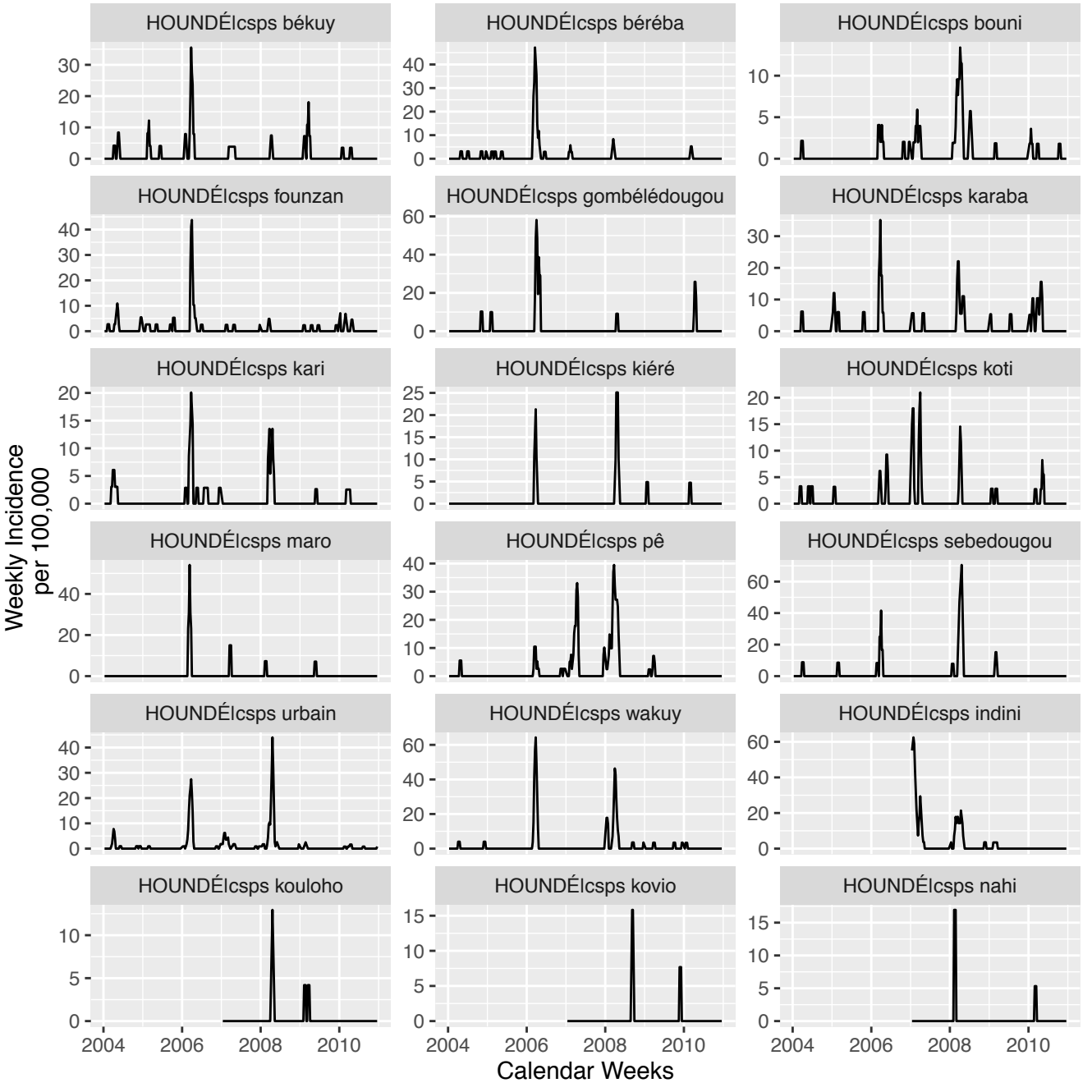
Appendix 3.

Figure 1. Time series of available hyperendemic meningitis data across health centers of four health districts in Burkina–Faso (2004–2012).


HOUNDÉlcsps békuy
HOUNDÉlcsps béréba
HOUNDÉlcsps bouni
HOUNDÉlcsps founzan
HOUNDÉlcsps gombélédougou
HOUNDÉlcsps karaba
HOUNDÉlcsps kari
HOUNDÉlcsps kiéré
HOUNDÉlcsps koti
HOUNDÉlcsps maro
HOUNDÉlcsps pê
HOUNDÉlcsps sebedougou
HOUNDÉlcsps urbain
HOUNDÉlcsps wakuy
HOUNDÉlcsps indini
HOUNDÉlcsps kouloho
HOUNDÉlcsps kovio
HOUNDÉlcsps nahi
Weekly Incidence per 100,000
Calendar Weeks
2004
2006
2008
2010

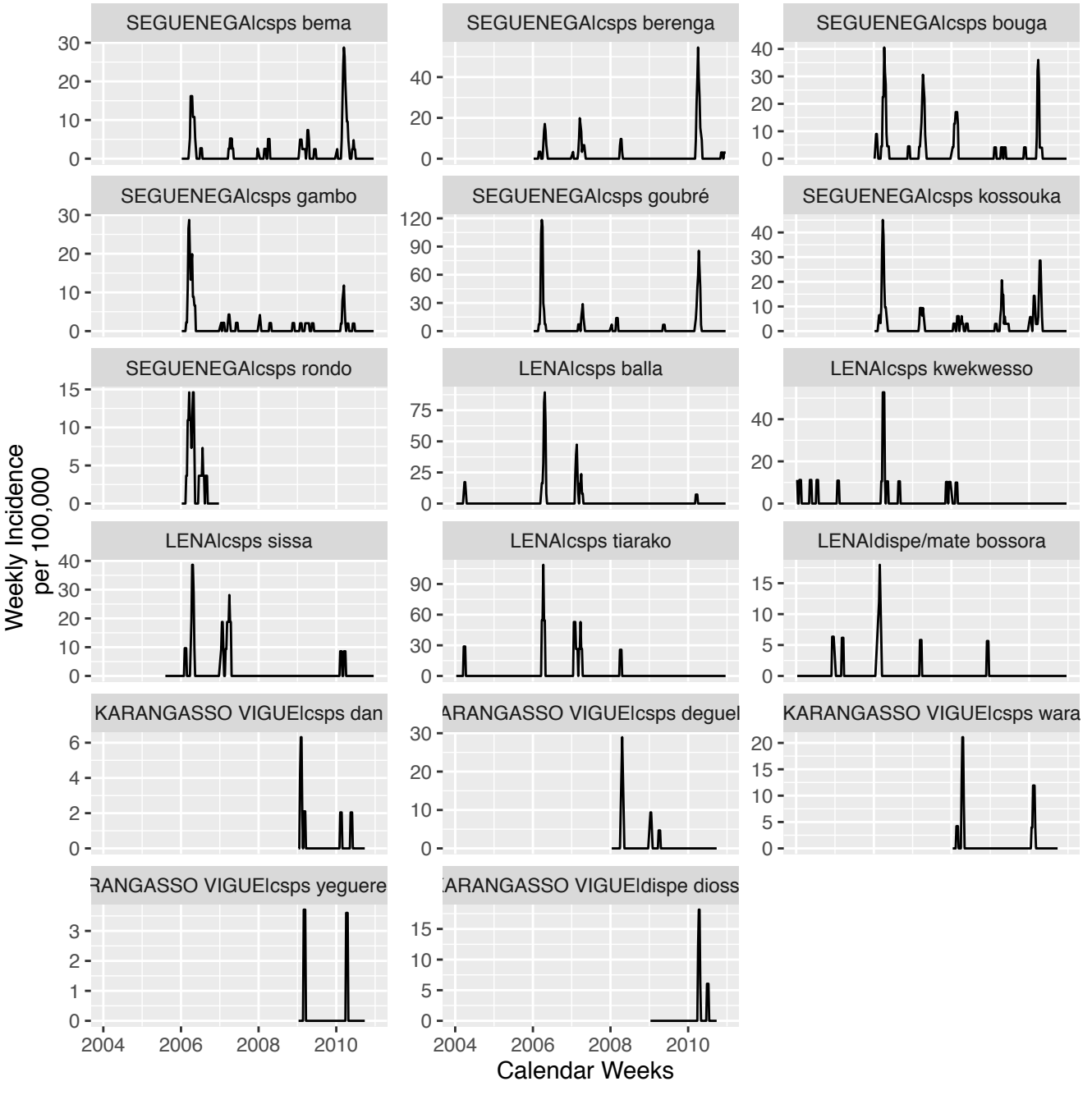
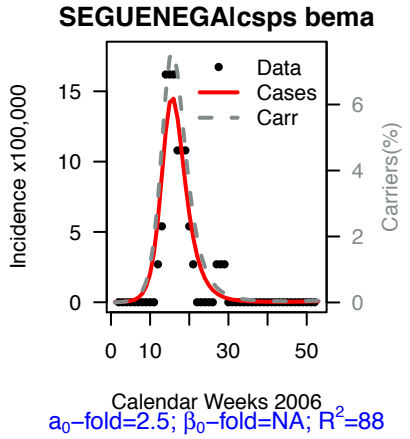
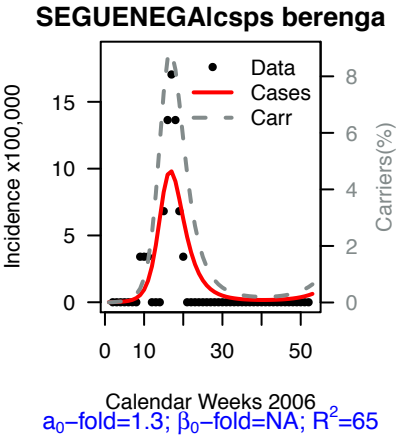
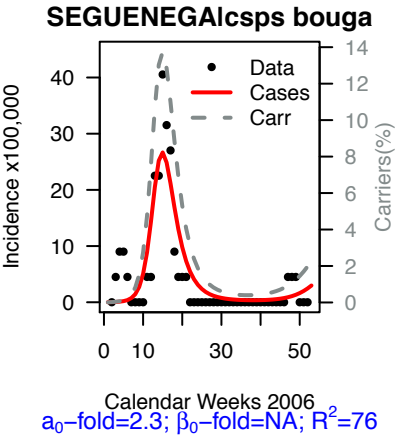
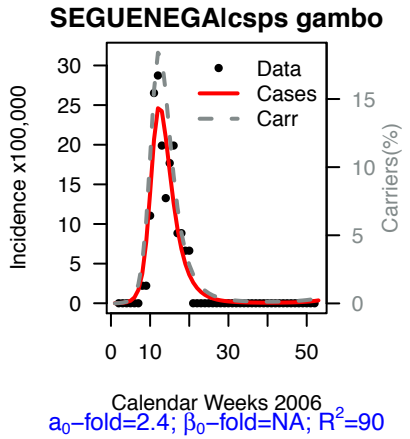

SEGUENEGAlcsps bema
SEGUENEGAlcsps berenga
SEGUENEGAlcsps bouga
SEGUENEGAlcsps gambo
SEGUENEGAlcsps goubré
SEGUENEGAlcsps kossouka
SEGUENEGAlcsps rondo
LENAlcsps balla
LENAlcsps kwekwesso
LENAlcsps sissa
LENAlcsps tiarako
LENAldispe/mate bossora
KARANGASSO VIGUElcsps dan
ARANGASSO VIGUElcsps deguel
KARANGASSO VIGUElcsps wara
RANGASSO VIGUElcsps yeguere
ARANGASSO VIGUEldispe dioss
Weekly Incidence per 100,000
Calendar Weeks
2004
2006
2008
2010

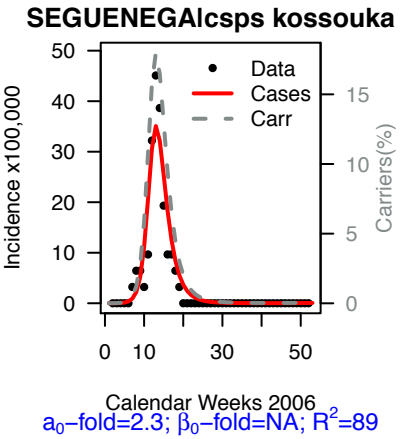
Figure 2. Model 1's trajectories matching plots of simulated and observed (weekly) data, for 64 health center–years with complete data, across four health distrits of Burkina faso (2004–2010).

