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Tiergesundheit, Zoonosen **Monitoring Surveillance**

Economic assessment of surveillance in a "One Health" context

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Key words
Economic assessment; economic framework, “One Health surveillance”, cross-sectoral surveillance, surveillance integration, zoonoses, Campylobacter, West Nile Virus, Qualitative research

Background of the project
"One health" frameworks promoting collaboration between the animal health and public health sectors have been increasingly recognized as needed to effectively address the threat of zoonotic diseases at the human-animal-ecosystems interface. A formal analysis of the benefits has not yet been carried out for collaborative surveillance programmes on zoonoses.

Aim of the study
The project used mixed methodological methods with a predominant quantitative component, to address the following main research questions: (1) Can a broad conceptual economic framework be developed to guide the economic assessment of surveillance in a “One Health” perspective?, and (2) Is surveillance of zoonoses in animal populations, in selected examples, economically beneficial for public health?

Material and methods
A conceptual framework to reflect the links between surveillance and intervention across the animal and the public health sector was developed for the economic assessment of cross-sectoral surveillance. The framework was applied to specific disease surveillance settings to test its practical implementation in guiding the economic assessment of concrete “One Health” surveillance examples. The selected examples were Campylobacter surveillance in Switzerland and West Nile Virus (WNV) surveillance in the United Kingdom and in Italy. A range of methods including cost analysis, Disability Adjusted Life Years (DALY) and cost-of-illness estimations was used in the case studies. This research project also integrated an exploratory qualitative study on the benefits, particularly on the intangible benefits, using semi-structured interviews and framework analysis.

Results and significance
In the proposed concept, monetary, non-monetary and intermediate or intangible cost components and benefit streams of three conceptually distinct stages of zoonotic disease mitigation are identified. In each stage, as the final disease mitigation objective varies so does the use of surveillance information generated in the animal populations for public health decision-making. Building on the proposed framework, practical steps for its application and future challenges were identified. The framework was applied to three different surveillance examples. For Campylobacter in Switzerland, there was an increase in expenditure mitigation efforts following integration, with an overall marginal cost of 1.2 million CHF (over 5 years) in relationship with the 5-year period 2004-2008, and a slight increase in the overall burden of campylobacteriosis of up to 1751- 2852 DALYs in 2013. The break-even point for the integrated mitigation efforts in 2009-2013 would be reached with an annual reduction in burden of 6 to 43.8 DALYs. Added value of the collaborative approach was linked to non-measurable benefits such intellectual capital and social capital. WNV surveillance efforts in the UK from 2002-2005 were harder to quantify. Data gaps on costs and benefits of a collaborative approach to WNV allowed little understanding on the efficiency of resource allocation of the collaborative approaches versus mono-sectorial approaches. Our findings highlighted the need for systems that adequately capture the level of expenditure in

surveillance and triggered activities. Data availability on the WNV integrated surveillance efforts in Emilia-Romagna, Italy, 2009-2015 allowed to quantify costs and benefits of a collaborative approach and showed positive effects in terms of costs savings and benefits generation. The qualitative study on intangible benefits generation showed that the overall added value of collaborative approaches to zoonoses surveillance is likely to include intangible benefits that should not be overlooked in economic evaluations. The practical application of the framework confirmed its usefulness as a guide for the identification of costs of benefits of "One Health" approaches to surveillance in a range of settings. It also highlighted the challenges of the availability of data for the quantification of costs and benefits and the need to include in the overall added and value of One Health approaches to surveillance intangibles such as stronger knowledge base, reassurance and social capital.

Publications and manuscripts in preparation for peer-review journals

Babo Martins, S.; Rushton, J.; Stärk, K. D. C. (2015), Economic Assessment of Zoonoses Surveillance in a 'One Health' Context: A Conceptual Framework. *Zoonoses and Public Health*. doi: 10.1111/zph.12239

Babo Martins, S.; Rushton, J.; Stärk, K. D. C. Economics of zoonoses surveillance in a "One Health" context: An assessment of Campylobacter surveillance in Switzerland (under review at *Epidemiology and Infection)*

Babo Martins, S.; Rushton, J.; Stärk, K. D. C. Perceived benefits of surveillance in a "One Health"context: A qualitative study (*manuscript in drafting stages*)

Babo Martins, S. et al. Economics of One Health surveillance: the case of West Nile Virus enhanced surveillance in the UK (*working title, manuscript in drafting stages*)

Paternoster, G.; Babo Martins, S. et al. A cost-benefit analysis of the West Nile Virus integrated surveillance efforts in Emilia-Romagna, Italy, 2009-2015 *(working title, manuscript in drafting stages)*

Posters presented at the following conferences

MedVetNet Association International Scientific Conference, Denmark, 2013 (with short oral presentation)

2nd International Conference on Animal Health Surveillance (ICAHS), Cuba, 2014

3rd International One Health Congress, The Netherlands, 2015

Presentations at seminars and conferences

Presentation at the RVC internal research seminars series, London, May 2013.

Presentation at the Veterinary Public Health Institute seminar, Bern, June 2014

Presentation at the RVC internal Tuesday Seminar Series, Autumn 2014, London, December 2014

Two presentations at the International Symposia on Veterinary Epidemiology and Economics (ISVEE 14), Yucatan, Mexico, November 2015. Best graduate student presentation award with presentation no. 56: *Economic assessment of zoonoses surveillance in a "One Health" context: a conceptual framework by S. Babo MARTINS.*

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