

WNF associated costs for the equine sector - Scenario 2			
General considerations	Rate/data/cost	Source	Reference(s)
Infection rate (%) (in the population of animals at risk)	34%	Literature	Durand B, Chevalier V, Pouillot R, Laie J, Marendat I, Murgue B, Zeller H, Zientara S. West Nile Virus Outbreak in Horses, Southern France, 2000: results of a serosurvey. Emerg Infect Dis 2002;8:777-82
Morbidity rate (%)	10%	Literature	Leblond A, Hendrikx P, Sabatier P. West Nile Virus outbreak detection using syndromic monitoring in horses. Vector Borne Zoonotic Dis 2007; 7:403-10
Hospitalisation rate (%)	35%	Literature	Weese JS, Baird JD, DeLay J, et al. WNV encephalomyelitis in horses in Ontario: 28 cases. Can Vet J 2003; 44: 469-73
Case-fatality rate (%)	28%	Literature	Murgue B, Murri S, Zientara S, Durand B, Durand JP, Zeller H. West Nile outbreak in horses in southern France, 2000: the return after 35 years. Emerg Infect Dis 2001; 7: 692-696
Duration of the clinical disease	7 days	Literature	Cantile C, Di Guardo G, Eleni C, Arispici M (2000) Clinical and neuropathological features of West Nile virus equine encephalomyelitis in Italy. Equine vet J 32:31-35
Duration epizootics (Hypothesis)	2,5 months	Hypothesis	August 1st = 1st case and October 21 = recovery of the last case

Hospitalisation (N = 1,426 horses)

Cost of a visit of the veterinary practitioner (before referring the horse to the vet hospital)	42,00 €		Union of Veterinary Professionals
Duration of the clinical disease (mean hospital stay)	7 days	Literature	Cantile C, Di Guardo G, Eleni C, Arispici M. Clinical and neuropathological features of West Nile virus equine encephalomyelitis in Italy. Equine vet J 2000; 32:31-35

Veterinary Hospital

Day of admission equine internal medicine (€)	15,00 €	Fac. Vet Medicine, Liege
Horse stay, per day (€)	9,00 €	Fac. Vet Medicine, Liege
Special consulting equine internal medicine (€)	35,00 €	Fac. Vet Medicine, Liege
Special deep consulting equine internal medicine (€)	50,00 €	Fac. Vet Medicine, Liege
Blood sampling (€)	5,00 €	Fac. Vet Medicine, Liege
Standard blood analysis (€)	51,00 €	Fac. Vet Medicine, Liege
1st x-ray - horse (€)	35,00 €	Fac. Vet Medicine, Liege
2nd x-ray - horse (€)	25,00 €	Fac. Vet Medicine, Liege
CSF puncture (€)	20,00 €	Fac. Vet Medicine, Liege
CSF analysis - White cells (neutrophils + leucocytic formula)	12,00 €	Fac. Vet Medicine, Liege
CSF - Total proteins	2,00 €	Fac. Vet Medicine, Liege
CSF - protein electrophoresis	12,00 €	Fac. Vet Medicine, Liege
CSF - Albumin	2,00 €	Fac. Vet Medicine, Liege
CSF - Glucose	2,00 €	Fac. Vet Medicine, Liege
CSF - Smear	11,00 €	Fac. Vet Medicine, Liege