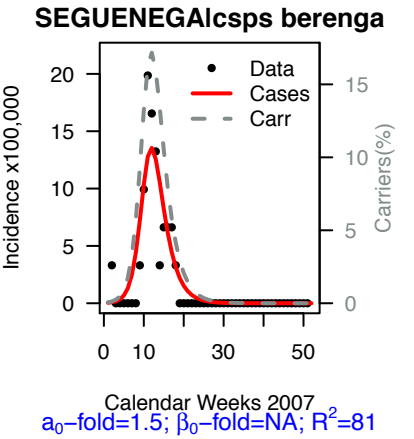

SEGUENEGAlcsps bema
Data
Cases
Carr
Incidence x100,000
Carriers(%)
Calendar Weeks 2006
a0−fold=2.5; β0−fold=NA; R2=88


SEGUENEGAlcsps berenga
Data
Cases
Carr
Incidence x100,000
Carriers(%)
Calendar Weeks 2006
a0−fold=1.3; β0−fold=NA; R2=65


SEGUENEGAlcsps bouga
Data
Cases
Carr
Incidence x100,000
Carriers(%)
Calendar Weeks 2006
a0−fold=2.3; β0−fold=NA; R2=76


SEGUENEGAlcsps gambo
Data
Cases
Carr
Incidence x100,000
Carriers(%)
Calendar Weeks 2006
a0−fold=2.4; β0−fold=NA; R2=90


SEGUENEGAlcsps kossouka
Data
Cases
Carr
Incidence x100,000
Carriers(%)
Calendar Weeks 2006
a0−fold=2.3; β0−fold=NA; R2=89


SEGUENEGAlcsps berenga
Data
Cases
Carr
Incidence x100,000
Carriers(%)
Calendar Weeks 2007
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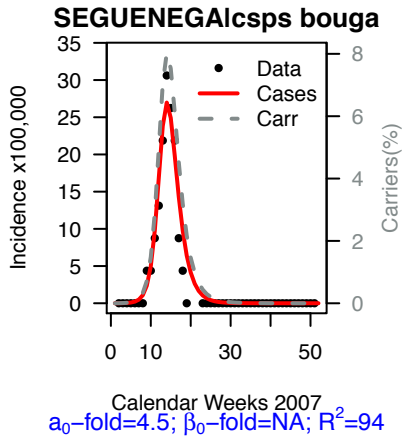
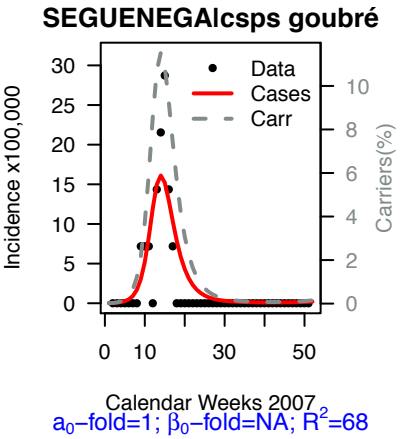
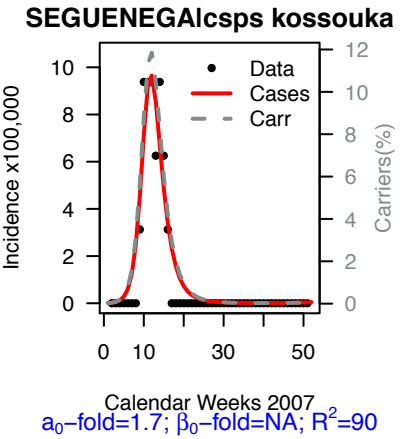
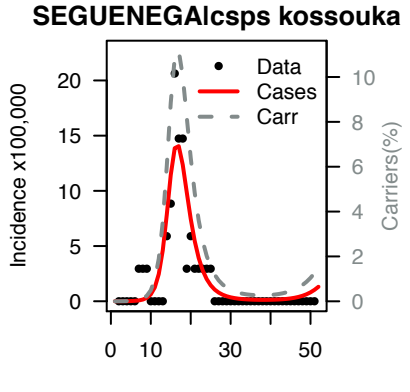
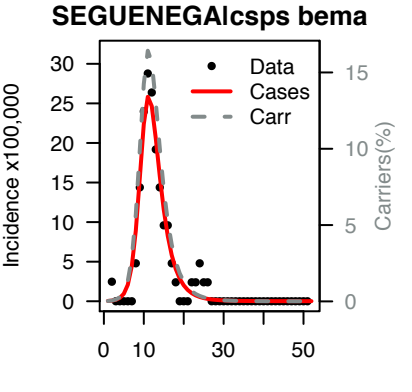

SEGUENEGAlcsps bouga
Data
Cases
Carr
Incidence x100,000
Carriers(%)
Calendar Weeks 2007
a0−fold=4.5; β0−fold=NA; R2=94


SEGUENEGAlcsps goubré
Data
Cases
Carr
Incidence x100,000
Carriers(%)
Calendar Weeks 2007
a0−fold=1; β0−fold=NA; R2=68

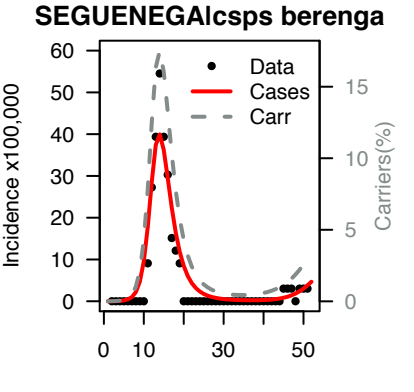

SEGUENEGAlcsps kossouka
Data
Cases
Carr
Incidence x100,000
Carriers(%)
Calendar Weeks 2007
a0−fold=1.7; β0−fold=NA; R2=90



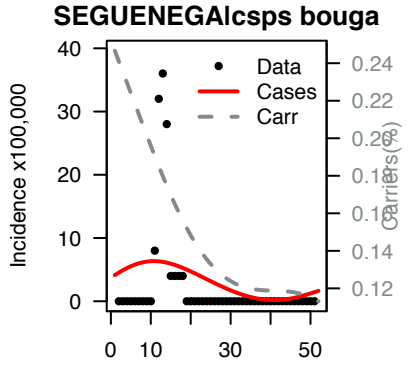
a_0–fold=2.8; β_0–fold=NA; R^2=80



a_0–fold=1.1; β_0–fold=NA; R^2=95



a_0–fold=4.6; β_0–fold=NA; R^2=90



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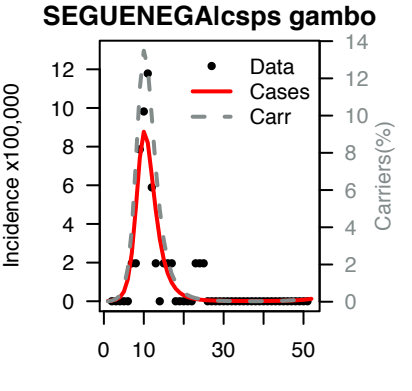

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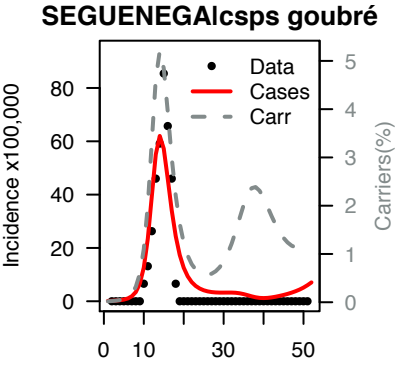

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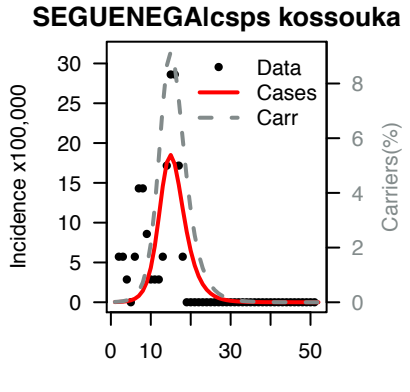

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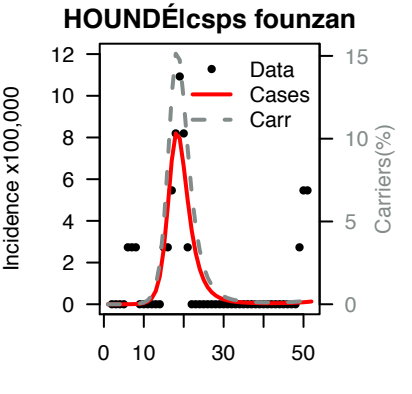
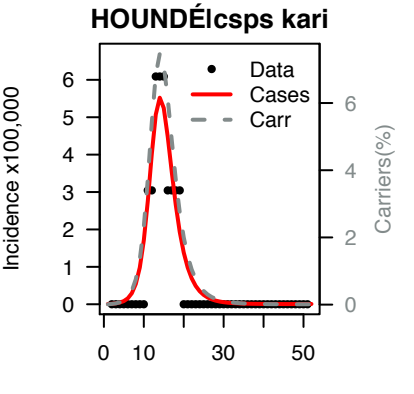
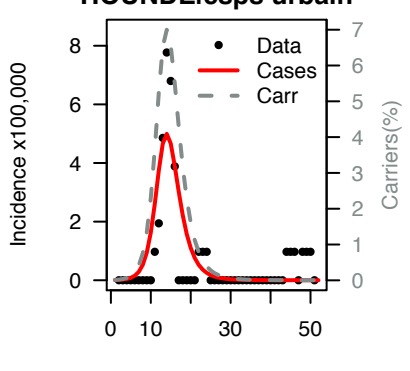


