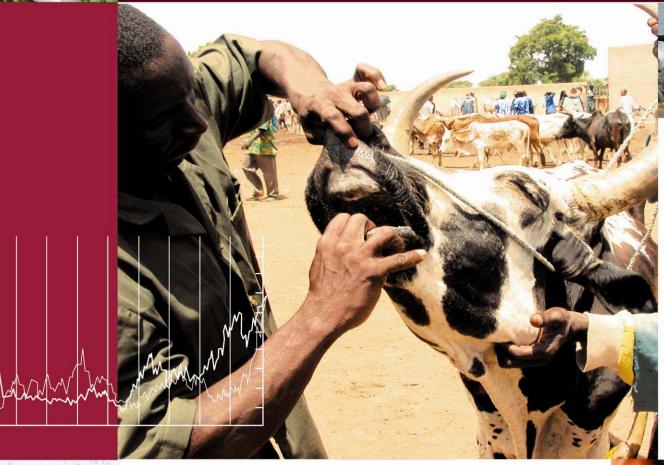Organisation
Mondiale
de la Santé
Animale

World
Organisation
for Animal
Health

Organización
Mundial
de Sanidad
Animal

OIE

COST OF NATIONAL PREVENTION SYSTEMS FOR ANIMAL DISEASES AND ZOONOSES
in Developing and Transition Countries

European Commission

World Bank

The World Organisation for Animal Health (OIE)

Cost of National Prevention Systems
for Animal Diseases and Zoonoses
in Developing and Transition Countries

Prepared by:

Civic Consulting

Cost of National Prevention Systems
for Animal Diseases and Zoonoses
in Developing and Transition Countries

Prepared by Civic Consulting

Civic Consulting

Potsdamer Strasse 150

D-10783 Berlin-Germany

Telephone: +49-30-2196-2297

Fax: +49-30-2196-2298

E-mail: alleweldt@civic-consulting.de

Study team

Dr Frank Alleweldt
(Project director)
Prof Martin Upton
(Lead author economic analysis)
Dr Senda Kara
Ms Sabine Pflug
Ms Ngo Thi Kim Cuc
Mr Rémi Béteille
Ms Marie-Pascale Doré
Mr Philipp von Gall

Key conclusions

The World Organisation for Animal Health (OIE) has commissioned Civic Consulting to conduct a study on the Cost of National Prevention Systems for Animal Diseases and Zoonoses in developing and transition countries. The aims of the study are twofold: (a) estimating the "peace time" costs of Veterinary Services allowing early detection and rapid response to emerging and re-emerging diseases in different regions, economies, animal health systems and eco-systems; and (b) developing economic indicators within the OIE-PVS Tool. The study is based on results of in-depth research in nine OIE member countries (Costa Rica, Kyrgyzstan, Mongolia, Morocco, Romania, Turkey, Uganda, Uruguay, Vietnam) and an extensive analysis of possible economic indicators. Key conclusions of the study include:

⇒ *Substantial differences in the public expenditure for the National Prevention System for Animal Diseases and Zoonoses exist between case study countries, reaching from 10 million international dollars to 167 million international dollars.* The average expenditure on the National Prevention System was 48.6 million international dollars in the baseline year 2007. Variations in expenditures between case study countries are clearly associated with differences in livestock population. Operational costs of the National Prevention System, when expressed on a per Veterinary Livestock Units (VLU) basis, therefore give a comparative measure of the level of service provision in relation to the quantitative requirements.

⇒ *In the case study countries, there is a close relationship between Gross Domestic Product (GDP) and the total public expenditures for the National Prevention System.* Differences in GDP explain to a large degree the variation in NPS expenditures. NPS expenditure appears to be mainly dependent on the country's ability to pay, rather than on the veterinary requirements. This may lead to a significant under funding of the NPS, most notably in low-income countries. In these cases Veterinary Services require a higher priority in the national budget allocation, and/or sustained external support to be able to effectively address global animal health challenges.

⇒ *Differences in NPS expenditures 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 Veterinary Livestock Unit 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.