	CSF - Lactate	4,00 €	Fac. Vet Medicine, Liege
	CSF - CPK	6,00 €	Fac. Vet Medicine, Liege
	CSF - LDH	4,00 €	Fac. Vet Medicine, Liege
Treatment	non steroidal antiinflammatory (Flunixin meglumine - Finadyne®) 1,1 mg/kg IV every 12h - during 5 days	Literature	Weese JS, Baird JD, DeLay J, et al. WNV encephalomyelitis in horses in Ontario: 28 cases. Can Vet J 2003; 44: 469-73
	steroidal antiinflammatory (Dexamethasone - Rapidexon®) 0,05 to 0,1 mg/kg, IV per 24h during 3 jours	Literature	Weese JS, Baird JD, DeLay J, et al. WNV encephalomyelitis in horses in Ontario: 28 cases. Can Vet J 2003; 44: 469-73
	Fluid therapy - Ringer Lactate 64ml/kg per 24 hours (32 liters per 24h)	Literature	Radostitis OM, Gay CC, Hinchcliff KW, Constable PD. West Nile Encephalitis. In: Veterinary Medicine - a textbook of the diseases of cattle, sheep, goats, pigs and horses, 10th edition. Ed. Saunders Elsevier; pp.1378-1381

Cost of treatment

<i>Non-steroidal antiinflammatory (5 days)</i>	67,00 €	100 ml of Finadyne® = 60.98 € (500 kg horse)	http://www.valdhony-verdifarm.be/fr
<i>Steroidal antiinflammatory drug (3 days)</i>	14,00 €	100 ml of Rapidexon® = 30.42 € (500 kg horse)	http://www.valdhony-verdifarm.be/fr
<i>Infusion kit</i>	20,00 €		Fac. Vet Medicine, Liege
<i>Fluid Therapy (5 days)</i>	260,00 €	160L of Ringer Lactate (1L = 1,5 €)	Fac. Vet Medicine, Liege
<i>Daily care kits</i>	35,00 €	5 € per kit, for 7 days	Fac. Vet Medicine, Liege
TOTAL	396,00 €		

Total costs for a hospitalised horse

visit of the veterinary practitioner	42,00 €	
Hospital stay	69,00 €	Day 1 (15,00 €) + 6 days (9,00 € per day)
Treatment	396,00 €	
Medical services	85,00 €	
Complementary examinations (X-ray, blood sampling, CSF)	191,00 €	
TOTAL	783,00 €	

Total costs for 1,426 hospitalized horses

1.116.558,00 €

No hospitalisation (N = 2,648 horses)

Cost of a visit of the veterinary practitioner (before referring the horse)	42,00 €	Union of Veterinary Professionals
Duration of treatment (days)	2	mean duration of clinical signs = 7 days

Mean duration of recovery (weeks)	4 to 6		Weese JS, Baird JD, DeLay J, et al. WNV encephalomyelitis in horses in Ontario: 28 cases. Can Vet J 2003; 44: 469-73
Treatment	non steroidal antiinflammatory (Flunixin meglumine - Finadyne®) 1,1 mg/kg IV every 12h - during 2 days	Literature	Weese JS, Baird JD, DeLay J, et al. WNV encephalomyelitis in horses in Ontario: 28 cases. Can Vet J 2003; 44: 469-73

Cost of treatment	<i>Non-steroidal antiinflammatory (2 days)</i>	27,00 €	100 ml of Finadyne®= 60.98 € (500 kg horse)	http://www.valdhony-verdifarm.be/fr
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Cost of second visite of the veterinary practitioner		31,00 €		Union of Veterinary Professionals
Cost of following visits (one per day)		24,00 €	5 visits	Union of Veterinary Professionals

Total costs for a non-hospitalised horse	
visits of the veterinary practitioner	193,00 €
Treatment	27,00 €
TOTAL	220,00 €

Total costs for 2,648 non hospitalised horses 582.560,00 €

Prevention - Vaccination

Vaccine WNF Belgium	Equip WNV®	Zoetis Belgium
Price of a vaccine dosis	47,00 €	http://www.valdhony-verdifarm.be/fr
Cost of the vaccine veterinary visit	50,00 €	Union of Veterinary Professionals
Number of vaccine doses to administer (protocol)	2 doses, interval of 3 to 5 weeks	http://www.cbip-vet.be/fr/frdrughits.php
Total cost for the vaccination protocol	144,00 €	

Total cost for vaccinating the whole population of horses (N = 226,748) 32.651.712,00 €