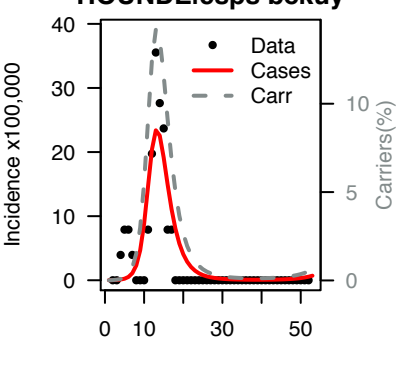
a_0–fold=1.2; β_0–fold=NA; R^2=57



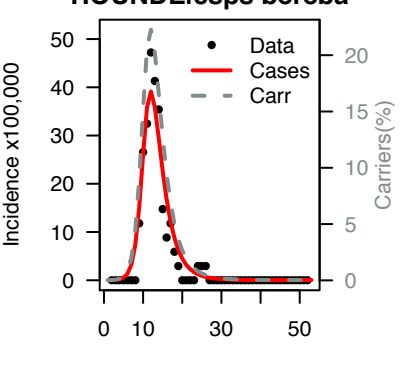
a_0–fold=1.6; β_0–fold=NA; R^2=89



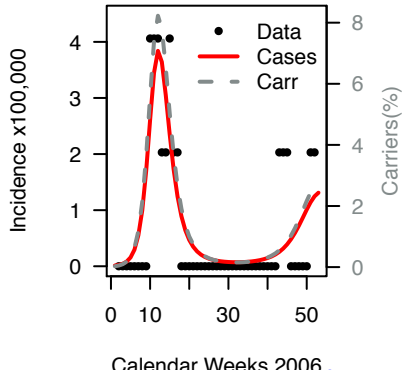
a_0–fold=1.3; β_0–fold=NA; R^2=65



a_0–fold=2.6; β_0–fold=NA; R^2=76



a_0–fold=2; β_0–fold=NA; R^2=94



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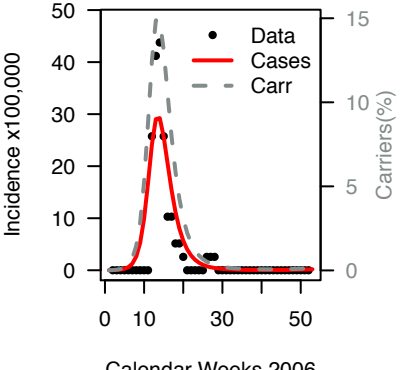
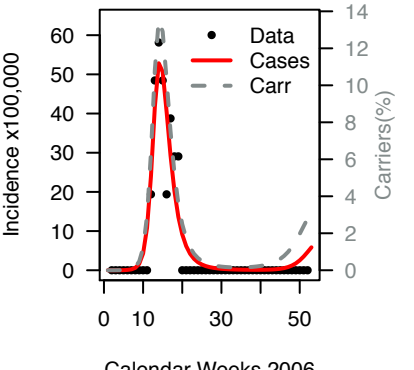
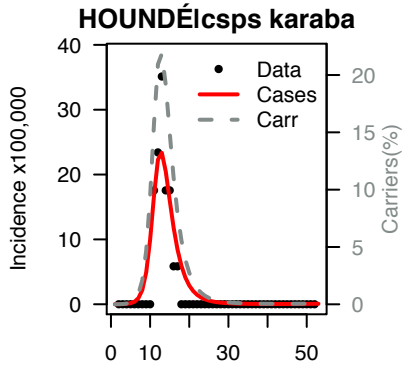


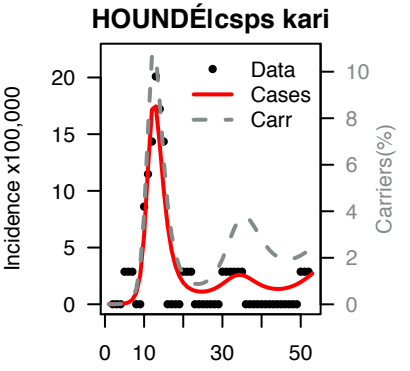
a_0–fold=2.3; β_0–fold=NA; R^2=78



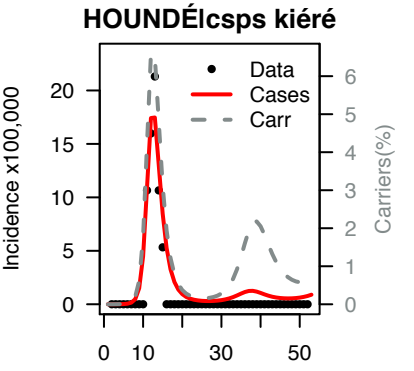
a_0–fold=8.4; β_0–fold=NA; R^2=88



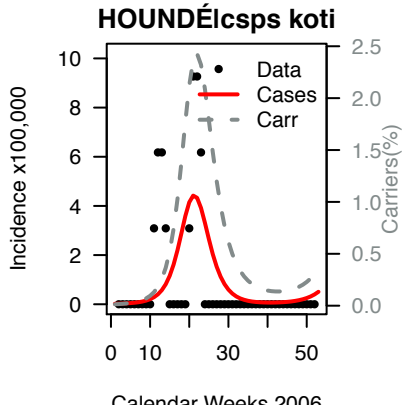
a_0–fold=1.2; β_0–fold=NA; R^2=84



a_0–fold=2.7; β_0–fold=NA; R^2=79



a_0–fold=5.4; β_0–fold=NA; R^2=87



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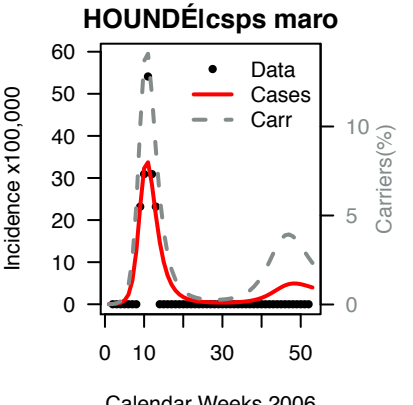
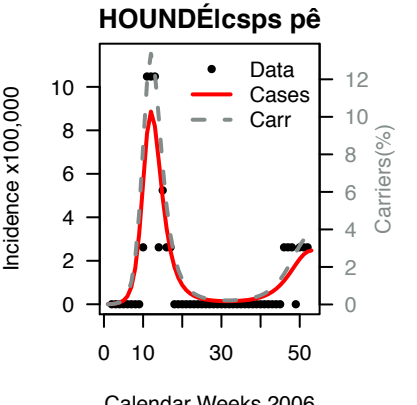
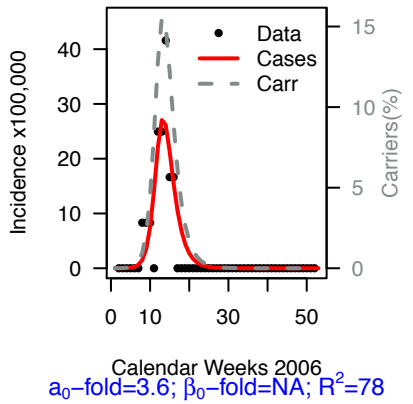


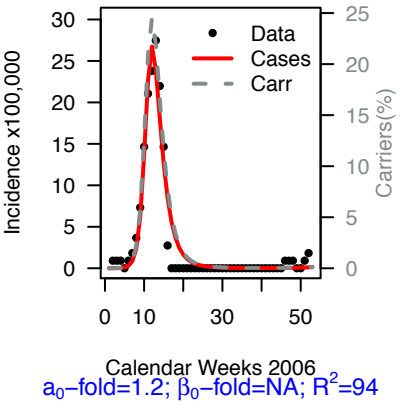
a_0–fold=2.5; β_0–fold=NA; R^2=77



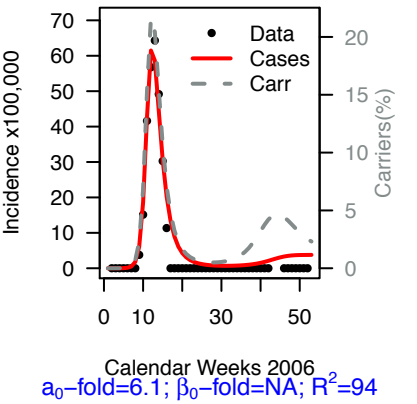
a_0–fold=1; β_0–fold=NA; R^2=79



a_0–fold=3.6; β_0–fold=NA; R^2=78



a_0–fold=1.2; β_0–fold=NA; R^2=94



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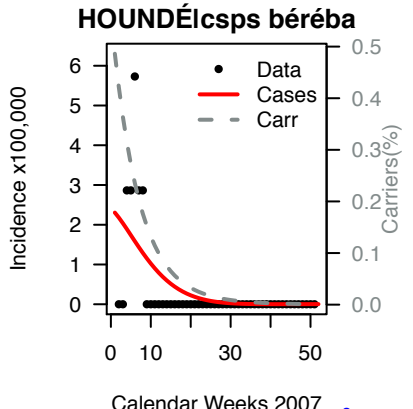

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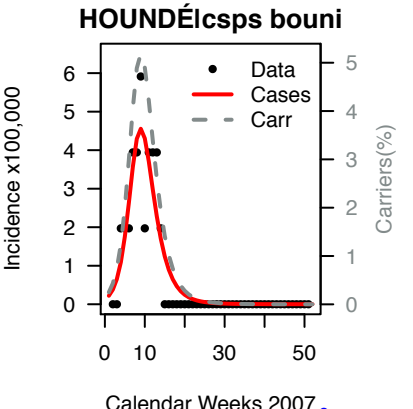

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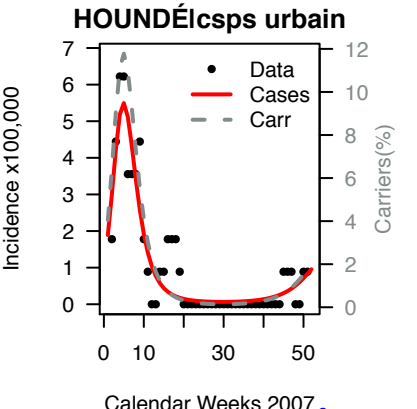
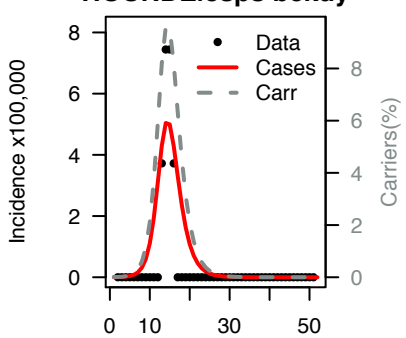


a_0–fold=1; β_0–fold=NA; R^2=84



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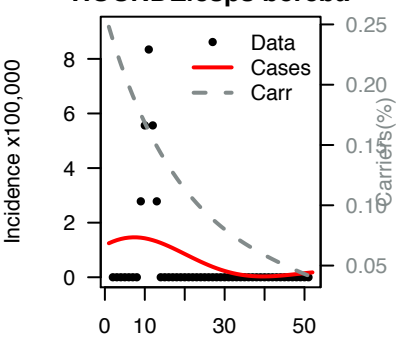

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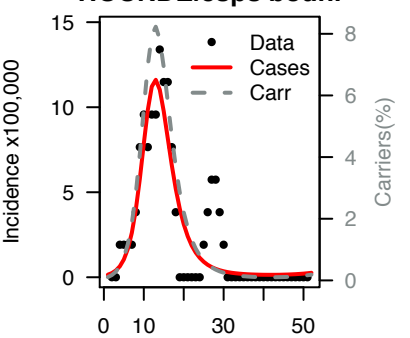
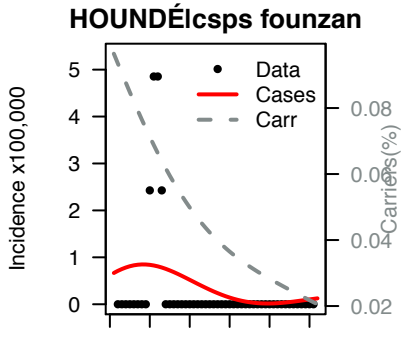
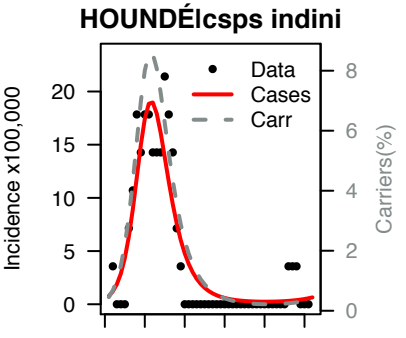