⇒ *Sub-national expenditures tend to increase relative to the centralised expenditures with increasing size of the national territory.* Operating expenditures associated with the National Prevention System are incurred either centrally, in or near the main centre of government, or dispersed more widely in provincial, regional or district locations. A high central expenditure in Costa Rica is clearly associated with a centralised structure in a relatively small country, whereas Turkey, Morocco and Vietnam, three of the largest countries in area, spent about three quarters of the total NPS operating expenditure at the sub-national level. Provided that both central and regional elements are included, the average total cost per VLU may be unaffected by the extent of decentralised expenditure.

⇒ *Spending patterns for different categories of expenditures vary across case study countries, however, this provides little explanation for differences in overall NPS expenditures.* Levels of staff costs and expenditures such as travel costs appear to be directly related to levels of *per capita* income of case study countries. Considerable differences in spending that depend on other factors are related to three categories: Fees

for private veterinarians conducting public service mission (up to 0.96 international dollar/VLU), expenditures for vaccines (up to 1.57 international dollar/VLU), and compensation of livestock holders (up to 0.74 international dollar/VLU). In some other countries, spending for these items is zero or close to zero.

⇒ *There is no evidence that a stronger private veterinary sector reduces public NPS expenditures in the case study countries.* The relative strength of the private veterinary sector, expressed as the ratio of public to private veterinarians, appears to be related to the income level of the country. In the case study countries, both NPS expenditures and the relative importance of the private veterinary sector increase with a higher GNI *per capita.*

⇒ *The strong linear correlation between GDP and NPS expenditures for the case study countries can be used to estimate current National Prevention System expenditure.* However, this approach provides a rough estimation of the likely current level of funding of the NPS only, and *does <u>not</u> in any case determine the optimal level of NPS expenditures* in a given country. The only reliable and accurate method of obtaining data on NPS expenditures in other countries currently available is by means of direct measurement, using the methodology developed for this study.

⇒ *A quantitative expression of OIE-PVS Evaluation results would be helpful for assessing the degree of compliance with OIE International Standards on Quality of Veterinary Services in a systemic perspective.* In future refinements of the PVS Tool, the introduction of a more quantitative approach could be considered. Also, due to the cross-cutting character of several of the critical competencies used for the PVS Tool, it is currently difficult to correlate the costs for key NPS elements (e.g. veterinary diagnostic laboratories) to the results of a sub-set of PVS critical competencies related to this NPS element. It could therefore also be considered to refine and group critical competencies to allow a more direct correlation of PVS results and costs for key elements of the NPS.

⇒ *OIE member countries should collect data on staff numbers of the public Veterinary Services across all levels of government.* Although collection of such data would require additional efforts by member governments, this would hugely improve the basis for any future economic assessment of the National Prevention System, as staff costs account for up to three quarters of NPS operating expenditures in the case study countries. This could be encouraged by revising the reporting format for the annual OIE World Animal Health Report. A possible reporting format, suggested in this study, would differentiate between public and private veterinary personnel, differentiate the categories of veterinary personnel paid from the public budget and differentiate the type of activity of the personnel.

⇒ *A 'gold standard' or quality benchmark figures are needed from the OIE for comparison of NPS expenditures between countries, but assessments may be more effective if focused on key elements rather than on the total NPS expenditure at national level.* The results of this study suggest a gradual approach to derive benchmark values that provide guidance to countries for allocating their NPS expenditures effectively and efficiently, focusing on key elements of the National Prevention System (such as cost of surveillance, border inspection, diagnostic laboratory facilities).

⇒ *Consideration could be given to the development of a database of benchmark cost data concerning specific components of NPS expenditures.* 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, creating both a better basis for the budgeting process of specific countries and more transparency for donors.

Executive summary

The World Organisation for Animal Health (OIE) has commissioned Civic Consulting to conduct a study on the Cost of National Prevention Systems for Animal Diseases and Zoonoses in developing and transition countries. The aims of the study are twofold: (a) estimating the "peace time" costs of Veterinary Services allowing early detection and rapid response to emerging and re-emerging diseases in different regions, economies, animal health systems and eco-systems; and (b) developing economic indicators within the OIE-PVS Tool.[13] The study is based on a review of relevant literature, results of in-depth research in nine OIE member countries, and an extensive analysis of possible economic indicators.

