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Effectiveness and cost-benefit study to encourage herd owners in sharing costs for vaccination programme against bluetongue serotype-8 in Belgium

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This study evaluated the **effectiveness of vaccination** against BTV-8 in Belgium and has shown that the interaction between the **time since the first injection and the second injection** of the primo-vaccination is **significantly** associated to **the change in serology** showing vaccine efficiency induces antibodies production. This study also clearly confirms **the benefit of vaccination by reducing economic** impact of treatment and production losses, especially in dairy cattle herds.

Introduction

Bluetongue has a significant economic direct and indirect impacts (Saegerman *et al*., 2008). In September of 2015, an outbreak of BTV-8 was reported in France. Due to the risk for re-introduction, preventive vaccination would enable Belgium to maintain its status of freedom from BTV-8 infection. To finance this programme, both decision-makers and stakeholders need to be persuaded by the effectiveness and the cost-benefit of vaccination.

Methods

Effectiveness of livestock vaccination

The effects of vaccination on seronegative individual cattle before the vaccination programme (2007-2008 (WS2)) and during/after (2008-2009 (WS3)) were analysed. Pearson and Spearman correlations were used between two relevant variables to identify variables of interests that were kept for a multivariate model analysis.

Cost-Benefit analysis

The model developed by Velthuis (Velhuis et al., 2011) was adapted to the Belgian bovine and ovine population data. For infected herds, costs include impact on production, preventive measures and treatment costs and trade restriction as described by Hanon (Hanon et al., 2009). The benefit is modelled as a function of avoided cost linked to productivity loss, treatment, and preventive management costs (e.i. insect repellents, export losses).

Results

Effectiveness of livestock vaccination

Animals with a longer duration between first vaccine injection and sampling have a superior 'Change'(= a variable obtained by subtracting QuantiWS2(=100 - Optical Density sample/Optical Density negative kit control)*100) from QuantiWS3) than the others which highlights the efficiency of the vaccine to induce antibodies. Having received two vaccine injections at sampling time also significantly increase 'Change' (Table I).

Table I. Results of the linear mixed model modelling the increase in serology between winterscreening 2008 (WS2) and winterscrening 2009 (WS3) ('Change')

Variable	Coefficient	Standard Error	P-value
Age	0.34	0.31	0.27
Time	27.69	10.01	<0.01
Two injections	52.01	11.28	<.0001
StatusWS1	8.05	6.42	0.21
Time*Two Injections	-32.69	12.31	0.02
Injection*Age	-0.57	0.35	0.11

'Age': Age of the cattle.

'Time': number of months between the date of first injection at herd level and the sampling date of the individual cattle.

'Two injections': indicates whether the animal had received its second vaccination (=1) or not yet (=0) at moment of sampling.

'StatusWS1': indicates whether the cattle came from a herd where within-herd seroprevalence in WS1 was above the mean prevalence of 27% or not.

Cost-Benefit analysis

The total net returns gained by avoiding compared to the vaccination cost was always positive at farm (**Figure1**) and at national level (**Figure 2**) with the exception of fattening calves, due to their short lifetimes.

