

# The cost of national prevention systems for animal diseases and zoonoses in developing and transition countries

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## Summary

This study, published in October 2009 by the World Organisation for Animal Health (OIE), aimed to estimate the essential costs of veterinary prevention systems in sample countries and to develop economic indicators for the veterinary performance evaluation provided by the OIE Tool for the Evaluation of Performance of Veterinary Services (PVS Tool). Full sets of data were collected from seven developing and transition countries. The sources used were literature review, a questionnaire survey and country visits by the core expert team. The total costs of national prevention systems (NPS), net of donor programmes, ranged from 10 million international dollars in Kyrgyzstan to 167 million international dollars in Turkey. These costs are associated with the size of the livestock sector, in veterinary livestock units (VLUs), and national income. It was concluded that NPS cost per VLU provides a meaningful comparative measure of the cost of service provision, varying from 1.92 international dollars in Uganda to 9.40 international dollars in Turkey. The relationship with national income provides estimated indicators of expected NPS costs for other countries. Introduction of quantitative measures to PVS Evaluations would help when assessing the degree of compliance with OIE standards.

## Keywords

Animal disease prevention – Case study country – Decentralisation – Disease control – Economic cost – Epizootic – International standard – Livestock – Response preparedness – Transboundary disease – Vaccination – Veterinary livestock unit – Zoonosis.

## Introduction

A study on the cost of national prevention systems (NPS) for animal diseases and zoonoses in developing and transition countries, commissioned by the World Organisation for Animal Health (OIE), was conducted by Civic Consulting (1). The aims of the study were twofold:

- to estimate how much Veterinary Services spend during ‘peace time’ to allow early detection of and rapid response to emerging and re-emerging diseases in different regions, economies, animal health systems and ecosystems

- to develop economic indicators that could be used within the OIE Tool for the Evaluation of Performance of Veterinary Services (PVS Tool) (2). (This tool enables Veterinary Services to measure their performance against OIE quality standards and identify any gaps or weaknesses in their service provision.)

The study was based on a review of relevant literature, the results of in-depth research in nine OIE Member Countries, and an extensive analysis of possible economic indicators.

# Estimating the cost of national prevention systems for animal diseases and zoonoses

## Methodological challenges and approach followed

Previous studies in the animal health field have either mainly focused on specific regions, e.g. in Africa; applied a narrower definition of 'epidemiological surveillance systems' than that of the NPS used in this study; or focused on control of specific diseases rather than considering the overall system. A major element of this study therefore involved the development, testing and refinement of the methodological framework. In brief, the approach followed by this study was as follows.

### Definition of the scope of the national prevention system

For the purposes of this study NPS were understood to include all public sector capacities for surveillance, early detection and rapid response (including the services of accredited private veterinarians who undertake public service missions). This definition is appropriate for the cost assessment, which consequently focused exclusively on public sector expenditures (in the baseline year 2007).

### Identification of the main functional units

Comparisons of key cost centres, at central and sub-national level, within the national prevention systems, were made across case study countries. Functional units at central level are central or federal public Veterinary Services (including veterinary inspection of live animal markets and slaughterhouses), the national veterinary laboratory, and border inspection. Functional units at sub-national level are regional and local-level public Veterinary Services (including veterinary inspection of live animal markets and slaughterhouses conducted at sub-national level), regional and local veterinary laboratories, and veterinary units of municipalities.

### Development of an approach to cost assessment

The cost assessment methodology was designed using best practices from the animal health and public health fields. The cost assessment clearly defined rules for the use of budget data, the extrapolation of data, where required, and the calculation of depreciation (consumption of fixed capital) based on an inventory of NPS infrastructure, where applicable.

### Selection of case study countries

A total of 13 candidate case study countries were selected, covering different OIE regions and having different levels

of compliance with OIE international standards, as expressed in the results of the PVS Evaluation (2, 3).

### Data collection

Data were collected from a review of the literature and databases, a questionnaire survey, and country visits by the core expert team. Final data sets were obtained for a total of seven of the nine countries studied: Costa Rica, Kyrgyzstan, Mongolia, Morocco, Turkey, Uganda and Vietnam. In addition, partial data sets were obtained for Uruguay and Romania.

### Comparative analysis of the costs of the national prevention system in case study countries and analysis of factors that influence these costs

Operating expenditures for the NPS as a whole and for the main functional units for all case study countries were compared, as well as different indicators/ratios of factors that may influence costs and that could be used within the PVS Tool (2, 3).

### Overview of case study results

Total public expenditures on the NPS for the seven case study countries for which a full data set is available are listed in Table I, together with other key data.