I. Estimating the cost of National Prevention Systems for Animal Diseases and Zoonoses

Methodological challenges and approach followed

A major challenge for the study has been the absence of other, comparable studies in the animal health field. Previous studies mainly focused on specific regions, e.g. in Africa, or applied a much narrower definition of "epidemiological surveillance systems" than the definition of National Prevention System (NPS) used in this study, or focused on measures related to specific diseases rather than considering the overall system. A major element of the study has therefore been developing, testing and refining the methodological framework. In brief, the approach followed by this study was as follows:

1. *Definition of the boundary of the National Prevention System* – A definition of the NPS was developed that includes all public sector capacities for surveillance, early detection and rapid response (including services of accredited private veterinarians undertaking public service missions) and is also practicable for the cost assessment, which consequently focused exclusively on public sector expenditures (in the baseline year 2007).

2. *Identification of main functional units* – Main functional units of the NPS at central and sub-national level were defined, to allow comparisons of key cost centres within the National Prevention System 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 conducted at central level), the national veterinary laboratory, 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, veterinary units of municipalities.

3. *Development of approach for cost assessment* – The methodology for the cost assessment was developed taking into account best practices from the animal health and public health field. The cost assessment approach includes 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.

4. *Selection of case study countries* – A total of 13 candidate countries for case studies were selected on the basis of a set of criteria described in section 2.2 of this report. The

---

[13] The OIE-PVS Tool for the Evaluation of Performances of Veterinary Services is designed to assist Veterinary Services to establish their current level of performance, to identify gaps and weaknesses regarding their ability to comply with OIE international standards, to form a shared vision with stakeholders (including the private sector) and to establish priorities and carry out strategic initiatives.

countries cover different OIE regions and have <u>different levels of compliance</u> with OIE International Standards as expressed in the results of the PVS Evaluation, in line with the aim of the study to cover a wide range of different regions and situations.

5. *Data collection* – Data were collected through a review of literature and databases, a questionnaire survey, and country visits of the core expert team. Final data sets were obtained for a total of seven countries: Costa Rica, Kyrgyzstan, Mongolia, Morocco, Turkey, Uganda, and Vietnam. In addition, partly incomplete data sets were obtained for Uruguay and Romania.

6. *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 main functional units for all case study countries were comparatively analysed, as well as different indicators/ratios to identify factors that may influence costs, and that could be used as economic indicators within the PVS Tool.

Overview of case study results

Total public expenditures on the National Prevention System for the seven case study countries for which a full data set is available are listed in the following Table together with other key data.

Key data of countries for which complete data set was available (2007)

OIE-Region	Costa Rica *The Americas*	Kyrgyz-stan *Europe & Central Asia*	Mon-golia *Asia*	Mo-rocco *Africa*	Turkey *Europe & Middle East*	Uganda *Africa*	Vietnam *Asia*	*Average*
NPS costs (000) intl. $	11,172	10,043	<u>21,086</u>	46,811	166,962	16,888[a]	67,356	*48,617*
NPS costs with donor programmes (000) intl. $	11,584	11,517	21,702	48,698	180,080	<u>23,369</u>[a]	72,619	*52,796*
Land area (000) km^2	51	200	1,567	447	784	241	<u>329</u>	*517*
Population (000)	4,398	5,258	2,604	<u>30,852</u>	73,888	30,930	85,140	*33,300*
GDP (PPP) million intl. $	<u>46,021</u>	10,508	8,426	126,943	885,905	32,767	221,614	*190,312*
Veterinary Livestock Units (000)	1,365	1,766	6,381	<u>6,455</u>	17,765	8,818	17,483	*8,576*
Number public veterinarians NPS	117	1,096	<u>450</u>	240	2,910	345	4,272	*1,347*
VLU / Number public veterinarians NPS	<u>11,648</u>	1,612	14,179	26,894	7,567	25,559	4,092	*13,079*

Source: Civic Consulting. For sources of data, see country tables in section 3.
Notes: (a) Fiscal year 1.7.2006 to 30.6.2007.
        Median values are underlined (see the glossary on page 9 for a definition of *median*).