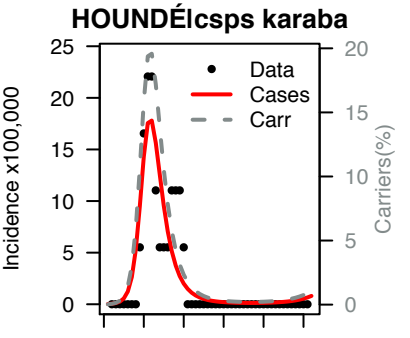
a_0–fold=1; β_0–fold=NA; R^2=78



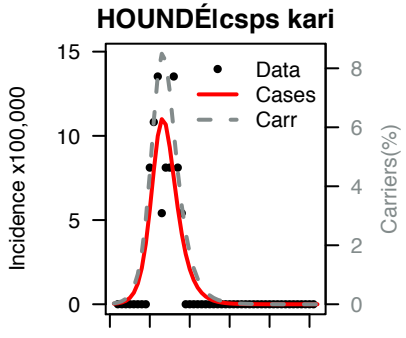
a_0–fold=22; β_0–fold=NA; R^2=14



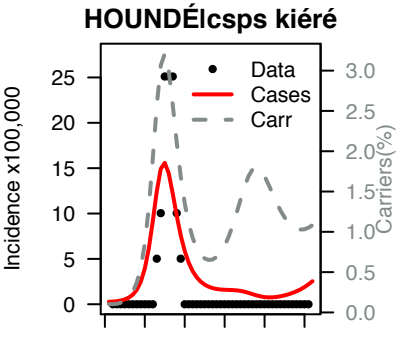
a_0–fold=2; β_0–fold=NA; R^2=84



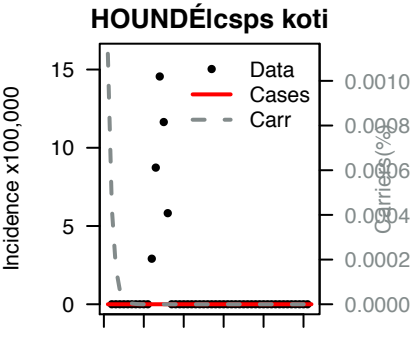
a_0–fold=1.5; β_0–fold=NA; R^2=76



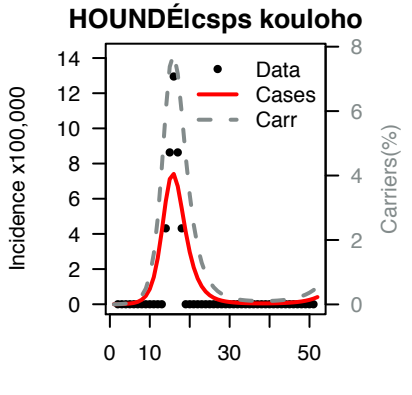
a_0–fold=2; β_0–fold=NA; R^2=78



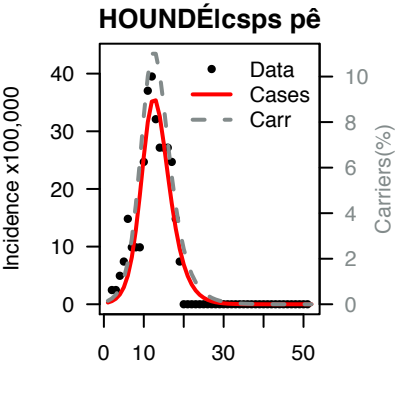
a_0–fold=10.4; β_0–fold=NA; R^2=61



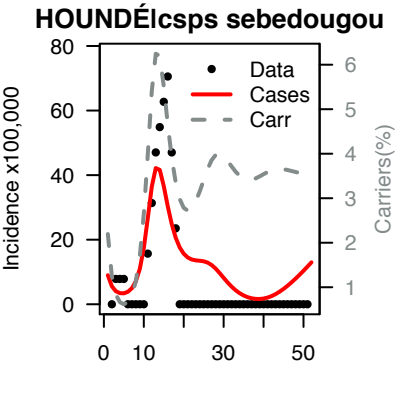
a_0–fold=1; β_0–fold=NA; R^2=−9



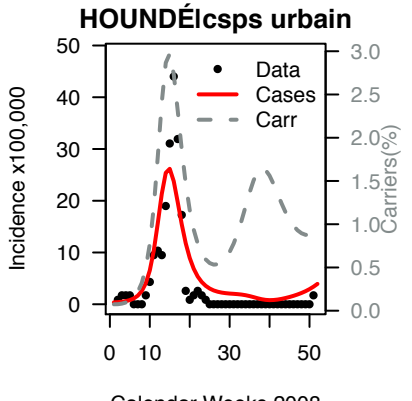
a_0–fold=2.1; β_0–fold=NA; R^2=68



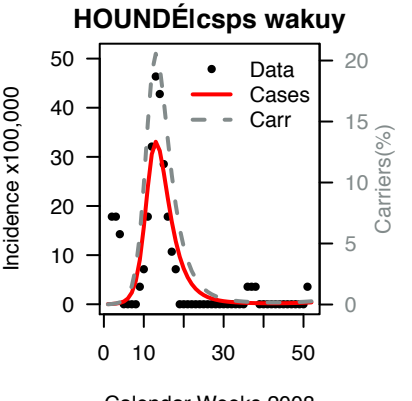
a_0–fold=5.6; β_0–fold=NA; R^2=92



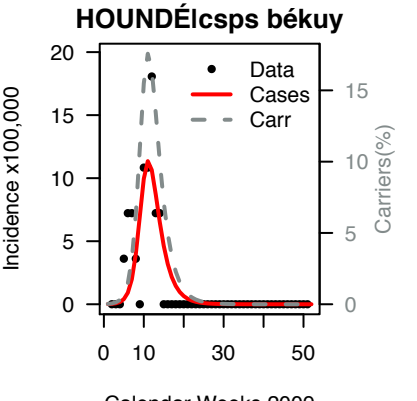
a_0–fold=14.5; β_0–fold=NA; R^2=58



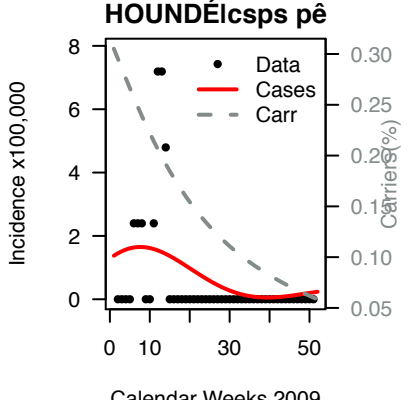
a_0–fold=17.5; β_0–fold=NA; R^2=73



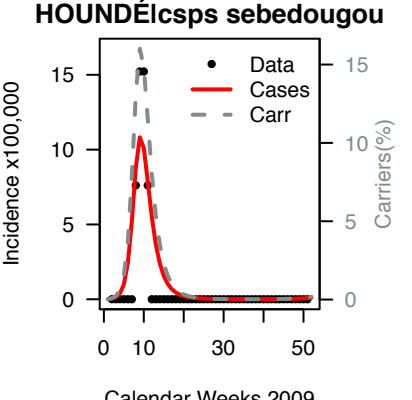
a_0–fold=1.3; β_0–fold=NA; R^2=73



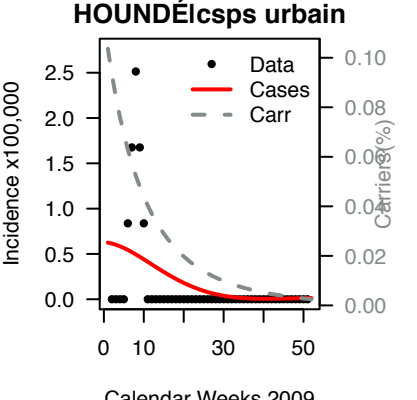
a_0–fold=1.4; β_0–fold=NA; R^2=67



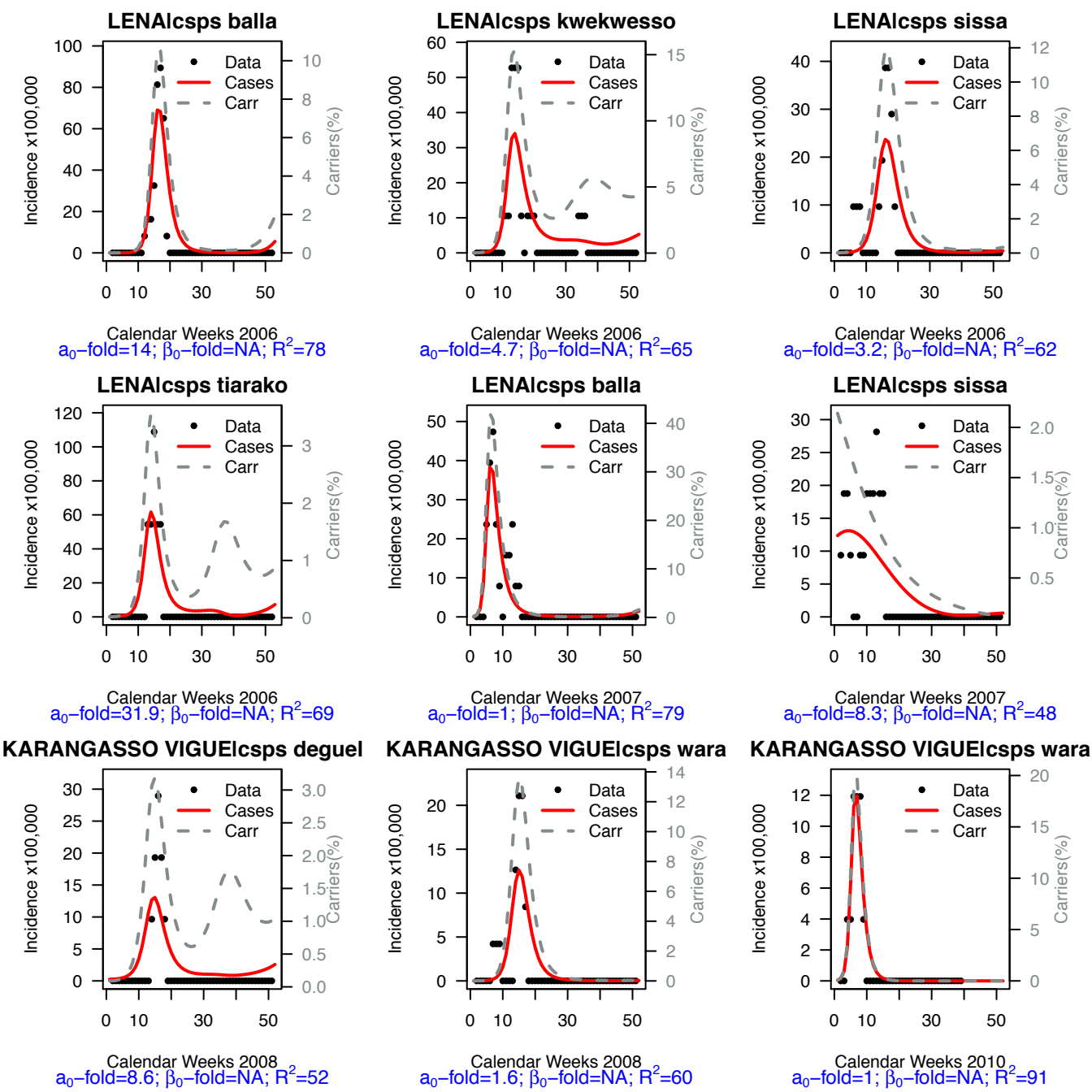
a_0–fold=11.6; β_0–fold=NA; R^2=21



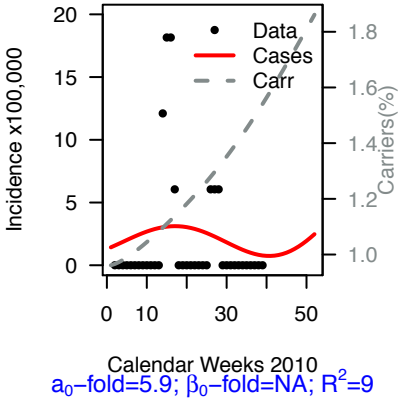
a_0–fold=1.5; β_0–fold=NA; R^2=75



a_0–fold=9.6; β_0–fold=NA; R^2=22

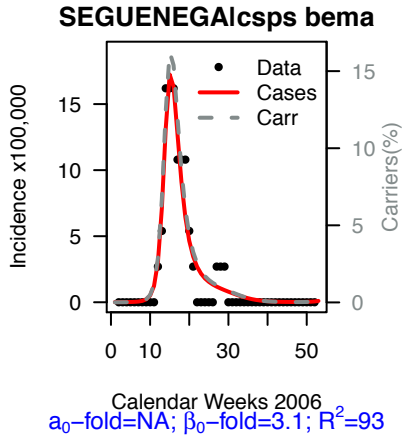

LENAIcsps balla
Incidence x100,000
Carriers(%)
Data
Cases
Carr
Calendar Weeks 2006
a0−fold=14; β0−fold=NA; R2=78
LENAIcsps kwekwesso
Calendar Weeks 2006
a0−fold=4.7; β0−fold=NA; R2=65
LENAIcsps sissa
Calendar Weeks 2006
a0−fold=3.2; β0−fold=NA; R2=62
LENAIcsps tiarako
Calendar Weeks 2006
a0−fold=31.9; β0−fold=NA; R2=69
LENAIcsps balla
Calendar Weeks 2007
a0−fold=1; β0−fold=NA; R2=79
LENAIcsps sissa
Calendar Weeks 2007
a0−fold=8.3; β0−fold=NA; R2=48
KARANGASSO VIGUEIcsps deguel
Calendar Weeks 2008
a0−fold=8.6; β0−fold=NA; R2=52
KARANGASSO VIGUEIcsps wara
Calendar Weeks 2008
a0−fold=1.6; β0−fold=NA; R2=60
KARANGASSO VIGUEIcsps wara