The arithmetic mean, or average, expenditure on the NPS for the seven countries is 48.6 million international dollars. (In order to make comparisons across countries feasible, cost data collected in local currency were converted into international dollars using implied Purchasing Power Parity conversion rates [national currency per current international dollar]). These figures are quoted net of donor support programmes, so they reflect only domestic spending on animal disease prevention. In the third column of the table, additional expenditure derived from foreign assistance programmes is included in the total NPS expenditure for each country. The following analyses of NPS expenditures in the case study countries are based on **the total domestic expenditure excluding foreign assistance**.

The data presented in Table I clearly underline the diversity of the sample. Less obvious are the influences of different factors on the NPS. Possible reasons for differences between the case study countries in NPS expenditures are therefore explored. (This analysis is based on a theoretical review of the factors that are likely to influence the level of a country's NPS costs, and simple correlation analysis. In cases where a reasonably strong association was observed, a regression line was fitted. However, as a result of the small number of case study countries, relationships that appear to provide good explanations for a high percentage of the variation in

**Table I****Key data on national prevention system expenditure in countries for which a complete data set was available (2007)**

Median values are underlined and the OIE region to which each country belongs has been included in brackets

Country	Domestic NPS costs (000) Intl \$	Total NPS costs* (000) Intl \$	Land area (000) km <sup>2</sup>	Population (000)	GDP (PPP) million Intl \$	VLU (000)	No. of public veterinarians	VLU/no. of public veterinarians
<b>Costa Rica</b> (The Americas)	11,172	11,584	51	4,398	<u>46,021</u>	1,365	117	<u>11,648</u>
<b>Kyrgyzstan</b> (Europe & Central Asia)	10,043	11,517	200	5,258	10,508	1,766	1,096	1,612
<b>Mongolia</b> (Asia)	<u>21,086</u>	21,702	1,567	2,604	8,426	6,381	<u>450</u>	14,179
<b>Morocco</b> (Africa)	46,811	48,698	447	<u>30,852</u>	126,943	<u>6,455</u>	240	26,894
<b>Turkey</b> (Europe & the Middle East)	166,962	180,080	784	73,888	885,905	17,765	2,910	7,567
<b>Uganda</b> (Africa)	16,888 <sup>(a)</sup>	<u>23,369<sup>(a)</sup></u>	241	30,930	32,767	8,818	345	25,559
<b>Vietnam</b> (Asia)	67,356	72,619	<u>329</u>	85,140	221,614	17,483	4,272	4,092
<b>Average</b>	48,617	52,796	517	33,300	190,312	8,576	1,347	13,079

Source: Civic Consulting (2009) (1)

\*including costs covered by foreign donor support programmes

(a) Fiscal year 1 July 2006 to 30 June 2007

GDP: gross domestic product

Intl \$: international dollars

NPS: national prevention system

PPP: purchasing power parity

VLU: veterinary livestock unit

the dependent variable can still have considerable sampling errors.)

## Analysis of factors that influence the total costs of national prevention systems in case study countries

### Land area, population and livestock

#### Land area and human population

There are huge differences in land area between the case study countries. However, comparisons between the countries suggest that there is no obvious association between land area and total NPS costs. Mongolia, the largest country, with an area of over 1.5 million km<sup>2</sup>, has a moderate level of NPS expenditure. Turkey, Vietnam and Morocco, with much smaller land areas, have considerably higher total NPS expenditures. This lack of association between land area and NPS expenditure may in part be due to differences in population density, which is extremely low in Mongolia compared with the other six countries, particularly Vietnam, where population density is very high. However, the relationship between NPS expenditure and the human population is still fairly weak.

#### Size of livestock sector

A veterinary livestock unit (VLU) is an equivalence unit for the estimation of annual veterinary cost and care. For

example, according to the definition, the annual veterinary cost and care of one bovine animal is the same as that of ten sheep or one hundred chickens. The total livestock population measured in VLU is, therefore, by definition, the most appropriate measure of the scale of veterinary service requirements. The variation between countries in NPS expenditure per VLU, as measured by the standard deviation, is relatively much smaller than that for total costs or livestock populations (Table II). Thus, while total NPS costs range from 10 million international dollars (in Kyrgyzstan) to almost 167 million (in Turkey), NPS costs per VLU vary over a smaller interval, from 1.92 international dollars (in Uganda) to 9.40 (in Turkey).

### Economic development and trade

#### National income

The gross domestic product (GDP) is a general measure of the level of national economic activity. There appears to be a close association between this measure of size and the total NPS costs. The straight-line regression relationship with GDP explains 97% of the variation in NPS expenditures in the case study countries.