The arithmetic mean, or average, expenditure on the National Prevention System, for the seven countries is 48.6 million international dollars.[14] These figures are quoted net of donor support programmes, so they reflect only domestic spending on animal disease prevention. In the second row of the Table additional expenditure derived from foreign assistance programmes is included in the total NPS expenditure for each country. The only change in the ordering of the countries, in terms of total NPS expenditure is that the value for Uganda is raised above that for Mongolia. 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 the Table clearly underline the diversity of the sample. Less obvious are patterns in the data presented that could provide some insight concerning the relationship of different factors influencing the total cost of the National Prevention System. The study analyses possible reasons for differences between the case study countries in National Prevention System expenditures.[15]

Analysis of factors that influence total NPS costs 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 countries suggest that there is no obvious association between land areas and total NPS costs. Mongolia, the largest country, with an area of over 1.5 million square kilometres, has a moderate level of NPS expenditure. Turkey, Vietnam and Morocco, with much smaller land areas have considerably higher total NPS expenditures. This absence of an 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 human population is still fairly weak.

Size of livestock sector: A Veterinary Livestock Unit (VLU) is an equivalence unit for the estimate of annual veterinary cost and care. For example, according to the definition one bovine requires the same annual veterinary cost and care as ten sheep or a hundred chickens. The total livestock population, measured in Veterinary Livestock Units is therefore, by definition, the most appropriate measure of the scale of veterinary service requirements. This is born out by the fact that Costa Rica and Kyrgyzstan have similar low livestock populations and report the lowest levels of NPS costs, while Turkey, followed by Vietnam, has the highest livestock population and the highest level of NPS costs (see the following Table).

---

[14] In order to make comparisons across case study countries feasible, cost data collected in local currency are converted in international dollars using implied Purchasing Power Parities conversion rates (national currency per current international dollar, see glossary).

[15] 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 a correlation analysis. Data from the case study countries were used in simple correlation between pairs of variables to test for strength of linear association. 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 be quite strong in explaining a high percentage of the variation in the dependent variable, can still have considerable sampling errors. The study team has therefore applied all possible caution in interpreting the results, and has only presented those findings that appear to be supported not only by the statistical analysis, but also by a thorough qualitative analysis of facts.

NPS expenditure expressed on a per VLU basis (2007)

	Costa Rica	Kyrgyz-stan	Mongolia	Morocco	Turkey	Uganda	Vietnam	*Average*
NPS costs (000) intl.$	11,172	10,043	<u>21,086</u>	46,811	166,962	16,888[a]	67,356	*48,617*
Veterinary Livestock Units (000)	1,365	1,766	6,381	<u>6,455</u>	17,765	8,818	17,483	*8,576*
NPS costs per VLU in intl.$	8.18	<u>5.69</u>	3.30	7.25	9.40	1.92	3.85	*5.66*

Source: Civic Consulting. For sources of data, see country tables in section 3.
Notes: Median values are underlined. NPS costs exclude donor programmes.

⇒ *Substantial differences in the expenditure for the National Prevention System for Animal Diseases and Zoonoses exist between case study countries.* For Turkey, expenditures are with 167 million international dollars roughly 17 times greater than for Kyrgyzstan with 10 million international dollars. Variations in expenditures between case study countries are clearly associated with differences in livestock population. Operational costs of the National Prevention System, when expressed on a per Veterinary Livestock Unit (VLU) basis, therefore give a meaningful comparative measure of the level of service provision in relation to the quantitative requirements.

Economic development and trade

National Income: Gross Domestic Product (GDP) is a general measure of the level of economic activity. There appears to be a close association between this measure of size and the total NPS costs. The straight-line relationship with GDP explains 97 percent of the variation in NPS expenditures in the case study countries.[16]

⇒ *In the case study countries, there is a close relationship between Gross Domestic Product (GDP) and the total expenditures for the National Prevention System.* Differences in GDP explain to a large degree the variation in NPS expenditures. This seems to imply that NPS expenditure is mainly dependent on the country's ability to pay, rather than on the veterinary requirements.

Per capita income: Per capita income (expressed as Gross National Income or GNI per capita of population), is a commonly used criterion to categorize 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.

⇒ *Differences in NPS expenditures 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 Veterinary Livestock Unit 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.

Trade: Costa Rica is the only case study country that earns a substantial income from beef and pig meat exports. This country benefits from FMD free status, without vaccination, and has a high level of NPS expenditure per VLU in comparison with most of the case study countries.

---

[16] See Figure 4.2 on page 134.