Calendar Weeks 2010
a0−fold=1; β0−fold=NA; R2=91

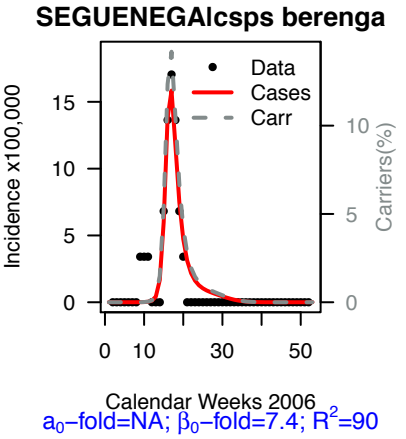
KARANGASSO VIGUEldispe dioss

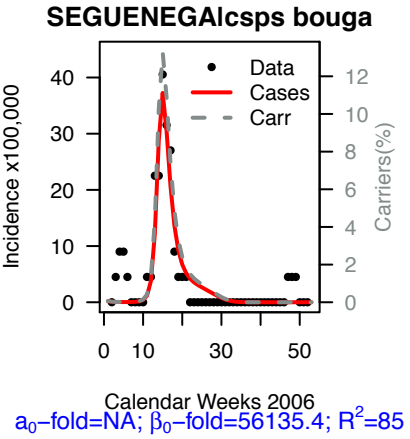


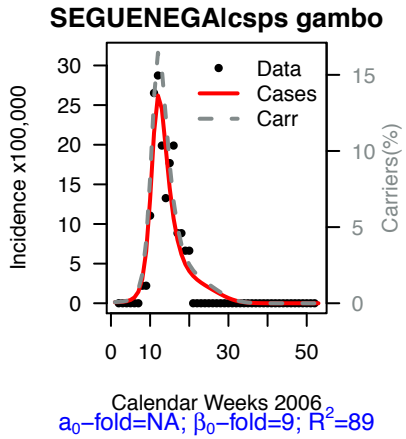
a_0–fold=5.9; β_0–fold=NA; R^2=9

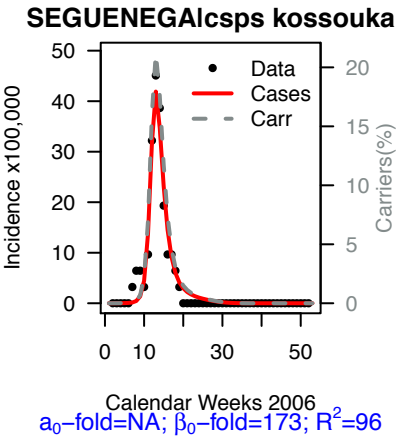
Figure 3. Model 2's trajectories matching plots of simulated and observed (weekly) data, for 64 health center–years with complete data, across four health distrits of Burkina faso (2004–2010).

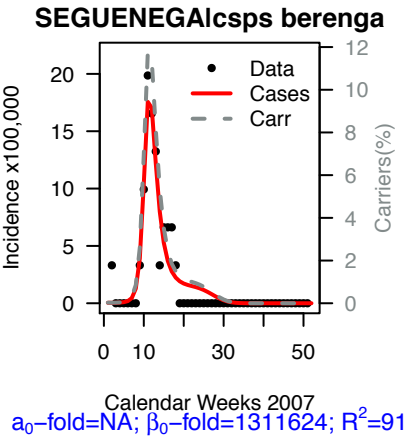

SEGUENEGAIcsps bema
Data
Cases
Carr
Incidence x100,000
Carriers(%)
Calendar Weeks 2006
a0−fold=NA; β0−fold=3.1; R2=93

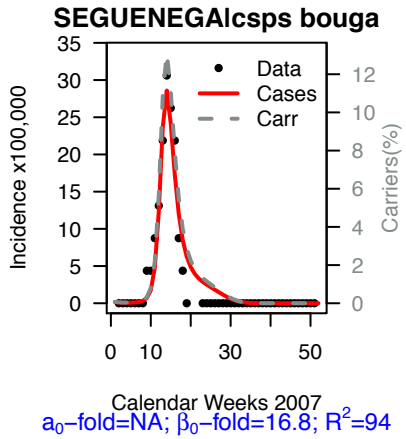

SEGUENEGAIcsps berenga
Data
Cases
Carr
Incidence x100,000
Carriers(%)
Calendar Weeks 2006
a0−fold=NA; β0−fold=7.4; R2=90

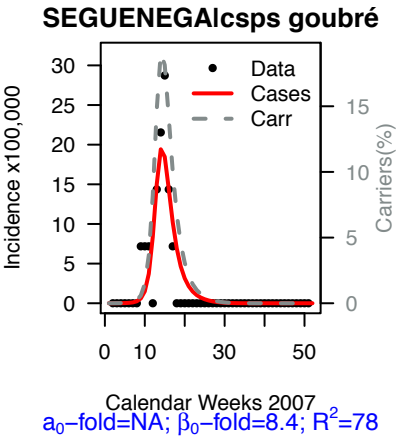

SEGUENEGAIcsps bouga
Data
Cases
Carr
Incidence x100,000
Carriers(%)
Calendar Weeks 2006
a0−fold=NA; β0−fold=56135.4; R2=85

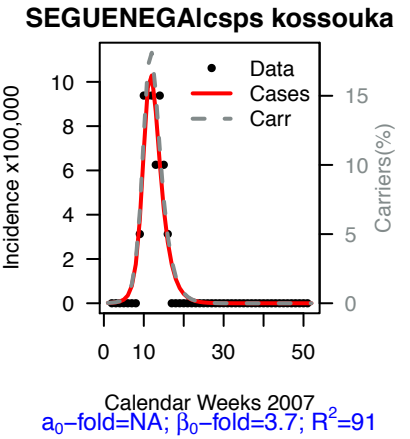

SEGUENEGAIcsps gambo
Data
Cases
Carr
Incidence x100,000
Carriers(%)
Calendar Weeks 2006
a0−fold=NA; β0−fold=9; R2=89

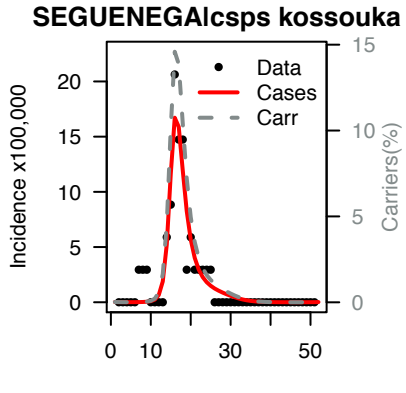

SEGUENEGAIcsps kossouka
Data
Cases
Carr
Incidence x100,000
Carriers(%)
Calendar Weeks 2006
a0−fold=NA; β0−fold=173; R2=96


SEGUENEGAIcsps berenga
Data
Cases
Carr
Incidence x100,000
Carriers(%)
Calendar Weeks 2007
a0−fold=NA; β0−fold=1311624; R2=91

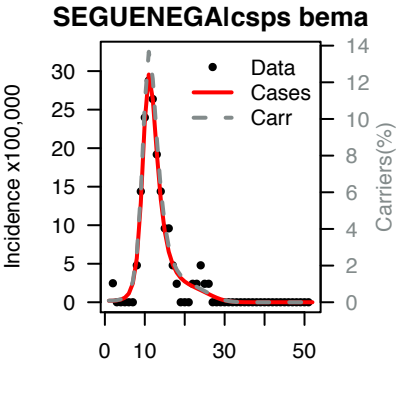

SEGUENEGAIcsps bouga
Data
Cases
Carr
Incidence x100,000
Carriers(%)
Calendar Weeks 2007
a0−fold=NA; β0−fold=16.8; R2=94


SEGUENEGAIcsps goubré
Data
Cases
Carr
Incidence x100,000
Carriers(%)
Calendar Weeks 2007
a0−fold=NA; β0−fold=8.4; R2=78

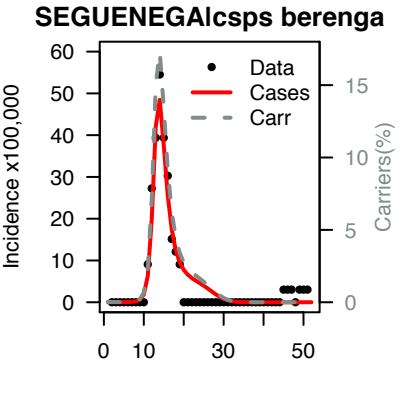

SEGUENEGAIcsps kossouka
Data
Cases
Carr
Incidence x100,000
Carriers(%)
Calendar Weeks 2007
a0−fold=NA; β0−fold=3.7; R2=91