#### Per capita income

Per capita income (expressed as gross national income [GNI] per capita of population) is a commonly used

**Table II**  
**National prevention system expenditure expressed per veterinary livestock unit (2007)**

Median values are underlined. NPS costs exclude donor programmes

Country	NPS costs (000) Intl \$	VLU (000)	NPS costs per VLU in Intl \$
Costa Rica	11,172	1,365	8.18
Kyrgyzstan	10,043	1,766	<u>5.69</u>
Mongolia	<u>21,086</u>	6,381	3.30
Morocco	46,811	<u>6,455</u>	7.25
Turkey	166,962	17,765	9.40
Uganda	16,888(a)	8,818	1.92
Vietnam	67,356	17,483	3.85
<b>Average</b>	<b><u>48,617</u></b>	<b><u>8,576</u></b>	<b><u>5.66</u></b>

Source: Civic Consulting (2009) (1)

a) Fiscal year 1 July 2006 to 30 June 2007

Intl \$: international dollars

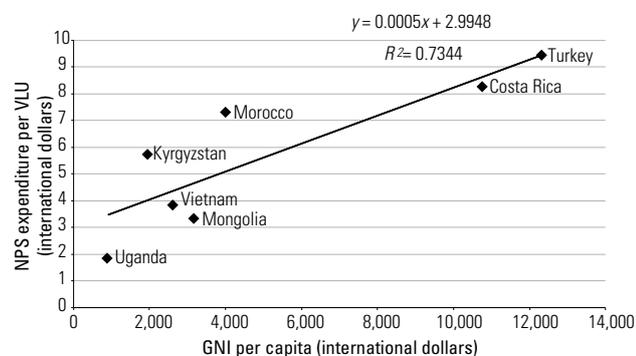
NPS: national prevention system

VLU: veterinary livestock unit

criterion to categorise countries according to their level of economic development. When the countries are ranked in order of increasing GNI per capita, the ordering of NPS expenditures per VLU broadly corresponds. While the overall average NPS cost per VLU for the seven countries amounts to 5.66 international dollars, the average for the three low-income countries, Uganda, Kyrgyzstan and Vietnam, is only 3.82 international dollars. The average for the two lower-middle-income countries, Mongolia and Morocco, is 5.28 international dollars, while that for the upper-middle-income countries, Costa Rica and Turkey, is 8.79 international dollars (Fig. 1).

### Trade

Costa Rica is the only case study country that earns a substantial income from beef and pig meat exports. It is



GNI: gross national income  
 NPS: national prevention system  
 VLU: veterinary livestock unit

**Fig. 1**

**Effect of gross national income per capita on national prevention system expenditure per veterinary livestock unit**

officially recognised by the OIE as a country that is 'free of foot and mouth disease without vaccination' and it has a high level of NPS expenditure per VLU in comparison with most of the case study countries. Expenditure on border inspections per VLU is the highest of the countries recording this item. Turkey is a net exporter of poultry meat and eggs, although the quantities represent only a small proportion of the large national output. The desire to avoid crises that could affect the value of these exports probably increases the emphasis placed on NPS expenditure. Both Kyrgyzstan and Mongolia are net exporters of livestock products, but of relatively small quantities. Morocco, Vietnam and Uganda are all net importers.

### Other factors

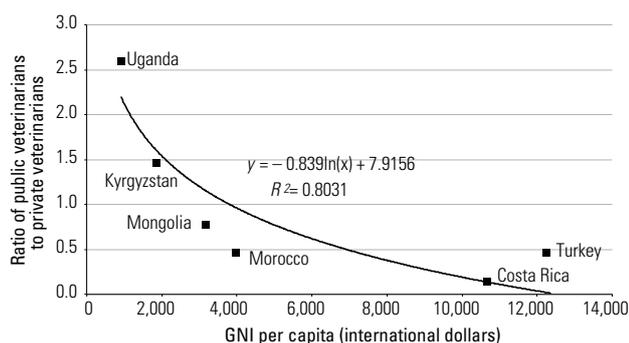
#### Local ecology and animal health situation

Geographical features of the country, such as the climate, topography and location, together with cultural variables, probably affect the types of livestock kept and the associated production systems. Disease incidence may also be linked to the presence, or absence, of alternative hosts and vectors of disease. These features can determine the relative importance and costs of different livestock diseases, and the choice of appropriate control measures. However, this is not reflected in the data from the case study countries, where there is no clear evidence of such impacts on NPS expenditures.

#### Existence of a private veterinary sector

Some animal health functions, in particular those that relate to prevention and control of highly contagious diseases, require public sector intervention. Other functions, such as the control of low-contagion endemic diseases, clinical diagnosis and treatment, are better suited to private provision. Given this division of responsibilities, private sector veterinarians cannot readily substitute for public sector veterinarians in the NPS. Rather, the activities of private and public sector veterinarians are likely to complement each other. The contribution of private veterinarians to the improvement of livestock production is excluded from the NPS as defined for this study. Lack of data concerning private sector veterinary expenditure in case study countries prevents identification of the effects of private veterinary expenditures on total NPS expenditures. However, it is possible to analyse whether or not the strength of the private veterinary sector, as expressed by the number of private veterinarians, has any effects in this respect. The study results indicate that the ratio of the number of public sector veterinarians to the number of private veterinarians in the NPS tends to decrease with increasing national per capita income (as depicted in Fig. 2).