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 value of these exports probably increases the emphasis placed on NPS expenditures. 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, affect the types of livestock kept and the associated production systems. Disease incidence may also be linked with the presence, or absence, of alternative hosts and vectors of disease. These features can determine the relative importance of different livestock diseases, and the choice of appropriate control measures. The total costs of National Prevention Systems are likely to depend upon the relative occurrence of different diseases and the choice of preventive control measures. However, this is not reflected in the data from the case study countries, where the association of NPS expenditures with GDP appears to be more relevant than other factors.

Existence of a private veterinary sector: Some animal health functions, particularly those relating 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 differentiation of responsibilities, private sector veterinarians cannot readily substitute for public sector veterinarians in the National Prevention System. Rather the private and public sector veterinarians are likely to complement each other's activities. The contribution of private veterinarians to the improvement of livestock production is not considered to be part of the National Prevention System as defined for this study, and related expenditures of the private sector have been excluded.[17] Due to the lack of data concerning private sector spending on veterinary measures and biosecurity in case study countries, it is not possible to identify 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. Study results indicate that the ratio of numbers of private veterinarians, to numbers of public sector veterinarians in the NPS, tends to increase with increasing national *per capita* income. Judged by the results from the sample of case study countries, the ratio of public to private veterinarians appears to be of little value to explain NPS expenditures.

⇒ *There is no evidence that a stronger private veterinary sector reduces public NPS expenditures in the case study countries.* The relative strength of the private veterinary sector, expressed as the ratio of public to private veterinarians, appears to be related to the income level of the country. In the case study countries, both NPS expenditures and the relative importance of the private veterinary sector 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 the difficulty in enforcement of quarantine, linked with 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

---

[17] However, public expenditures for services of accredited private veterinarians undertaking public service missions are included in NPS costs.

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 National Prevention Systems. However, no quantitative evidence in this respect was available from the case study countries.

Allocation of NPS expenditures between central and sub-national level

Operating expenditures associated with the National Prevention System 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. De-centralised or sub-national units generally include provincial, district and/or municipal veterinary units and laboratories.

If only the degree of decentralisation of public services is considered, i.e. NPS expenditures at different levels of government, the following picture emerges: In most case study countries the centralised expenditure per VLU is consistently between one and two 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 percent, values range from a low, of 20 percent in Turkey, to a high level of 77 percent in Uganda.

$\Rightarrow$ *Sub-national expenditures tend to increase relative to the centralised expenditures with increasing size of the national territory.* A high central expenditure in Costa Rica is clearly associated with a centralised structure in a relatively small country, whereas Turkey, Morocco and Vietnam, three of the largest countries in area, spent about three quarters of the total NPS operating expenditure 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. Livestock population density is sparse and less funding is distributed to decentralised agencies. Provided that both central and regional elements are included, the average total cost per VLU may be unaffected by the extent of decentralised expenditure.

Allocation of NPS expenditures to different types of expenditure

Staff costs: Staff expenditures 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, with a lower expense than might be expected for its income level, does not follow the trend, partly due to the fact that at district level the local Veterinary Services are run by private Veterinary Service units and related public expenses are a service expenditure and therefore not included in staff costs. Staff expenditures, expressed as a percentage of the total NPS operating expenditure, vary from 19 % in Mongolia to 73 % in Costa Rica and 74% in Turkey.

Material supplies: In all 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 the costs of 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 being 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, laboratory diagnostics, communications and training of employees. Hire of services accounts for a relatively small proportion of total NPS operating expenditure, a negligible amount in Costa Rica and Kyrgyzstan. Amounts spent on services are all below one international dollar and range from 0.08 international dollars in Uganda to 0.96 international dollars in Morocco.

Consumption of fixed capital: This category of operational costs relates to the annual reduction in the value of fixed assets, or 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: Compensation of livestock holders for animals culled for disease control purposes in Mongolia is low at only 0.02 international dollars per VLU and accounts for less than one percent of the total operating expenditure. In Morocco the expenditure is intermediate, at 0.23 international dollars and accounts for three percent of the total operating expenditure. The highest expenditure on livestock owner compensation was reported from Turkey, where it amounts to 0.74 international dollars and eight percent of the total operating expenditure. Levels of expenditure on producer compensation for compulsorily culled animals are therefore absent or very low in most of the seven countries. However, the larger than average amounts spent for compensation of farmers in Morocco and especially in Turkey could be one of the factors contributing to higher than average NPS costs in these countries.