226,748 = (total population of horses - N cases)

Total cost for vaccinating horses at risk (N = 115,731) 16.665.264,00 €

115,731 = (population of horses at risk - N cases)

Diagnosis

Cost of a serological WNV diagnostic test	6,00 €	personal communication (VAR)
Cost of a RT-PCR WNV diagnostic test	70,00 €	personal communication (VAR)
Total cost for diagnosis	76,00 €	

Total cost for diagnosis of 4,073 cases 309.624,00 €

Active surveillance (minimal) in horses

Cost of a serological WNV diagnostic test	6,00 €	personal communication (VAR)
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N tests to perform - active surveillance	2.569	Win episcope	sample size to detect the disease - 5% expected prevalence and 95% confidence interval
N tests to perform in 81 horse rental centers reporting at least one case	1.539	19 samples per horse rental center	
Total number of tests to perform for the 6 sampling periods	24.648		

Total cost for active surveillance (expected 5% prevalence)	147.888,00 €
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Entomological surveillance	not considered
Surveillance of wild avifauna	not considered (no additional costs as already implemented)
Surveillance of sentinel poultry farms	not considered

Containment of sick and recovering horses indoor

Supplementary feeding

Average daily cost of extra feeding (cereals + hay + water)		
<i>High-value horse</i>	0,93 €	Centre européen du Cheval de Mont-le-Soie, Département d'économie rurale de l'Université de Liège, Unité d'économie et de développement rural, Gembloux Agro-Bio Tech, University of Liege. Le poids socio-économique de la filière équine en Wallonie. http://www.cbc-bcp.be/images/Documents/fr-100510-105-chiffres-officiels.pdf [in French] (accessed October 3, 2014).
<i>Leisure horse</i>	0,53 €	Centre européen du Cheval de Mont-le-Soie, Département d'économie rurale de l'Université de Liège, Unité d'économie et de développement rural, Gembloux Agro-Bio Tech, University of Liege. Le poids socio-économique de la filière équine en Wallonie. http://www.cbc-bcp.be/images/Documents/fr-100510-105-chiffres-officiels.pdf [in French] (accessed October 3, 2014).
<i>Semi-feral horse</i>	0,33 €	Centre européen du Cheval de Mont-le-Soie, Département d'économie rurale de l'Université de Liège, Unité d'économie et de développement rural, Gembloux Agro-Bio Tech, University of Liege. Le poids socio-économique de la filière équine en Wallonie. http://www.cbc-bcp.be/images/Documents/fr-100510-105-chiffres-officiels.pdf [in French] (accessed October 3, 2014).

Hospitalised horses (N = 1,026 surviving horses) - 35 days of recovery indoor (399 dead/euthanized horses not considered)

Cost of extra-feeding (cereals + hay + water) for 35 days

<i>High-value horse</i>	33,00 € 0,93 € = average daily cost of extra feeding (cereals + hay + water)	Centre européen du Cheval de Mont-le-Soie, Département d'économie rurale de l'Université de Liège, Unité d'économie et de développement rural, Gembloux Agro-Bio Tech, University of Liege. Le poids socio-économique de la filière équine en Wallonie. http://www.cbc-bcp.be/images/Documents/fr-100510-105-chiffres-officiels.pdf [in French] (accessed October 3, 2014).
<i>Leisure horse</i>	19,00 € 0,53 € = average daily cost of extra feeding (cereals + hay + water)	Centre européen du Cheval de Mont-le-Soie, Département d'économie rurale de l'Université de Liège, Unité d'économie et de développement rural, Gembloux Agro-Bio Tech, University of Liege. Le poids socio-économique de la filière équine en Wallonie. http://www.cbc-bcp.be/images/Documents/fr-100510-105-chiffres-officiels.pdf [in French] (accessed October 3, 2014).
<i>Semi-feral horse</i>	12,00 € 0,33 € = average daily cost of extra feeding (cereals + hay + water)	Centre européen du Cheval de Mont-le-Soie, Département d'économie rurale de l'Université de Liège, Unité d'économie et de développement rural, Gembloux Agro-Bio Tech, University of Liege. Le poids socio-économique de la filière équine en Wallonie. http://www.cbc-bcp.be/images/Documents/fr-100510-105-chiffres-officiels.pdf [in French] (accessed October 3, 2014).