Judged by the results from the sample of case study countries, the ratio of public to private veterinarians



GNI: gross national income

**Fig. 2**  
**Association of gross national income per capita with the ratio of public/private veterinarians**

appears to be of little value in explaining variations in NPS expenditures. The study provided no evidence that a stronger private veterinary sector reduces public NPS expenditure in the case study countries. Both NPS expenditure and the relative strength of the private veterinary sector, expressed as the ratio of public to private veterinarians, increase with a higher GNI per capita.

### *Conflict and civil unrest*

Violent civil disputes may lead to an array of adverse effects on the control and prevention of animal disease. Adverse effects may include difficulties in enforcing quarantine because of military and refugee movement, loss of supply lines for materials, increased smuggling, and problems in getting access to conflict areas, making it difficult to conduct formal disease surveillance and treatment. Few of these problems were reported from the case study countries, although movement of refugees, cross-border migration for economic reasons, and informal trade in live animals are relevant issues in some cases. It is likely that where associated disease control problems arise, they limit the effective performance, and therefore raise the costs, of the NPS. However, no quantitative evidence in this respect was available from the case study countries.

### **Allocation of national prevention system expenditures between central and sub-national levels**

Operating expenditures associated with NPS are incurred either centrally, in or near the main centre of government, or dispersed more widely in provincial, regional or district locations. Organisations at or near the main centre of government include the national Veterinary Authority, the veterinary border inspection agency (or unit) and the central veterinary diagnostic laboratory. Decentralised or sub-national units generally include provincial, district and/or municipal veterinary units and laboratories.

With regard to the degree of decentralisation of NPS expenditures at different levels of government, the

following picture emerges. In most case study countries the centralised expenditure per VLU is consistently between 1 and 2 international dollars. The exception is Costa Rica where the cost is much higher, at 6.18 international dollars. Expenditure per VLU at provincial, district or municipal level is more variable, ranging from 0.45 international dollars in Uganda to 7.52 international dollars in Turkey. There is similar variation in the centralised expenditure expressed as a percentage of the total NPS expenditure. Although the average is 43%, values range from a low of 20% in Turkey, to a high of 77% in Uganda.

What are the drivers of these differences in the allocation of NPS expenditures between central and sub-national levels? The size of the country appears to have some influence on the distribution of expenditures between central and sub-national units. The high central expenditure in Costa Rica is clearly associated with a centralised structure in a relatively small country, where most resources are concentrated in the capital and other parts of the country are served by relatively small decentralised units. In contrast, the decentralised expenditure of Kyrgyzstan, the second-smallest country in the sample, is higher than average, but this is due to the inclusion of the costs of vaccination under this heading while, in other countries, these charges form part of the central expenditure. Turkey, Morocco and Vietnam, three of the largest countries in area, spend much more money at sub-national level than at national level; they each allocate approximately three-quarters of the total NPS operating expenditure to regional agencies. However, Mongolia, the largest of all the case study countries, has a higher degree of centralised expenditure: livestock population density is sparse and less funding is distributed to the decentralised agencies. The high percentage of centralised spending in Uganda mainly reflects the significant under-funding of the overall system, which is especially obvious at the sub-national level. Hence, although there are exceptions to the rule, it seems that the larger the country, the greater the sub-national expenditure relative to centralised expenditure. Apart from these possible influences, the allocation of expenditures between centre and periphery may be decided largely on political grounds such that the average total cost (including both central and regional expenditures) per VLU may be unaffected by the extent of decentralised expenditure.

### **Allocation of national prevention system funds to different types of expenditure**

#### *Staff costs*

Staff costs per VLU appear to vary with level of per capita income. The lowest level applies in Uganda, a low-income country, while substantially higher levels apply in the two upper-middle-income countries, Costa Rica and Turkey. Only Mongolia, which has lower staff costs than might be

expected for its income level, does not follow the trend, partly because at district level the local Veterinary Services are run by private Veterinary Service units, while related public expenses are a service expenditure (see below) and therefore not included in staff costs. Staff costs, expressed as a percentage of the total NPS operating costs, vary from 19% in Mongolia to 73% in Costa Rica and 74% in Turkey.

### *Material supplies*

In all the countries except Turkey, the largest component of the total public non-staff operating expenditure for the NPS is the provision of the necessary supply of materials. These include items such as vaccines, veterinary drugs, office stationery, and fuel for vehicles. The costs of vaccines are significant in most case study countries, accounting for 20% to 54% of the total NPS expenditure (the exception is Costa Rica, where vaccines are purchased privately by livestock owners and are therefore not a relevant cost factor for the public Veterinary Services).