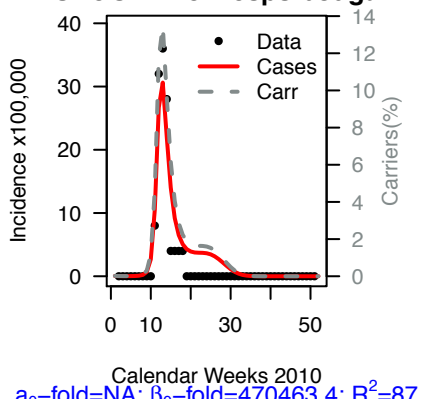
a_0–fold=NA; β_0–fold=4.8; R^2=89



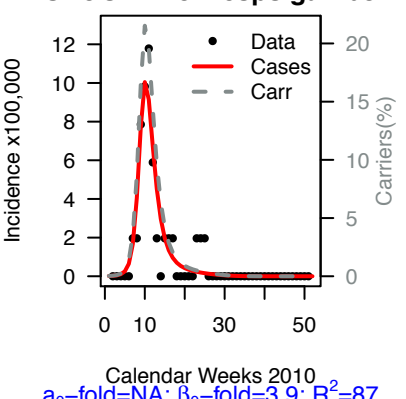
a_0–fold=NA; β_0–fold=121924.1; R^2=97



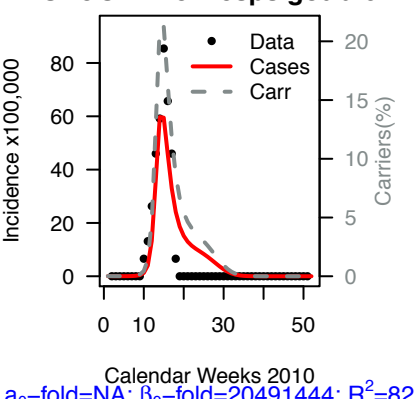
a_0–fold=NA; β_0–fold=53994.4; R^2=94



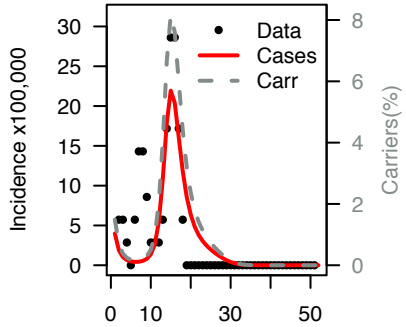
a_0–fold=NA; β_0–fold=470463.4; R^2=87



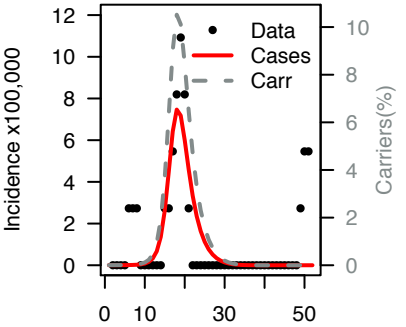
a_0–fold=NA; β_0–fold=3.9; R^2=87



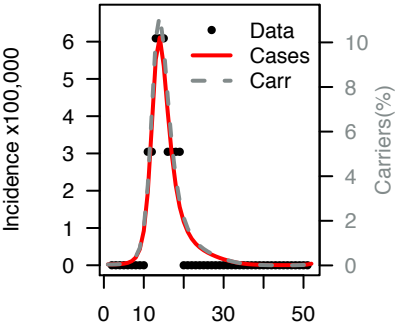
a_0–fold=NA; β_0–fold=20491444; R^2=82



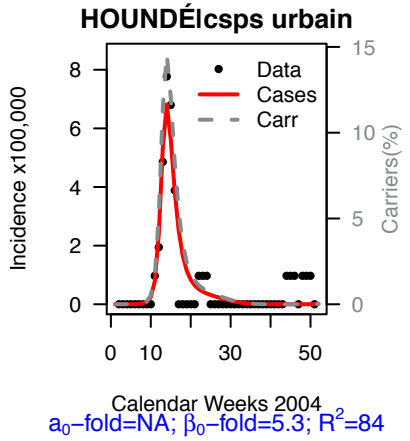
a_0–fold=NA; β_0–fold=372315.2; R^2=63



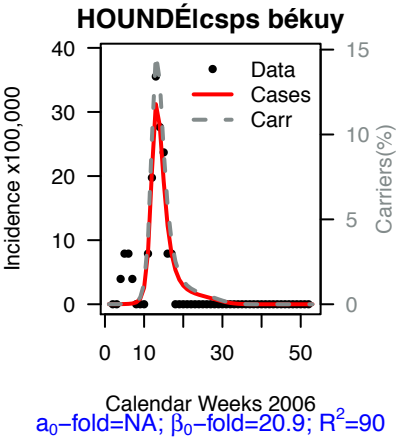
a_0–fold=NA; β_0–fold=4.7; R^2=56



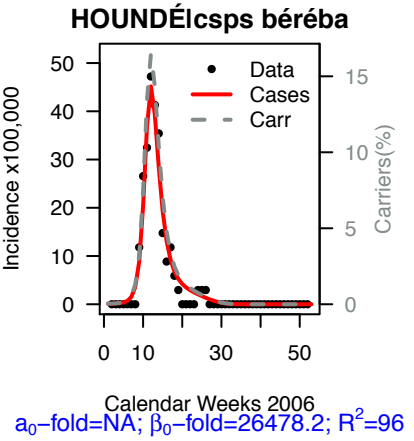
a_0–fold=NA; β_0–fold=3.5; R^2=92



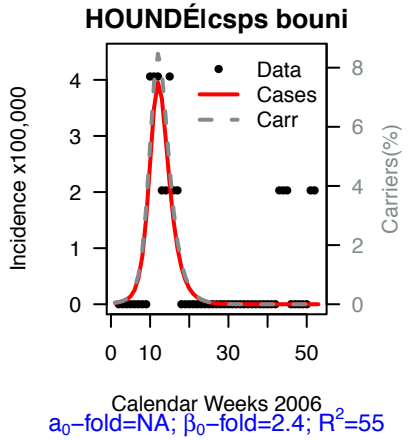
a_0–fold=NA; β_0–fold=5.3; R^2=84



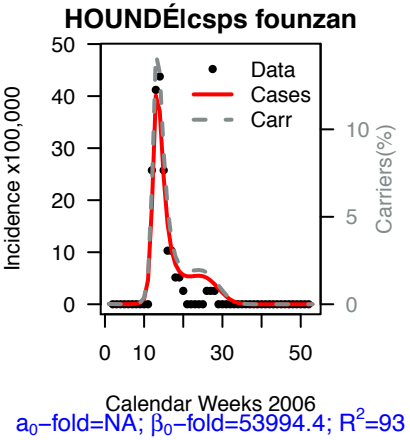
a_0–fold=NA; β_0–fold=20.9; R^2=90



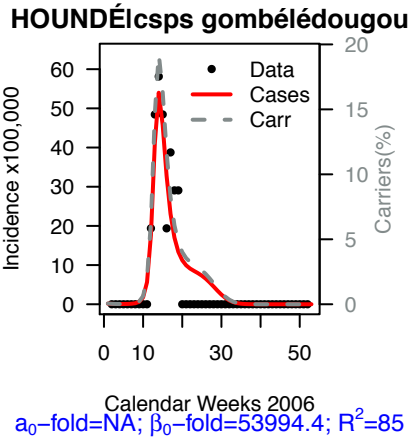
a_0–fold=NA; β_0–fold=26478.2; R^2=96



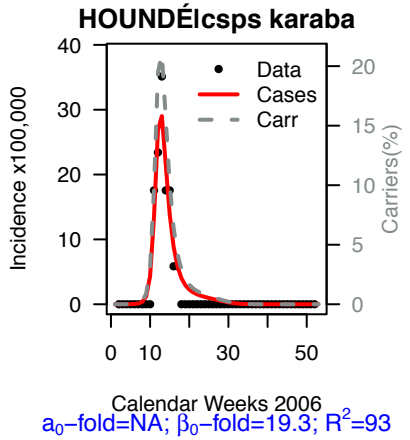
a_0–fold=NA; β_0–fold=2.4; R^2=55



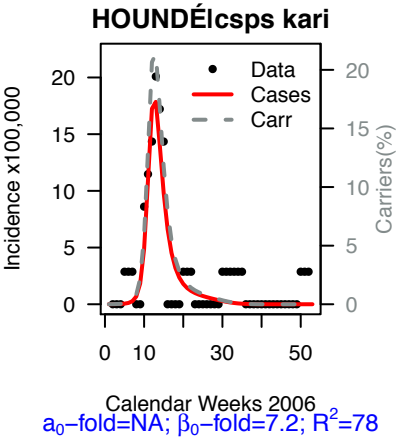
a_0–fold=NA; β_0–fold=53994.4; R^2=93



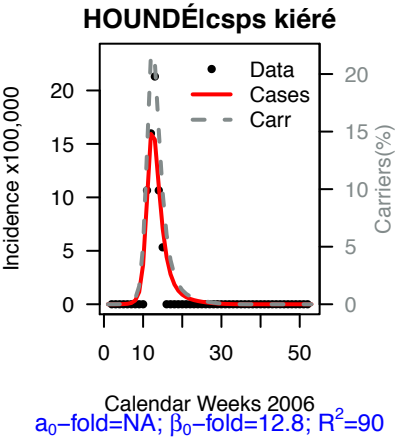
a_0–fold=NA; β_0–fold=53994.4; R^2=85



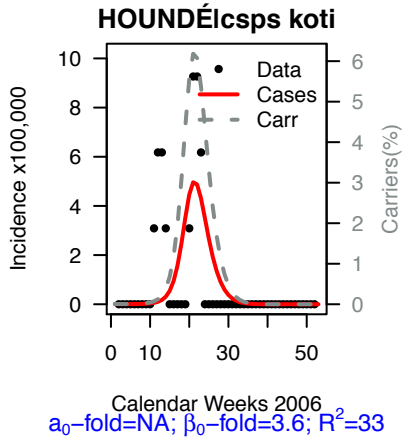
a_0–fold=NA; β_0–fold=19.3; R^2=93

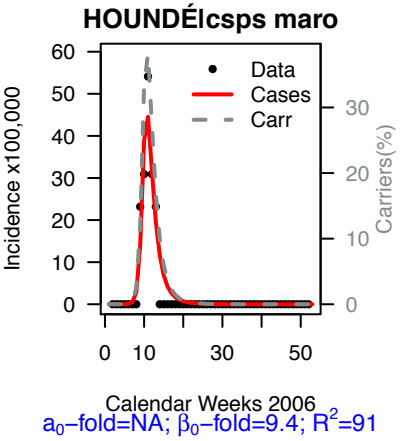


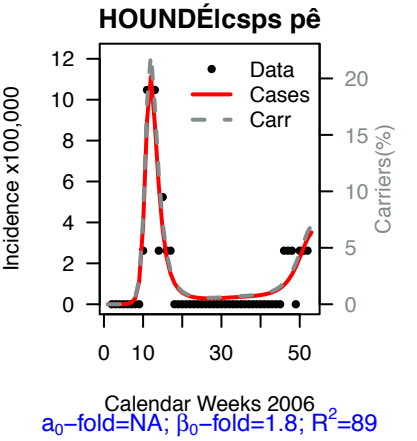
a_0–fold=NA; β_0–fold=7.2; R^2=78

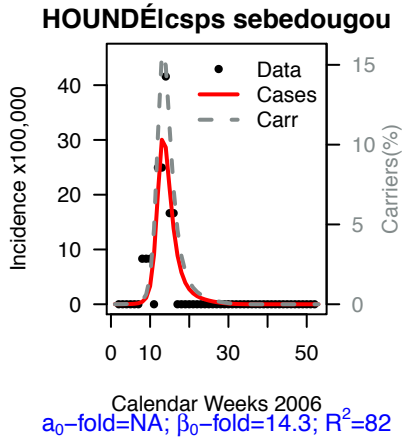


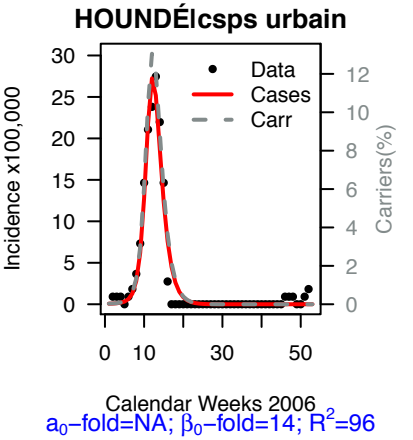
a_0–fold=NA; β_0–fold=12.8; R^2=90

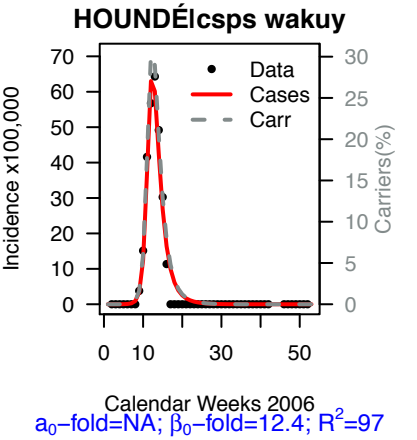

HOUNDÉlcsps koti
Data
Cases
Carr
Incidence x100,000
Carriers(%)
Calendar Weeks 2006
a0−fold=NA; β0−fold=3.6; R2=33


