

West Nile Virus infection in wild birds of Madagascar

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- **West Nile virus:** zoonotic arbovirus of birds which can affect Humans and horses, endemic in Madagascar but never studied in wild bird populations
- Statistical model: What is the seroprevalence and the risk factors associated with the infection of WVN in birds in Madagascar ?
- Mechanistic model: Can endemic transmission be maintained in passerine bird populations from Alaotra-Mangoro without new reintroductions of the virus ?

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- Serological survey of 354 birds from 4 regions of Madagascar in 2016-7
- **Seroprevalence: 12.5%** (44/352) of birds [95%CI: 11.0-14.0]
- Response variable: serological status
- Family: Binomial
- Link: Logit
- Potential predictors: Order, Family, region, proximity to wetlands, forests or urban areas, distribution area, nesting behavior, age, sex, migration behavior

R code:

```
m1< glm (Res ~ Prox_wetlands + Order +
distri_area + Region, data=WN,
family="binomial")
summary (m1)
drop1(m1, .~., test="Chisq")
```

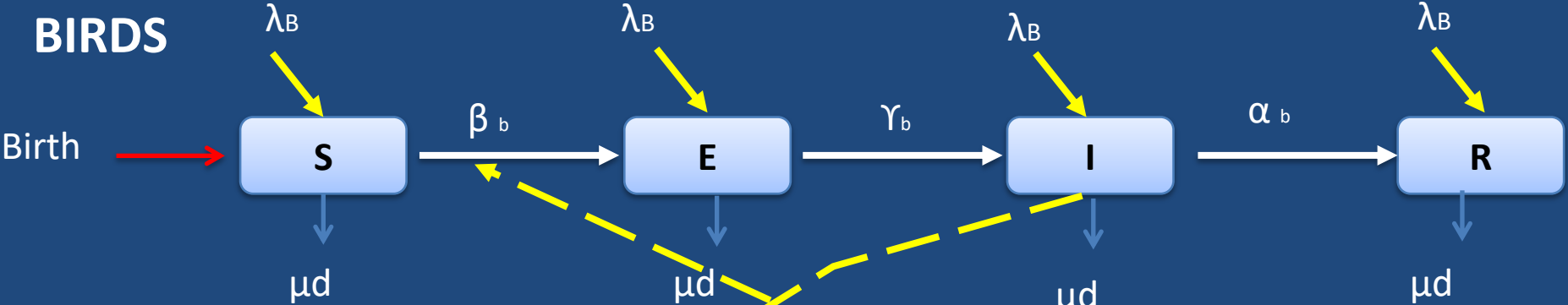
Results: Exposure in bird is associated with order, region, proximity of wetlands and African distribution area

Logistic regression model: risk factors

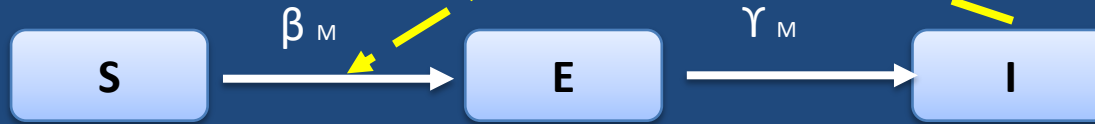
Variables		OR	95% CI OR	p
Constant		0,002	9.10 ⁻⁰⁵ -0,02	
Proximity to wetlands	Yes	1		0,021
	No	8,19	1,2-165,1	
Order	Others order	1		0,023
	Ciconiiformes	2,5	0,3-29,5	
	Passeriformes	4,99	1,6-16,2	
Region	Analamanga	1		5,01.10 ⁻⁰⁶
	Itasy	9,2	1,2-115,3	
	Vakinankaratra	1,6	0,03-41,6	
	Alaotra-Mangoro	41,4	6,2-610,7	
Distribution area	Widespread	1		0,0002
	Endemic to Indian Ocean	2,6	0,5-14,3	
	Endemic to Madagascar	1,1	0,28-4,8	
	Africa	31,9	5,46-313,1	

AUC ROC: 0,856

BIRDS



MOSQUITOES



S: Susceptible bird

E: Exposed bird

I: Infected bird

R: Recovered bird

λ_B : bird migration rate (0 when there is no migration)

β_b : transmission rate in birds

γ_b : incubation rate in birds

α_b : recovery rate in birds

μd : death rate in birds

S: Susceptible mosquito

E: Exposed mosquito

I: Infectious mosquito

β_M : transmission rate in mosquito

γ_M : incubation rate in mosquito (extrinsic incubation rate)

Next Steps

- Develop my mechanistical model framework
- Define parameter values
- Fit the model to my data
- Write my mechanistic model paper