### *Services*

Expenditure on services includes fees for accredited private veterinarians who undertake public service missions and, if subcontracted, spending on laboratory diagnostics, communications and training of employees. Hire of services accounts for a relatively small proportion of total NPS operating expenditure in most case study countries, and a negligible amount in Costa Rica and Kyrgyzstan. The amounts spent on services are all below 1 international dollar per VLU, and range from 0.08 international dollars in Uganda to 0.96 international dollars in Morocco.

### *Consumption of fixed capital*

This is a category of operational costs that relates to the annual reduction in the value of fixed assets, i.e. the depreciation of buildings and equipment. Costs of capital depreciation are generally quite low, at a fraction of an international dollar per VLU.

### *Compensation of livestock holders for animals culled for disease control purposes*

In Mongolia, compensation of livestock holders for animals culled for disease control purposes is low, at only 0.02 international dollars per VLU, and accounts for less than 1% of the total operating expenditure. In most of the seven countries, levels of expenditure on compensation are similarly low or, in some cases, absent. However, in Morocco, the expenditure is intermediate, at 0.23 international dollars (i.e. 3% of the total operating expenditure) and in Turkey, which has the highest expenditure on livestock owner compensation, it amounts to 0.74 international dollars (i.e. 8% of the total operating expenditure). The larger-than-average amounts spent on compensation of farmers in Morocco and, especially, in Turkey could be one of the factors contributing to the higher-than-average NPS costs in these countries.

## Economic indicators linked to Veterinary Services for use within the PVS Tool

Economic indicators linked to Veterinary Services can relate either to the total NPS operating expenditure, or to the various functional cost components of this expenditure, such as those of staffing requirements, vaccine provision, veterinary laboratory services and equipment. An additional aim is therefore to identify indicators of the level of provision of these specific components.

For these purposes, information was gathered not only from the detailed country case study investigations, PVS Evaluation reports and literature review, but also from online resources. Economic data were derived mainly from the World Bank and International Monetary Fund databases, livestock data from the Food and Agriculture Organization of the United Nations (FAO) agricultural databases (FAOSTAT), and veterinary data from the OIE World Animal Health Information Database (WAHID).

Relationships between variables may be established on logical grounds, such as that between NPS expenditure and scale of veterinary requirements, as measured by the total VLU number. Hypothesised relationships between variables may be tested by means of scatter plots, and their strength measured by statistical correlation or regression analysis. Using these approaches, a large set of potential indicators was scrutinised, many of which proved to be of limited value. In this report, only those that appear to have value as economic indicators of the level of provision of Veterinary Services are discussed.

### **Measuring or estimating total national prevention system expenditure**

Data on NPS expenditure in the case study countries are not readily available from official records and accounts. To obtain precise measurements of NPS expenditure there appears to be no easy alternative to the method of direct recording of expenditure through country visits undertaken by an experienced expert team (not unlike the approach chosen for the PVS Evaluation). However, the strong linear association with GDP, identified from the case study analysis, may provide a crude estimate. This finding is important because it seems to demonstrate that levels of NPS expenditure are largely determined by national income levels or ability to pay.

The regression equation is:

$$R^2 = 0.97$$

Where  $y$  = NPS expenditure in millions of international dollars and  $x$  = GDP in billions of international dollars.

This implies that there is a fixed cost of 15.19 million international dollars incurred regardless of the level of GDP. In addition, for each billion international dollar increase in GDP, there is a corresponding increase in NPS expenditure of 175,600 international dollars. This equation might therefore be used to predict the NPS costs for other countries, based on the published estimate of the national GDP.

Such predictions have to be interpreted with care, because of the small size of the sample and the consequent wide prediction intervals (uncertainty) surrounding individual NPS estimates. Extrapolation of the relationship to countries with GDP levels outside the range covered by the case study countries is subject to even greater prediction uncertainties. (Initial results from Uruguay and Romania, which have higher GDP levels than the other case study countries, indicate more widely varying NPS expenditures per VLU.)

### Indicators for total national prevention system expenditure

The total public expenditure for the national prevention system (not including donor contributions), per unit of livestock population (expressed in VLU), serves as a key indicator used throughout much of this study.

However, the study results raise a general question about the appropriateness of using data on total NPS expenditure from one or a few countries as a benchmark for other countries. Given the large social, economic, geographical and livestock population differences between countries, it is doubtful whether a single benchmark value for total NPS expenditure per VLU is likely to be *globally* applicable as a guide to the budget needed to develop an NPS that is largely aligned with OIE international standards.

