5.89	17.67	2.0270	SGBr rate outb. ext.	n.a.	n.a.	2.1508
BTb incidence	4.73	10.54	0.9757	BTb pattern	n.a.	n.a.	1.5086
BBr incidence	11.72	26.49	1.8982	BBr pattern	n.a.	n.a.	2.4537
SGBr incidence	6.39	17.59	10.4808	SGBr pattern	n.a.	n.a.	5.9653

Both BTb and SGBr incidence variation and variation of outbreak extinction time span differed significantly in relation to the disease outbreaks dynamics variable (BTb: χ^2=15.63, P=0.0004 and χ^2=10.34, P=0.0057, respectively; SGBr: χ^2=47.62, P<0.0001 and χ^2=22.21, P<0.0001, respectively). BBr incidence variation differed significantly in relation to the disease outbreaks dynamics variable only (χ^2=19.95, P=0.0002).

CONCLUSIONS

Comparison of the various indicators generated, by overlaying the specific thematic maps, it is not difficult. If the comparison is performed for priority diseases, quantification of the demand and supply of veterinary services in each Municipality becomes an easy task. Comparison of Moran's index values shows that spatial clustering of disease incidence occurs only in the case of SGBr. This could be due to the extensive husbandry method of sheep and goats keeping practised in the Region. Indeed overlaying land use maps over the one reporting SGBr outbreaks occurrence, a significant correlation is observed between outbreaks clustering and percentage of land used for extensive grazing. It appears, finally, that GIS provides a significant added value to current routine data usually taken into low consideration for either epidemiological or management purposes in veterinary medicine.

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