⟹ *Spending patterns for different categories of expenditures vary across case study countries, however, this provides little explanation for differences in overall NPS expenditures.* Levels of staff costs and expenditures such as travel costs appear to be directly related to levels of *per capita* income of case study countries. Considerable differences in spending that depend on other factors are related to three categories: Fees for private veterinarians conducting public service mission (up to 0.96 international dollar/VLU), expenditures for vaccines (up to 1.57 international dollar/VLU), and compensation of livestock holders (up to 0.74 international dollar/VLU). In some other countries, spending for these items is zero or close to zero.

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

Economic indicators linked to Veterinary Services can either relate 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.

In the search for suitable economic indicators to be integrated into PVS Evaluations, 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 FAO agricultural databases and veterinary data from the OIE animal health database. The methodology adopted was to seek for relationships between NPS expenditures and other variables, relating to the geographical, economic livestock production and veterinary characteristics of each country.

Relationships may be established on logical grounds, such as that between NPS expenditures and scale of veterinary requirements, as measured by the total VLU numbers. Hypothesised relationships between variables may be tested by means of scatter-plots, and their strength measured by statistical correlation or regression analysis. These statistical approaches allow an

assessment of goodness of fit, measured by the proportion of variation in the dependent variable attributable to the relationship. If the fit is poor, it suggests there is little or no relationship and it is unlikely to provide a useful indicator. All these methods were used, in the course of the study visits and subsequently in analysis of the results. For this study, a large set of potential indicators was scrutinised, many of which proved to be of limited value. In this report, only those selected indicators that appear to have value as economic indicators linked to Veterinary Services are discussed.

Indicators for total NPS expenditure

The total public expenditure for the National Preventions System (not including donor contributions), when related to livestock population (expressed in Veterinary Livestock Units) or national income (GDP), serves as a key indicator used throughout much of this study.

Overview of possible indicators concerning costs of the NPS as a whole

Description	Indicator	Comments
Indicators for the costs of the NPS as a whole		
Indicator of the level of NPS provision in relation to veterinary care requirements	Total public operating expenditures for the NPS / VLU	*Data collection for providing measurement of total NPS expenditures in a given country requires separate visit of a specialist team.*
Indicator of the level of NPS provision in relation to national income	Total public operating expenditures for the NPS / GDP	

Source: Civic Consulting.

Measuring or estimating total NPS expenditure

Data on National Prevention System expenditures in the case study countries are not readily available from official records and accounts. There appears to be no easy alternative to the method of direct recording of expenditures through country visits of an experienced expert team (not unlike the approach chosen for the PVS Evaluation) for providing *precise measurements* of NPS expenditures. However, the results of the study point to a possibility of *estimating* NPS expenditures with easily available data. With the measures of NPS expenditures for the case study countries, together with published estimates of GDP, an apparently strong linear association has been identified between the two variables. This finding is important since it seems to demonstrate that levels of NPS expenditure are largely determined by national income levels or ability to pay. The relationship with GDP explains 97 percent of the variation in NPS expenditures between countries (see section 4.2.2.1). The regression equation is:

$$y = 0.1756x + 15.19$$

> 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 additional billion international dollar increase in GDP there is a corresponding increase in NPS expenditure of 175.6 thousand international dollars.

$\Rightarrow$ *The strong linear correlation between GDP and NPS expenditures for the case study countries can be used to estimate current National Prevention System expenditure.* However, this approach provides a rough estimation of the likely <u>current level</u> of funding of the NPS only, and does <u>not in any case determine the optimal level of NPS expenditures</u> in a given country. The only reliable and accurate method of obtaining data

on NPS expenditures in other countries currently available is by means of direct measurement, using the methodology developed for this study.

Limitations of using total NPS expenditures as benchmark

The basis for the formula for estimating NPS expenditures presented above is a statistical correlation and regression analysis of the data obtained through the country studies. The resulting findings have to be interpreted with care, because of limitations regarding the size of the sample and the way it was constructed (see section 6.2.3.1 of this report). In addition to these limitations, study results raise general questions concerning the possibility of using data on total NPS expenditures as benchmarks for other countries. Because of the large social, economic, geographical and livestock population differences between countries, it is doubtful whether uniform benchmark values for total NPS expenditures per VLU are likely to be *globally* applicable, e.g. concerning the expenditures for a NPS largely aligned with OIE International Standards. Initial results from Uruguay and Romania, which have higher PVS levels than the other case study countries, appear to hint to widely varying NPS expenditures per VLU, although unfortunately data limitations do not allow for a final conclusion in this respect.