Global cost of extra-feeding during recovery of 1,026 hospitalised horses which survived	19.508,00 €
<i>High-value horses</i>	6.798,00 €
<i>Leisure horses</i>	7.790,00 €
<i>Semi-feral horses</i>	4.920,00 €

206 high-value horses (20% of 1,026)
410 mixed horses (40% of 1,026)
410 rustic horses (40% of 1,026)

Not hospitalised horses (N = 2,648 horses) - 42 days of recovery indoor

Cost of extra-feeding (cereals + hay + water) for 42 days

<i>High-value horse</i>	39,00 € 0,93 € = average daily cost of extra feeding (cereals + hay + water)	Centre européen du Cheval de Mont-le-Soie, Département d'économie rurale de l'Université de Liège, Unité d'économie et de développement rural, Gembloux Agro-Bio Tech, University of Liege. Le poids socio-économique de la filière équine en Wallonie. http://www.cbc-bcp.be/images/Documents/fr-100510-105-chiffres-officiels.pdf [in French] (accessed October 3, 2014).
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<i>Leisure horse</i>	22,00 € 0,53 € = average daily cost of extra feeding (cereals + hay + water)	Centre européen du Cheval de Mont-le-Soie, Département d'économie rurale de l'Université de Liège, Unité d'économie et de développement rural, Gembloux Agro-Bio Tech, University of Liege. Le poids socio-économique de la filière équine en Wallonie. http://www.cbc-bcp.be/images/Documents/fr-100510-105-chiffres-officiels.pdf [in French] (accessed October 3, 2014).
<i>Semi-feral horse</i>	14,00 € 0,33 € = average daily cost of extra feeding (cereals + hay + water)	Centre européen du Cheval de Mont-le-Soie, Département d'économie rurale de l'Université de Liège, Unité d'économie et de développement rural, Gembloux Agro-Bio Tech, University of Liege. Le poids socio-économique de la filière équine en Wallonie. http://www.cbc-bcp.be/images/Documents/fr-100510-105-chiffres-officiels.pdf [in French] (accessed October 3, 2014).

Global cost of extra-feeding during recovery of 2,648 horses not hospitalised	58.794,00 €
<i>High-value horses</i>	20.670,00 €
<i>Leisure horses</i>	23.298,00 €
<i>Semi-feral horses</i>	14.826,00 €

530 high-value horses (20% of 2,648)
1,059 mixed horses (40% of 2,648)
1,059 rustic horses (40% of 2,648)

Supplementary bedding

Average daily quantity of straw used per horse (kg)		
<i>High-value horse</i>	10	Centre européen du Cheval de Mont-le-Soie, Département d'économie rurale de l'Université de Liège, Unité d'économie et de développement rural, Gembloux Agro-Bio Tech, University of Liege. Le poids socio-économique de la filière équine en Wallonie. http://www.cbc-bcp.be/images/Documents/fr-100510-105-chiffres-officiels.pdf [in French] (accessed October 3, 2014).
<i>Leisure horse</i>	5	Centre européen du Cheval de Mont-le-Soie, Département d'économie rurale de l'Université de Liège, Unité d'économie et de développement rural, Gembloux Agro-Bio Tech, University of Liege. Le poids socio-économique de la filière équine en Wallonie. http://www.cbc-bcp.be/images/Documents/fr-100510-105-chiffres-officiels.pdf [in French] (accessed October 3, 2014).