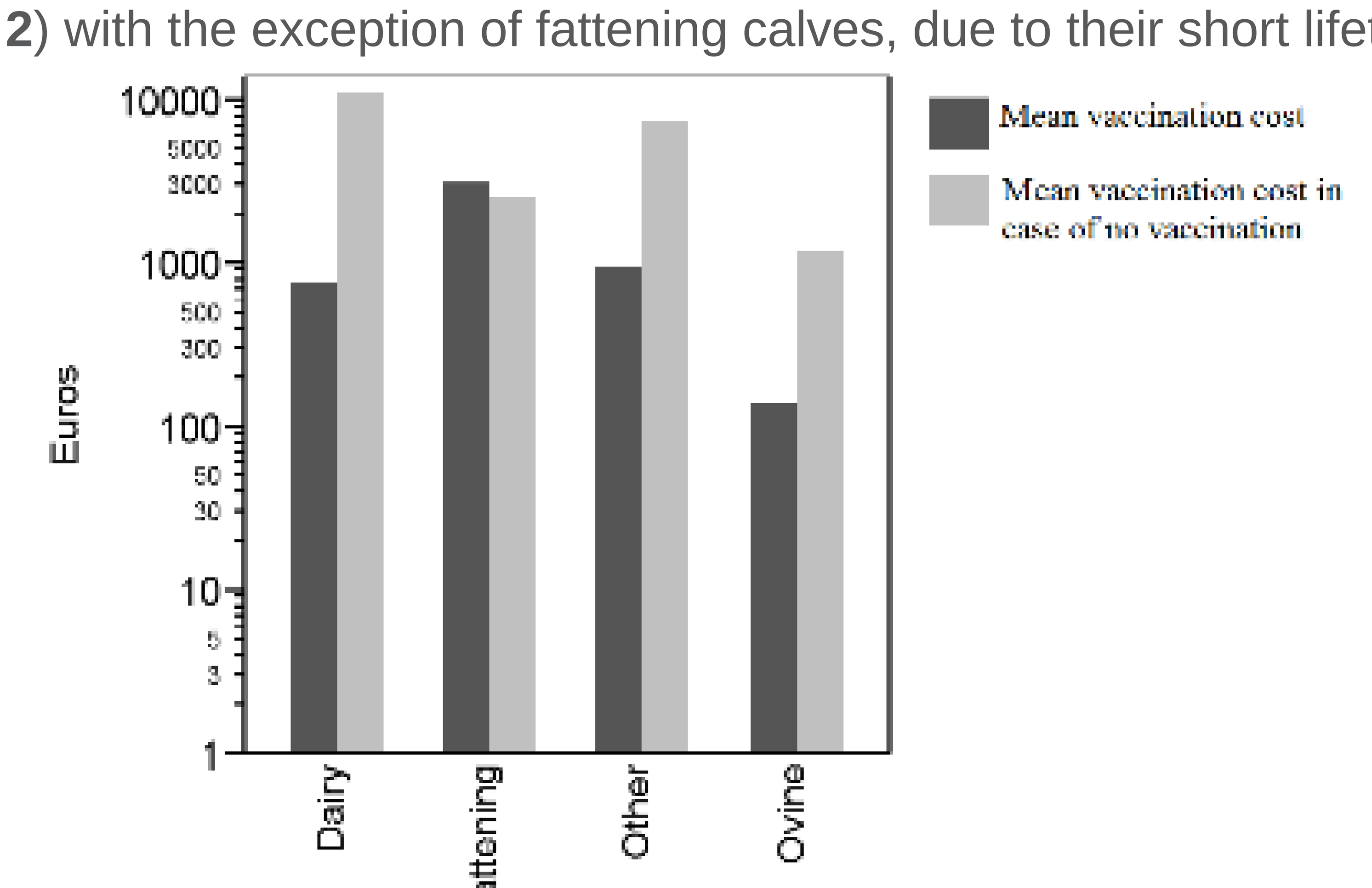

Figure 1: Expected cost of an epidemic in case no BTV-8 vaccination compared to vaccination cost at farm level for each defined herd category.

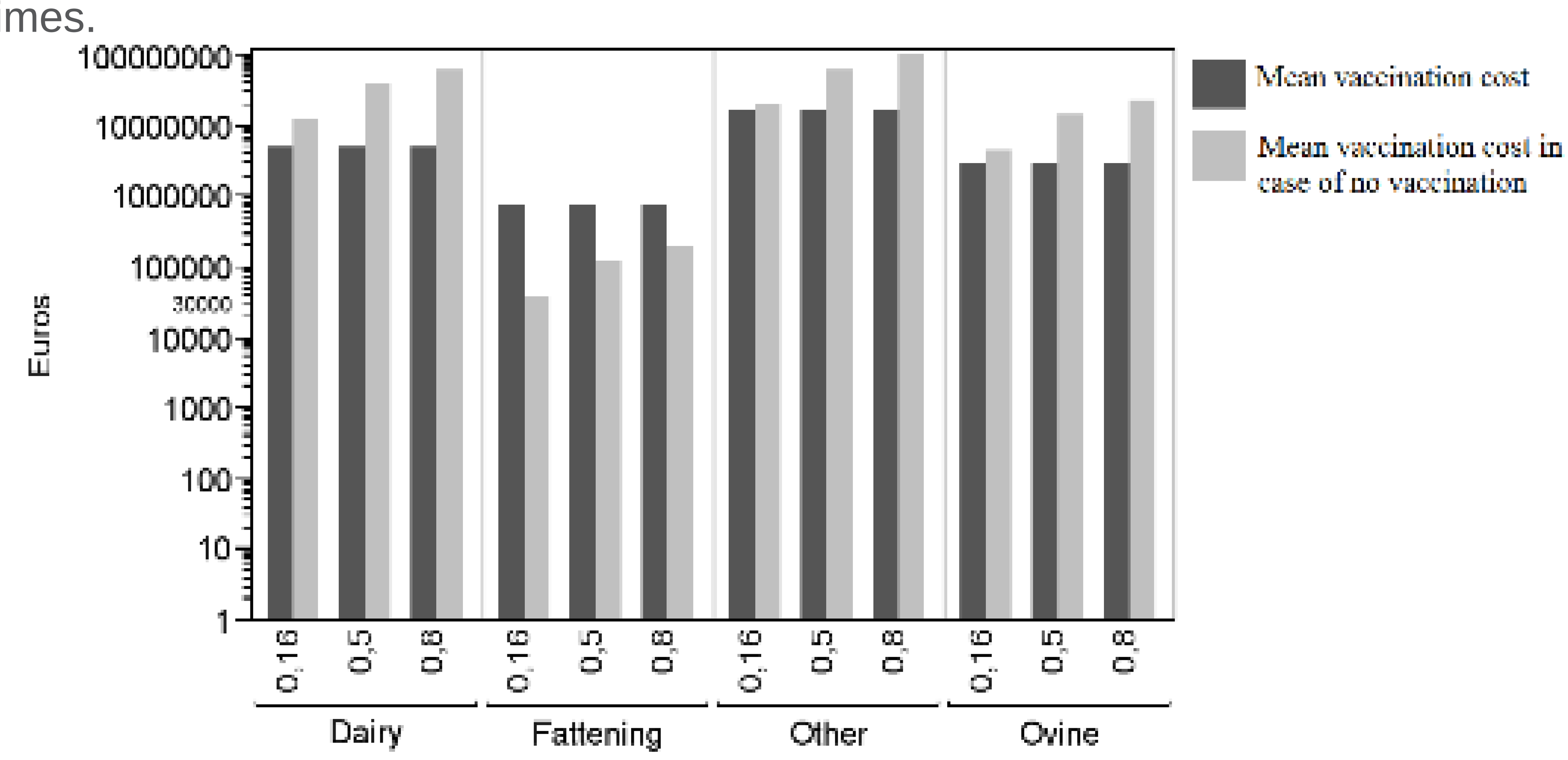

Figure 2: Expected cost of an epidemic in case no BTV-8 vaccination compared to vaccination cost at national level for each defined herd category.

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Disclaimer

Yves Van der Stede is currently employed with the European Food Safety Authority (EFSA). The positions and opinions presented here are those of the author alone and are not intended to represent the views or scientific works of EFSA.

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