⇒ *A 'gold standard' or quality benchmark figures are needed for comparison of NPS expenditures between countries, but assessments may be more effective if focused on key elements rather than on the total NPS expenditure at national level.* The results of this study suggest a gradual approach to derive benchmark values that provide guidance to countries for allocating their NPS expenditures effectively and efficiently, focusing on key elements of the National Prevention System (such as cost of surveillance, border inspection, diagnostic laboratory facilities); and collecting regional benchmark cost data.

Indicators for degree of compliance with OIE International Standards

The development of the OIE-PVS Tool is the product of a comprehensive and detailed analysis and review of the requirements of effective Veterinary Services, and appears to be a very valuable tool for economic analysis, as it provides an assessment, albeit qualitative, of the level of performance (degree of compliance with OIE International Standards on Quality of Veterinary Services). An aggregated PVS measure would be very helpful as it would allow comparison of NPS expenditures with the degree to which the National Prevention System adheres to OIE International Standards. For example, the relationship between PVS results and NPS expenditures could be of interest as a benchmark for performance, if results from a sufficient number of comparable countries were available. NPS expenditures that are much higher per VLU than in other countries reaching similar PVS scores would justify further analysis, either to identify possible inefficiencies, or to identify factors that explain the additional expenditure. Similarly, NPS expenditures that are much lower per VLU than in other countries reaching similar PVS scores would either be interesting study objects concerning best practices, or could provide more insights in (country-specific) factors reducing NPS expenditures.

Constructing an average score for PVS Evaluations, however, raises methodological concerns, because critical competencies relate to a variety of different issues, and the use of averages allocates the same weight to very different critical competencies. This could lead to distortions, because some aspects of the NPS may be more relevant for the overall compliance with OIE standards than others. A possible solution would be to develop a weighting scheme that would assign weights reflecting the relative importance given to the different critical competencies. Alternatively, it would 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 directly be related to the expenditures for these key elements.

Overview of possible indicators concerning compliance with OIE Standards

Description	Indicator	Comments
Possible indicators linked to Veterinary Services in compliance with OIE International Standards on Quality of Veterinary Services		
Quantitative expression of overall PVS results	Overall PVS result compared to total public operating expenditures for the NPS / VLU	*Currently not available. In future refinements of the PVS Tool, consideration could be given to a more quantitative approach, and group critical competencies to allow a more direct correlation of PVS results and costs for key elements of the NPS.*
Quantitative expression of PVS results for key NPS elements such as veterinary diagnostic laboratories	PVS result for key NPS elements compared to public operating expenditures for the key element / VLU	

Source: Civic Consulting.

⇒ *A quantitative expression of OIE-PVS Evaluation results would be helpful for assessing the degree of compliance with OIE International Standards on Quality of Veterinary Services in a systemic perspective.* In future refinements of the PVS Tool, the introduction of a more quantitative approach could be considered. Also, due to the cross-cutting character of several of the critical competencies used for the PVS Tool, it is currently difficult to correlate the costs for key NPS elements (e.g. veterinary diagnostic laboratories) to the results of a sub-set of PVS critical competencies related to this NPS element. It could therefore also be considered to refine and group critical competencies to allow a more direct correlation of PVS results and costs for key elements of the NPS.

Indicators for specific NPS 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 below). These indicators are mainly of interest when analysing how specific NPS features compare with other countries.

Overview of possible indicators concerning specific NPS components

Description	Indicator	Comments
Indicators for specific NPS expenditures		
Indicator for NPS staff relative to requirements	VLU / Public professional staff of the NPS	*Key indicator, which requires new reporting format for OIE members*
Indicator for 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 expenditures in all seven case study countries, and provides therefore insight into main cost factors relevant for the NPS.*
Indicator for public procurement of vaccines	Public expenditures for vaccines / VLU	
Indicator for relevance of accredited private veterinarians undertaking public service missions	Public expenditures for accredited private veterinarians / VLU	
Indicator for veterinary laboratories	Public expenditures for 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.*

Specific indicators for material infrastructure of the NPS		
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	
Other indicators		
Dependence on donor funding	Donor funding / total public operating expenditures for the NPS	*To assess the level of dependence on outside funding.*

Source: Civic Consulting.