Semi-feral horse

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Centre européen du Cheval de Mont-le-Soie, Département d'économie rurale de l'Université de Liège, Unité d'économie et de développement rural, Gembloux Agro-Bio Tech, University of Liege. Le poids socio-économique de la filière équine en Wallonie. <http://www.cbc-bcp.be/images/Documents/fr-100510-105-chiffres-officiels.pdf> [in French] (accessed October 3, 2014).

Average price of wheat straw per kg

0,13 € 12,50 € per 100 kg

http://www.valbiom.be/files/library/Docs/Biomasse/Valorisation-potentielle-de-la-menue-paille-en-Belgique_20130719.pdf

Hospitalised horses (N = 1,026 surviving horses) - 35 days of recovery indoor (dead/euthanized horses not considered)

Average quantity of wheat straw for 35 days per horse (kg)

<i>High-value horse</i>	350
<i>Leisure horse</i>	175
<i>Semi-feral horse</i>	175

Cost per horse for 35 days

<i>High-value horse</i>	44,00 €
<i>Leisure horse</i>	22,00 €
<i>Semi-feral horse</i>	22,00 €

Global cost of extra-bedding during recovery of 1,026 hospitalised horses which survived 27.104,00 €

<i>High-value horses</i>	9.064,00 €
<i>Leisure horses</i>	9.020,00 €
<i>Semi-feral horses</i>	9.020,00 €

206 high-value horses (20% of 1,026)
410 mixed horses (40% of 1,026)
410 rustic horses (40% of 1,026)

Not hospitalised horses (N = 2,648 horses) - 42 days of recovery indoor

Average quantity of wheat straw for 42 days per horse (kg)

<i>High-value horse</i>	420
<i>Leisure horse</i>	210
<i>Semi-feral horse</i>	210

Cost per horse for 42 days

<i>High-value horse</i>	53,00 €
<i>Leisure horse</i>	26,00 €
<i>Semi-feral horse</i>	26,00 €

Global cost of extra-bedding during recovery for 2,648 horses not hospitalised 83.158,00 €

<i>High-value horses</i>	28.090,00 €
<i>Leisure horses</i>	27.534,00 €
<i>Semi-feral horses</i>	27.534,00 €

530 high-value horses (20% of 2,648)
1,059 mixed horses (40% of 2,648)
1,059 rustic horses (40% of 2,648)

Global cost for indoor containment of sick and recovering horses 188.564,00 €

<i>High-value horses</i>	64.622,00 €
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<i>Leisure horses</i>	67.642,00 €
<i>Semi-feral horses</i>	56.300,00 €

Additional costs - management of cadavers (N = 399 dead or euthanized horses)

Cost of transport for cadavers (per ton)	39,00 €	FASFC, personal communication
Cost of destruction of cadavers (per ton)	100,00 €	FASFC, personal communication
Cost of transport and destruction per cadaver	70,00 €	one horse = 500 kg

Global cost of transport and destruction for the 399 dead horses	27.930,00 €
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Replacement cost for dead horses (N = 399 dead/euthanized horses)

Average replacement value	
<i>High-value horse</i>	10.000,00 €
<i>Leisure horse</i>	4.000,00 €
<i>Rustic horse</i>	2.000,00 €

Global replacement value for dead horses (N = 399)	1.750.000,00 €
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<i>High-value horses (N = 79)</i>	790.000,00 €	20% of high-value horses	Centre européen du Cheval de Mont-le-Soie, Département d'économie rurale de l'Université de Liège, Unité d'économie et de développement rural, Gembloux Agro-Bio Tech, University of Liege. Le poids socio-économique de la filière équine en Wallonie. http://www.cbc-bcp.be/images/Documents/fr-100510-105-chiffres-officiels.pdf [in French] (accessed October 3, 2014).
<i>Leisure horses (N = 160)</i>	640.000,00 €	40% of mixed horses	Centre européen du Cheval de Mont-le-Soie, Département d'économie rurale de l'Université de Liège, Unité d'économie et de développement rural, Gembloux Agro-Bio Tech, University of Liege. Le poids socio-économique de la filière équine en Wallonie. http://www.cbc-bcp.be/images/Documents/fr-100510-105-chiffres-officiels.pdf [in French] (accessed October 3, 2014).
<i>Semi-feral horses (N = 160)</i>	320.000,00 €	40% of rustic horses	Centre européen du Cheval de Mont-le-Soie, Département d'économie rurale de l'Université de Liège, Unité d'économie et de développement rural, Gembloux Agro-Bio Tech, University of Liege. Le poids socio-économique de la filière équine en Wallonie. http://www.cbc-bcp.be/images/Documents/fr-100510-105-chiffres-officiels.pdf [in French] (accessed October 3, 2014).