HOUNDÉlcsps maro
Data
Cases
Carr
Incidence x100,000
Carriers(%)
Calendar Weeks 2006
a0−fold=NA; β0−fold=9.4; R2=91


HOUNDÉlcsps pê
Data
Cases
Carr
Incidence x100,000
Carriers(%)
Calendar Weeks 2006
a0−fold=NA; β0−fold=1.8; R2=89


HOUNDÉlcsps sebedougou
Data
Cases
Carr
Incidence x100,000
Carriers(%)
Calendar Weeks 2006
a0−fold=NA; β0−fold=14.3; R2=82


HOUNDÉlcsps urbain
Data
Cases
Carr
Incidence x100,000
Carriers(%)
Calendar Weeks 2006
a0−fold=NA; β0−fold=14; R2=96


HOUNDÉlcsps wakuy
Data
Cases
Carr
Incidence x100,000
Carriers(%)
Calendar Weeks 2006
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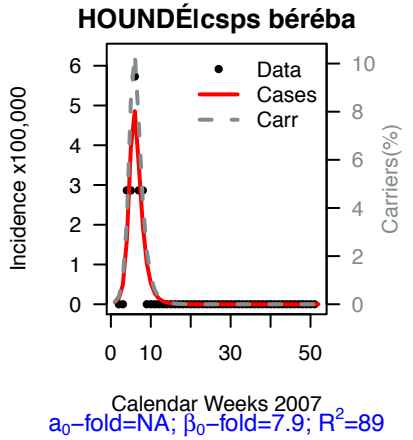
HOUNDÉlcsps béréba
Data
Cases
Carr
Incidence x100,000
Carriers(%)
Calendar Weeks 2007
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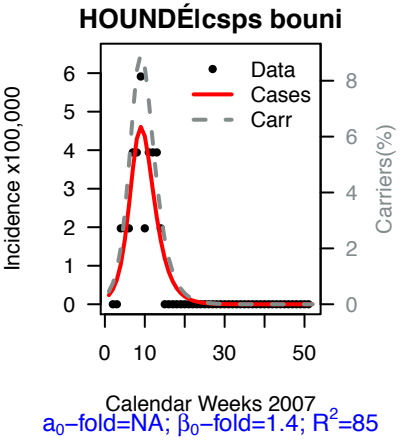
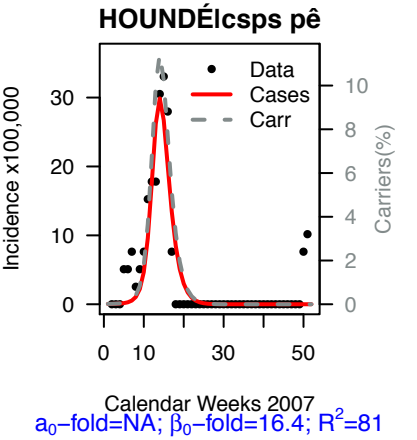
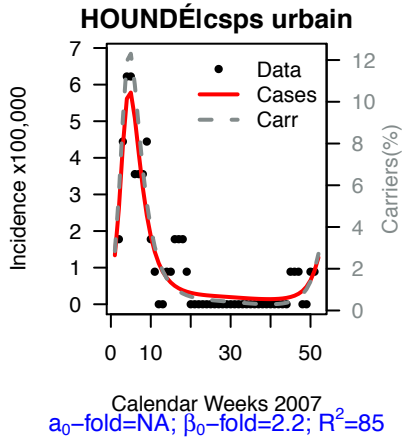

HOUNDÉlcsps bouni
Data
Cases
Carr
Incidence x100,000
Carriers(%)
Calendar Weeks 2007
a0−fold=NA; β0−fold=1.4; R2=85


HOUNDÉlcsps pê
Data
Cases
Carr
Incidence x100,000
Carriers(%)
Calendar Weeks 2007
a0−fold=NA; β0−fold=16.4; R2=81



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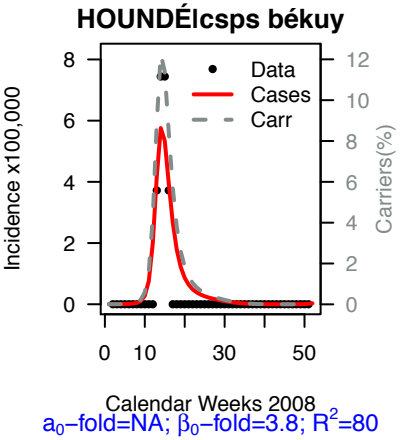

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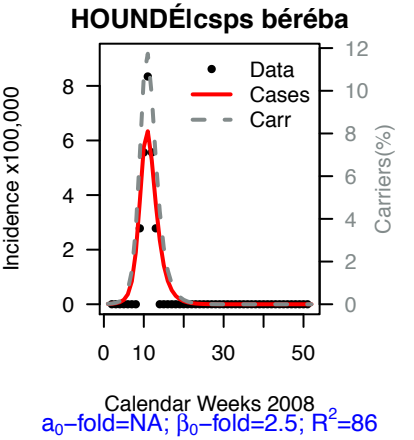

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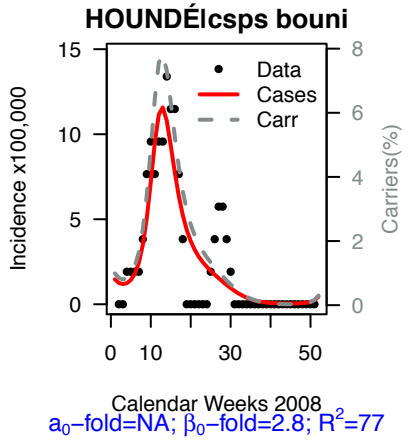

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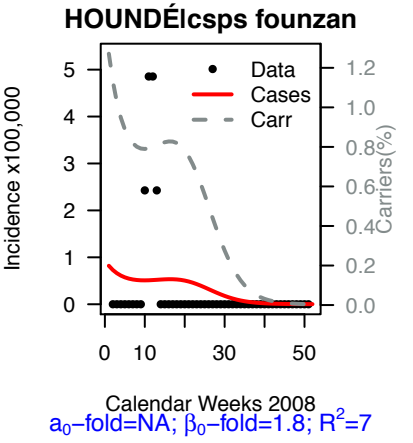

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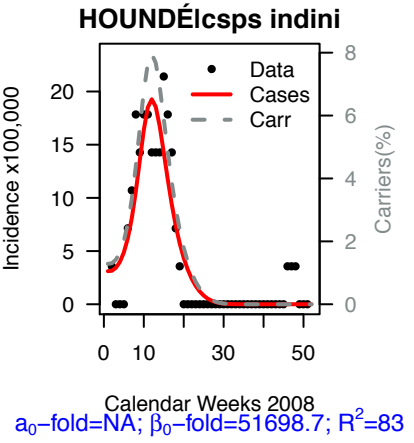
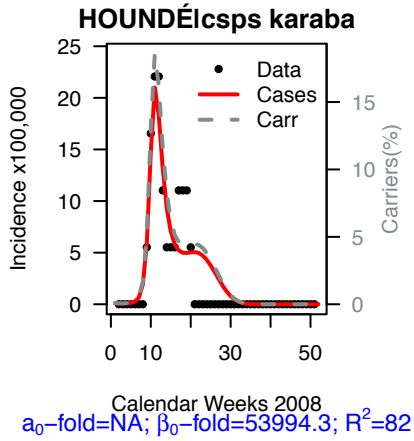
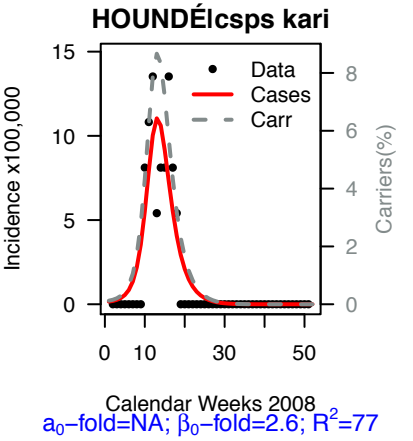


a_0–fold=NA; β_0–fold=51698.7; R^2=83



a_0–fold=NA; β_0–fold=53994.3; R^2=82



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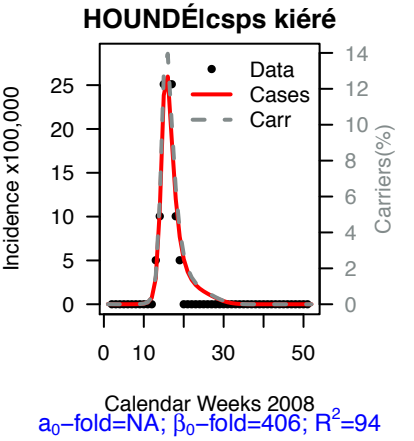
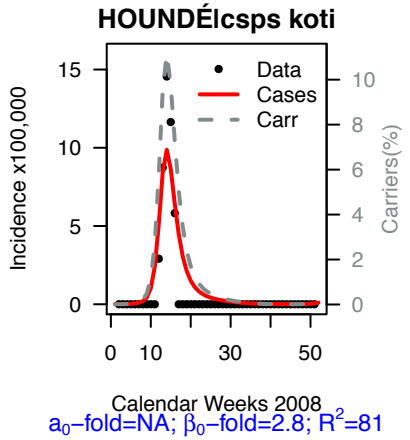
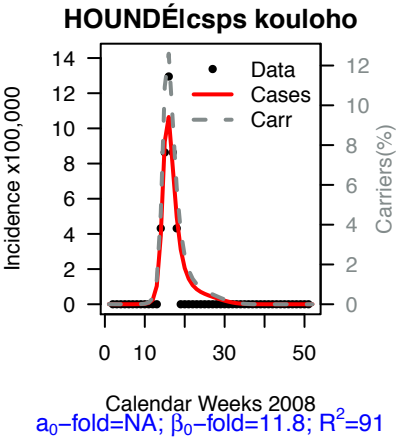