### Indicators for degree of compliance with OIE international standards

The PVS Tool was developed following a detailed analysis and review of the requirements of effective Veterinary Services, and its use provides an assessment, albeit qualitative, of the level of performance in relation to OIE international quality standards for Veterinary Services. A quantitative measure of PVS would be very useful because it would allow comparison of the extent of the quality achievement of a particular country with that expected for the level of NPS expenditures per VLU. If results from a

sufficient number of comparable countries were available, analysis of the reasons for over- or under-achievement could produce valuable insights. Constructing an average score for PVS Evaluation, however, raises methodological concerns, because the critical competencies that are assessed relate to a variety of different issues, and the use of averages allocates the same weight to very different critical competencies, which could lead to distortions. A possible solution would be to develop a weighting scheme that assigns weights reflecting the relative importance given to the different critical competencies. The development of meaningful quantitative measurements for use with the PVS Tool would make it possible to provide an overall indicator of compliance with OIE standards, based on comparison of the PVS result with the NPS expenditure per VLU.

Alternatively, it may be possible to refine and regroup all critical competencies of the PVS Tool that are related to a specific key component of the NPS (e.g. veterinary diagnostic laboratories), and combine the levels of advancement reached for these competencies, which could then be related directly to the expenditures for these key elements.

### Indicators for specific national prevention system expenditures, material infrastructure and donor support

A set of indicators for specific NPS expenditures, material infrastructure and donor support can be defined as a basis for further analysis (see Table III).

These indicators are mainly of interest when analysing how specific NPS features compare with those of other countries. Data relating to expenditure on these and other indicators can be collected during the OIE PVS Evaluation or the PVS Gap Analysis (the latter determines ways in which to fill the gaps identified in the PVS Evaluation report and helps governments to draw up budgets to make the necessary improvements), as well as through focused study visits of a specialist expert team or – to a more limited extent – from local correspondents. In the medium to long term a database of regional benchmark cost data for key elements of the NPS could be gathered. Relevant experiences from the public health field could be worth evaluating in depth, both in terms of data collection procedures and the use of data.

### Options for improving base data collection

#### Livestock and veterinary livestock unit data

Measures of VLU are calculated from estimates of livestock populations by species using specific conversion coefficients for each species. A more consistent use of VLU would be facilitated significantly by a coordinated effort to

**Table III**  
**Overview of possible indicators concerning specific components of national prevention systems**

Component	Indicator	Comments
<b>Specific NPS expenditures</b>		
NPS staff relative to requirements	Number of public professional staff of the NPS/VLU	Key indicator, which requires new reporting format for OIE Member Countries
Staff costs	Public staff costs of the NPS/VLU	Possible to assess with a relatively limited effort during PVS Evaluation visit. The sum of these three categories of expenditure accounts for more than 60% of total NPS expenditure in all seven case study countries, and provides therefore an insight into the main cost factors relevant for the NPS
Public procurement of vaccines	Public expenditure on vaccines/VLU	
Accredited private veterinarians undertaking public service missions	Public expenditure on accredited private veterinarians/VLU	
Veterinary laboratories	Public expenditure on veterinary diagnostic laboratories/VLU	More difficult to measure in practice, data on depreciation of laboratory equipment rarely available. Further research on benchmark cost data needed
<b>Material infrastructure of the NPS</b>		
Vehicle index	Number of vehicles/public NPS veterinarian	Of interest when identifying needs and calculating estimates of investment costs to upgrade the material infrastructure, based on easily available standard cost data
ICT index	Number of ICT items/public NPS veterinarian	
<b>Other indicators</b>		
Dependence on donor funding	Donor funding/total public operating expenditure on the NPS	To assess the level of dependence on outside funding

Source: Civic Consulting (2009) (1)

ICT: office information technology and communications equipment

NPS: national prevention system

PVS: performance of veterinary services

VLU: veterinary livestock unit

GNI: gross national income

NPS: national prevention systems

VLU: veterinary livestock unit

improve the reliability and scope of the data on livestock populations provided at international level. Currently, livestock data from available sources such as FAOSTAT and the OIE WAHID database can differ significantly, and this can potentially distort the analysis. In addition, the reliability of VLU conversion coefficients might be improved by redefinition, e.g. by including more species and possibly differentiating conversion coefficients according to the production system. The latter approach would, however, depend on the more detailed classification of livestock data in this respect, which appears to be a challenge in itself. A redefined VLU would therefore necessarily be a compromise between the aim of representing a valid measurement of veterinary requirements and the need to allow its application in practice.

### Data on veterinary personnel

Currently, the only data available on veterinary personnel are those reported to the OIE from Member Countries. However, the analysis in the case study countries showed that reporting is not always accurate and the reporting format does not allow differentiation between public sector veterinarians working on prevention, surveillance and

control and other public veterinarians working on livestock production issues (such as genetic improvement). In addition, in several case study countries the central Veterinary Authority is not aware of the number of veterinary personnel working at the sub-national level, and this again is problematic, both in terms of the comparability of data from different countries and from a disease management perspective.