SUMMARY OF COSTS ASSOCIATED WITH WNF EPIDEMICS - 100% VACCINATION

Cost of hospitalisation (N = 1,426 horses)	1.116.558,00 €	3,04%
Cost of care for 2,648 horses not hospitalised	582.560,00 €	1,58%
Cost of vaccination for 226,748 horses	32.651.712,00 €	88,79%
Cost of diagnosis for 4,073 cases	309.624,00 €	0,84%
Cost of active surveillance	147.888,00 €	0,40%
Cost of indoor containment (extra feed and bedding)	188.564,00 €	0,51%
Cost of transport and destruction of 399 cadavers	27.930,00 €	0,08%
Global replacement value for 399 dead/euhtanised horses	1.750.000,00 €	4,76%
TOTAL	36.774.836,00 €	100,00%

SUMMARY OF COSTS ASSOCIATED WITH WNF EPIDEMICS - VACCINATION IN AREAS AT RISK

Cost of hospitalisation (N = 1,426 horses)	1.116.558,00 €	5,37%
Cost of care for 2,648 horses not hospitalised	582.560,00 €	2,80%
Cost of vaccination for 115,731 horses	16.665.264,00 €	80,17%
Cost of diagnosis for 4,073 cases	309.624,00 €	1,49%
Cost of active surveillance	147.888,00 €	0,71%
Cost of indoor containment (extra feed and bedding)	188.564,00 €	0,91%
Cost of transport and destruction of 399 cadavers	27.930,00 €	0,13%
Global replacement value for 399 dead/euhtanised horses	1.750.000,00 €	8,42%
TOTAL	20.788.388,00 €	100,00%

SUMMARY OF COSTS ASSOCIATED WITH WNF EPIDEMICS - WITHOUT VACCINATION

Cost of hospitalisation (N = 1,426 horses)	1.116.558,00 €	27,08%
Cost of care for 2,648 horses not hospitalised	582.560,00 €	14,13%
Cost of diagnosis for 4,074 cases	309.624,00 €	7,51%
Cost of active surveillance	147.888,00 €	3,59%
Cost of indoor containment (extra feed and bedding)	188.564,00 €	4,57%
Cost of transport and destruction of 399 cadavers	27.930,00 €	0,68%
Global replacement value for 399 dead/euhtanised horses	1.750.000,00 €	42,44%
TOTAL	4.123.124,00 €	100,00%

Loss of income - horse rental centers (N = 138)

Average price of one hour rental	14,00 €	Average of several riding schools
Average number of hours per horse per day	3	Centre européen du Cheval de Mont-le-Soie, Département d'économie rurale de l'Université de Liège, Unité d'économie et de développement rural, Gembloux Agro-Bio Tech, University of Liege. Le poids socio-économique de la filière équine en Wallonie. http://www.cbc-bcp.be/images/Documents/fr-100510-105-chiffres-officiels.pdf [in French] (accessed October 3, 2014).
Average income per horse per day	42,00 €	

Average income per horse for a 45 days recovery

1.638,00 € 6 resting days (1 per week)

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Global loss of income for horse rental centers (275 horses)

450.450,00 €

10% morbidity rate - 2 sick horses per rental center (average N = 20)