Data on expenditures concerning these and other indicators can be collected during the OIE-PVS Evaluation or the PVS Gap Analysis,[18] as well as through focused study visits of a specialist expert team or – to a more limited extent – through 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.

⇒ *Consideration could be given to the development of a database of benchmark cost data concerning specific components of NPS expenditures.* 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, creating both a better basis for the budgeting process of specific countries and more transparency for donors.

Possibilities to improve base data collection

Livestock and VLU data: As has been indicated before, this study confirms that the best available indicators for comparative assessments of National Prevention Systems are defined on a per Veterinary Livestock Unit (VLU) basis. Measures of Veterinary Livestock Units are calculated from estimates of livestock populations by species and using conversion coefficients for different species. A more consistent use of VLU would be supported significantly by a coordinated effort to improve 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, there appears to be some scope for improving the reliability of VLU conversion coefficients by redefining them, e.g. by including more species and possibly differentiating conversion coefficients according to production system for some species. The latter aspect would, however, depend on the possibility of making available global 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 to represent a valid measurement of veterinary requirements and the need to allow its application in practice.

Veterinary personnel data: Currently, the only data source available concerning veterinary personnel is the data reported to the OIE from member countries. However, the analysis in the case study countries made clear that reporting is not always accurate, and the reporting format

---

[18] Currently, the OIE-PVS Evaluation is complemented in selected countries by a PVS Gap Analysis. A PVS Gap Analysis is intended as a basis for budgeting to strengthen the Veterinary Services and builds upon the results of the PVS Evaluation. It describes main activities to fill the current gaps identified in the PVS Evaluation and also considers organisational issues related to implementing a so-called '5-years conformity strengthening plan'.

does not allow differentiation between public veterinarians of the Veterinary Services working on prevention, surveillance and control and other public veterinarians working e.g. on livestock production issues (such as genetic improvement of livestock). In addition, in several of the case study countries the central public Veterinary Service is not aware of the number of veterinary personnel working at the sub-national level, and this again is problematic both in terms of comparability of data from different countries, and also from a disease management perspective. It appears to be reasonable that a precondition for improving a National Prevention System at any level of expenditure would require that the central Veterinary Service has reliable information on the staff resources available at sub-national level e.g. for emergency measures. It is therefore recommendable that governments develop a database of staff numbers of the public Veterinary Services across 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 provide the following categories (see also the indicative template, Table 6.2 on page 185):

- Differentiate between *public and private* veterinary personnel;

- Differentiate the *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);

- Differentiate the *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 hugely improve the basis for any future economic assessment of the National Prevention System, as staff costs account for up to three quarters of NPS operating expenditures in the case study countries.

Animal health situation: Assessments of the cost-effectiveness of specific animal disease control measures, such as brucellosis vaccination programmes, are often measured against an indicator, such as changes in disease prevalence as identified through active surveillance programmes or changes in the number of reported brucellosis cases per year. At a systemic level a 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 very crude indicator for the overall animal health situation, but this indicator is of very limited use. In comparison, in the public health field several systemic indicators for the health of the population are available, such as the expected lifetime at birth. In the medium to long term it appears to be indispensable for any economic consideration of animal health measures to have better systemic indicators available that reflect the animal health situation of the livestock population in a given country.

⇒ *The use of economic indicators within the PVS Tool, and economic analysis of National Prevention Systems for Animal Diseases and Zoonoses in general, could be significantly furthered by improving the reliability of global base data.* The country studies conducted for this study have documented a large variety of data availability issues concerning base data such as livestock numbers and veterinary personnel. This can potentially distort the analysis. A coordinated effort to improve reliability and scope of the base data on livestock populations and other relevant topics appears to be necessary at international level.

**Cost of National Prevention Systems
for Animal Diseases
and Zoonoses in Developing
and Transition Countries**

This study was commissioned by the World Organisation for Animal Health (OIE) and co-funded by the World Bank and the European Union. The views and recommendations presented in this study are those of the authors and do not necessarily represent the views of the OIE or one of the co-funding institutions.

OiE