A precondition for improving an NPS is that the central Veterinary Authority has reliable information on the staff resources available at all levels of government. This could be encouraged by revising the reporting format for the annual OIE World Animal Health Report. A new reporting format could include sub-categories that differentiate between:

- *public and private* veterinary personnel
- *categories* of veterinary personnel paid from the public budget (veterinarians, other university graduates and veterinary paraprofessionals/technicians in the public Veterinary Services, as well as accredited private veterinarians/paraprofessionals paid for public service missions)

– *type of activity* of the personnel (animal health, public health, veterinary diagnostic laboratories, animal production, veterinary research and education, other).

Although collection of such data would require additional efforts by member governments, this would improve the basis for future economic assessment of the NPS, because staff costs account for up to three-quarters of the total NPS operating expenditures in the case study countries.

### Animal health situation

The cost-effectiveness of specific animal disease control measures, such as brucellosis vaccination programmes, is often measured against an indicator, such as the change in the number of reported brucellosis cases per year. A systemic, comparable and quantitative indicator for the animal health situation in a specific country is, however, not available. In this study, the total number of animal disease outbreaks reported to the OIE was used as a crude indicator of the overall animal health situation, but it is of limited value because it is subject to many influences that reflect both strengths and weaknesses of the animal health services. Useful systemic indicators of human public health, such as the expected lifespan at birth, are available. However, identification of a comparable single quantitative indicator of performance in the animal health field would be much more difficult, given the range of different animal species involved.

## Conclusions

Substantial differences in public expenditure on the NPS for animal diseases and zoonoses exist between case study countries. The average expenditure on an NPS was 48.6 million international dollars in the baseline year of 2007. Variations in expenditure between the case study countries are clearly associated with differences in livestock populations. The operational costs of the NPS, when expressed on a per VLU basis, therefore give a comparative measure of the level of service provision in relation to the quantitative requirements.

Among the case study countries, there is a close relationship between GDP and the total expenditure on the NPS. This seems to imply that NPS expenditure is mainly dependent on the country's ability to pay, rather than on the veterinary requirements.

Differences in NPS expenditure between countries on a per VLU basis are at least partly explained by differences in per capita incomes. While the overall average NPS cost per VLU for the seven countries amounts to 5.66 international dollars, the average for the three low-income countries, Uganda, Kyrgyzstan and Vietnam, is only 3.82 international dollars. The average for the two lower-middle-income countries, Mongolia and Morocco, is

5.28 international dollars, while that for the upper-middle-income countries, Costa Rica and Turkey, is 8.79 international dollars.

There is no evidence that a stronger private veterinary sector reduces public NPS expenditure in the case study countries. In the case study countries, both NPS expenditure and the relative importance of the private veterinary sector increase along with a higher GNI per capita.

Sub-national expenditures relative to centralised expenditures are usually greater in larger countries. In Costa Rica, a relatively small country, the NPS is clearly centralised, whereas in Turkey, Morocco and Vietnam, three of the largest countries with respect to area, about three-quarters of the total NPS operating expenditure is spent at the sub-national level. However, there are exceptions to the rule: Mongolia, the largest of all the case study countries, has a higher degree of centralised expenditure. Notably, though, the average total cost per VLU (including both central and sub-national expenditures) may be unaffected by the extent of decentralisation.

Spending in different categories of expenditure varies across case study countries, but this provides little explanation for differences in overall NPS expenditure. Levels of staff costs and expenditure such as travel costs appear to be directly related to levels of per capita income of case study countries. Considerable differences exist in spending on fees for private veterinarians conducting public service missions, expenditure on vaccines, and compensation of livestock holders.

The strong linear correlation between GDP and NPS expenditure for the case study countries can be used to predict current NPS expenditure in other countries. However, this approach only provides an estimate of the likely current level of funding for the NPS, with quite a wide prediction interval resulting from the small sample size. The only reliable and accurate method currently available to obtain data on NPS expenditure in other countries is direct measurement, using the methodology developed for this study.

A 'gold standard' or quality benchmark set of figures is needed for comparison of NPS expenditures between countries, but assessments might be more effective if focused on key elements rather than on the total NPS expenditure at national level. Thus, a more nuanced approach (as opposed to concentrating on total expenditure at national level) is recommended. This could involve derivation of several benchmark values in order to provide guidance to countries on the effective and efficient allocation of their NPS funding, focusing on key individual elements of the NPS (such as the cost of surveillance, border inspection, diagnostic laboratory facilities).

A quantitative expression of OIE PVS Evaluation results would be helpful in assessing the degree of compliance of Veterinary Services with OIE international standards. In future refinements of the PVS Tool, the introduction of a more quantitative approach (e.g. the introduction of a numerical PVS score) should be considered. Also, owing to the cross-cutting character of several of the critical competencies used for the PVS Tool, it is currently difficult to relate the costs for key NPS elements (e.g. veterinary diagnostic laboratories) with the results of a subset of relevant PVS critical competencies. Consideration might therefore be given to refinement and grouping of critical competencies to allow a more direct comparison of PVS results and costs for key elements of the NPS.

Evaluation would be facilitated by establishing a database of benchmark cost data concerning specific components of NPS expenditure. The necessary data could be obtained during the PVS Evaluation or PVS Gap Analysis visit or, alternatively, through a visit of a specialist expert team.

Benchmark cost data concerning key elements of the NPS would create a better basis for the design and budgeting of desired improvements in the NPS provisions in developing and transition countries, with more transparency for donors.

The use of economic indicators within the PVS Tool, and economic analysis of NPS for animal diseases and zoonoses, would be facilitated by improving the reliability of the global base data. The country studies conducted for this study have documented a large variety of problems with the accessibility of basic data such as numbers of livestock and veterinary personnel. Errors in data can potentially distort the analysis. A coordinated effort to improve the reliability and scope of the basic data on livestock populations and other relevant topics appears to be necessary at international level.

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## Coût des systèmes nationaux de prévention des maladies animales et des zoonoses dans les pays en développement et en transition

F. Alleweldt, M.Upton, Ş. Kara & R. Beteille

### Résumé

La présente étude, publiée en octobre 2009 par l'Organisation mondiale de la santé animale (OIE) avait pour but d'estimer les principaux coûts des systèmes de prévention des maladies animales dans un certain nombre de pays sélectionnés à cette fin, et d'élaborer des indicateurs économiques destinés à l'Outil PVS de l'OIE (Outil pour l'évaluation des performances des Services vétérinaires). Des séries complètes de données ont été recueillies dans sept pays en développement et en transition. Les données provenaient de plusieurs sources : examen de la littérature, enquête basée sur un questionnaire, et visites effectuées dans les pays par l'équipe d'experts principale. Les coûts des systèmes nationaux de prévention, hors programmes financés par des donateurs, s'élevaient à un total variant, suivant les pays, de 10 millions de dollars internationaux pour le Kirghizistan à 167 millions de dollars internationaux pour la Turquie. Ces coûts ont été corrélés, dans chaque pays, à la taille du secteur de l'élevage, en nombre d'unités de bétail vétérinaires (VLU) et au revenu national. Il en ressort que le coût des systèmes nationaux de prévention par unité de bétail vétérinaire constitue un paramètre significatif pour la

comparaison des prestations de services ; ce coût s'échelonne de 1,92 dollar internationaux pour l'Ouganda à 9,40 dollars internationaux pour la Turquie. La prise en compte du revenu national fournit des indications permettant d'évaluer les coûts escomptés des systèmes nationaux de prévention dans d'autres pays. Les auteurs considèrent que l'intégration de mesures quantitatives serait fort utile pour évaluer le niveau de conformité avec les normes de l'OIE lors des évaluations PVS.

#### **Mots-clés**

Bétail – Capacité d'intervention – Coût économique – Décentralisation – Épizootie – Étude d'un cas national – Maladie transfrontalière – Norme internationale – Prévention des maladies animales – Prophylaxie – Unité de bétail vétérinaire – Vaccination – Zoonose.



## **Costo de los sistemas nacionales de prevención de enfermedades animales y zoonosis en los países en desarrollo y en transición**

F. Alleweldt, M.Upton, Ş. Kara & R. Beteille

#### **Resumen**

Los autores repasan un estudio publicado en octubre de 2009 por la Organización Mundial de Sanidad Animal (OIE) y destinado a estimar los principales costos de los sistemas de prevención veterinaria en una muestra de países y a definir indicadores económicos para la herramienta de la OIE de evaluación de la eficacia de los Servicios Veterinarios (herramienta PVS). Para ello se obtuvieron series completas de datos de siete países en desarrollo y en transición a partir de referencias bibliográficas, completadas con un cuestionario y con la visita a cada uno de los países de un equipo básico de expertos. El costo total de los sistemas nacionales de prevención, descontados los programas de los donantes, iban desde 10 millones de dólares internacionales en Kirguistán hasta 167 millones en Turquía. Estos costos guardan relación con el tamaño del sector ganadero (en unidades ganaderas veterinarias: UGV) y con la renta nacional. En el estudio se llega a la conclusión de que el costo de los sistemas nacionales de prevención por UGV ofrece una interesante medida comparativa de la prestación de servicios, que oscila entre los 1,92 dólares internacionales de Uganda y los 9,40 de Turquía. Gracias a su correlación con la renta nacional, es posible obtener una medida estimativa de cuáles pueden ser los costos en otros países. La introducción de medidas cuantitativas en las evaluaciones PVS resultaría útil para evaluar el grado de cumplimiento de las normas de la OIE.

#### **Palabras clave**

Control de enfermedades – Costo económico – Descentralización – Enfermedad transfronteriza – Epizootia – Estudio de ejemplos nacionales – Ganado – Norma internacional – Preparación de la respuesta – Prevención de enfermedades animales – Unidad ganadera veterinaria – Vacunación – Zoonosis.



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