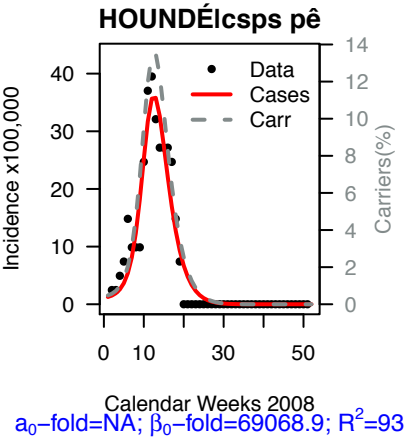
a_0–fold=NA; β_0–fold=406; R^2=94



a_0–fold=NA; β_0–fold=2.8; R^2=81



a_0–fold=NA; β_0–fold=11.8; R^2=91



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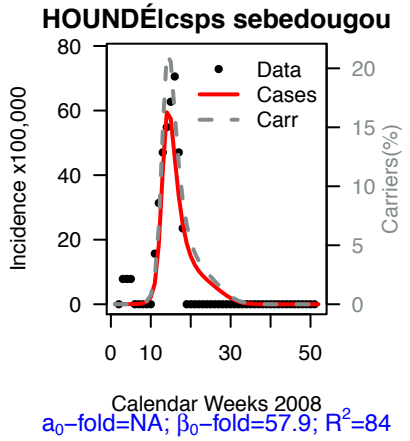
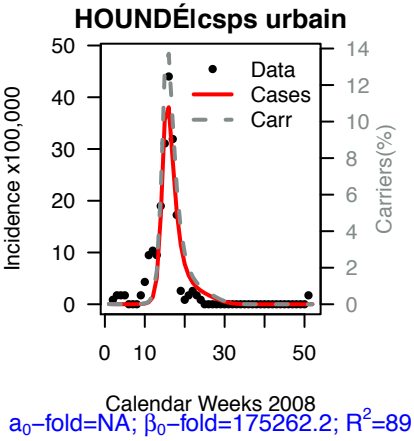


a_0–fold=NA; β_0–fold=57.9; R^2=84



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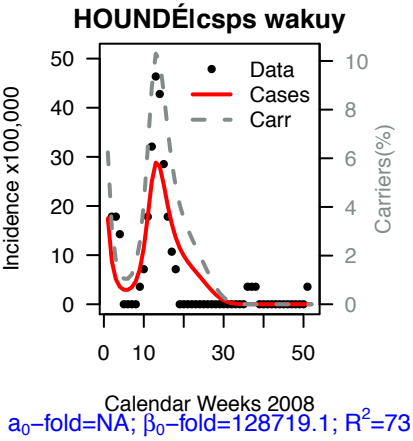
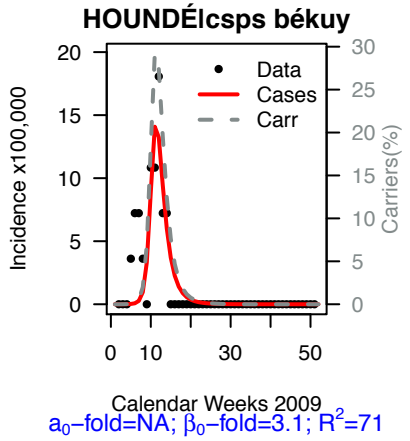
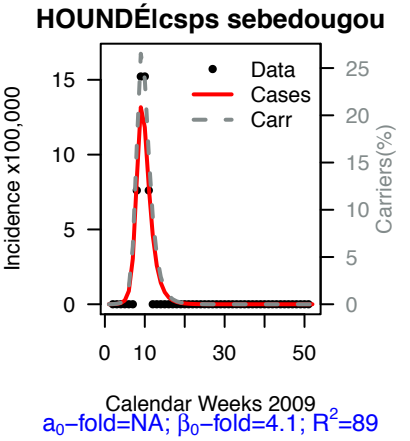


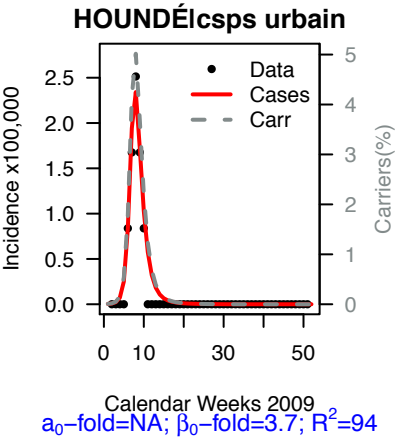
a_0–fold=NA; β_0–fold=128719.1; R^2=73



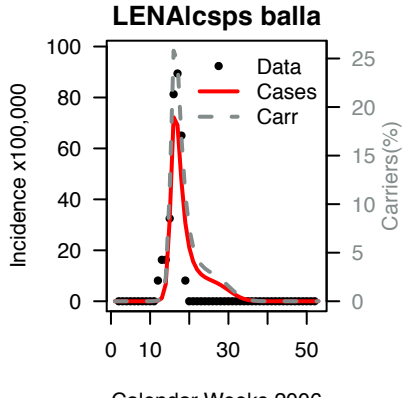
a_0–fold=NA; β_0–fold=3.1; R^2=71

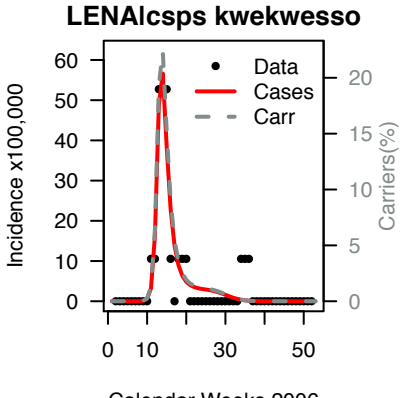


a_0–fold=NA; β_0–fold=4.1; R^2=89



a_0–fold=NA; β_0–fold=3.7; R^2=94


LENAIcsps balla
Data
Cases
Carr
Incidence x100,000
Carriers(%)
Calendar Weeks 2006
a0−fold=NA; β0−fold=600219.6; R2=84


LENAIcsps kwekwesso
Data
Cases
Carr
Incidence x100,000
Carriers(%)
Calendar Weeks 2006
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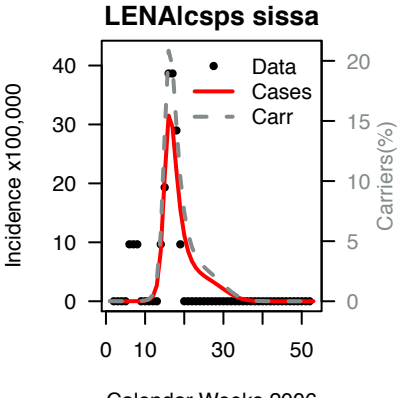
LENAIcsps sissa
Data
Cases
Carr
Incidence x100,000
Carriers(%)
Calendar Weeks 2006
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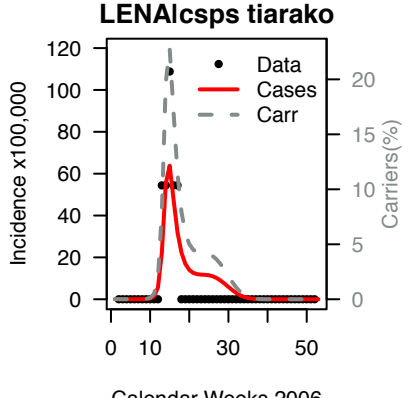
LENAIcsps tiarako
Data
Cases
Carr
Incidence x100,000
Carriers(%)
Calendar Weeks 2006
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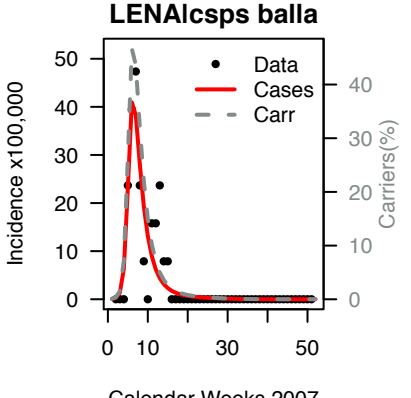
LENAIcsps balla
Data
Cases
Carr
Incidence x100,000
Carriers(%)
Calendar Weeks 2007
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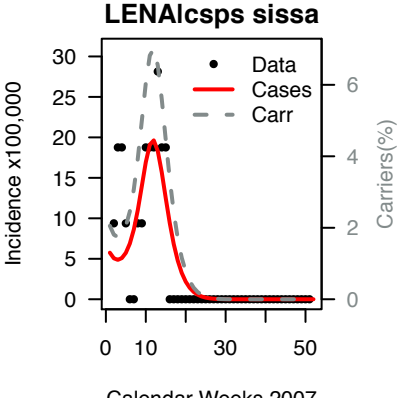
LENAIcsps sissa
Data
Cases
Carr
Incidence x100,000
Carriers(%)
Calendar Weeks 2007
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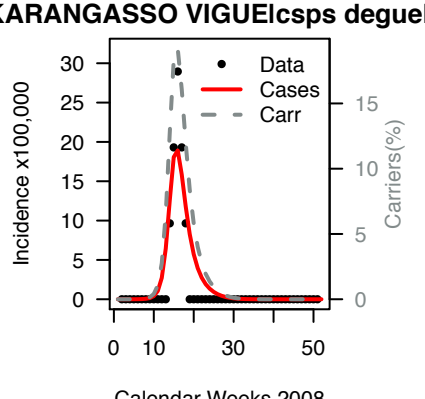
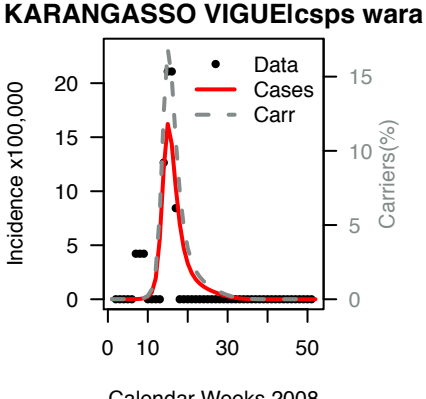

KARANGASSO VIGUEIcsps deguel
Data
Cases
Carr
Incidence x100,000
Carriers(%)
Calendar Weeks 2008
a0−fold=NA; β0−fold=11.1; R2=81


KARANGASSO VIGUEIcsps wara
Data
Cases
Carr
Incidence x100,000
Carriers(%)
Calendar Weeks 2008
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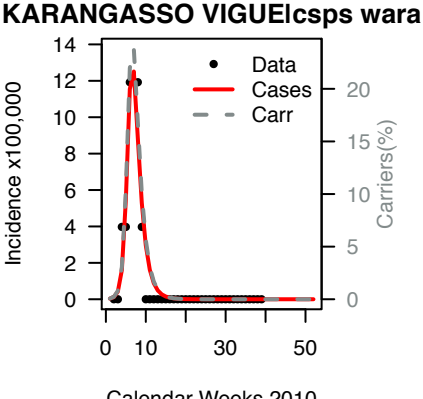
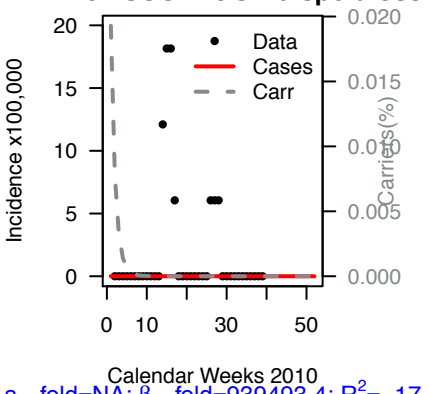
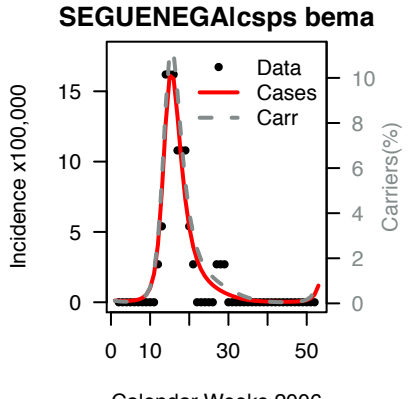

KARANGASSO VIGUEIcsps wara
Data
Cases
Carr
Incidence x100,000
Carriers(%)
Calendar Weeks 2010
a0−fold=NA; β0−fold=3; R2=92

KARANGASSO VIGUEldispe dioss

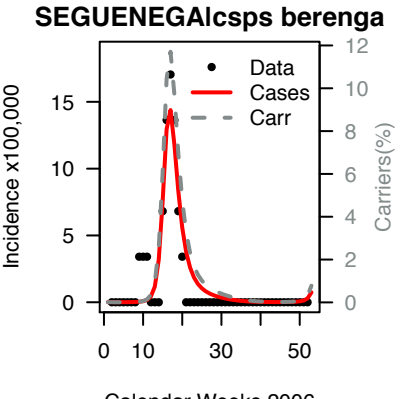


a_0–fold=NA; β_0–fold=939493.4; R^2=–17

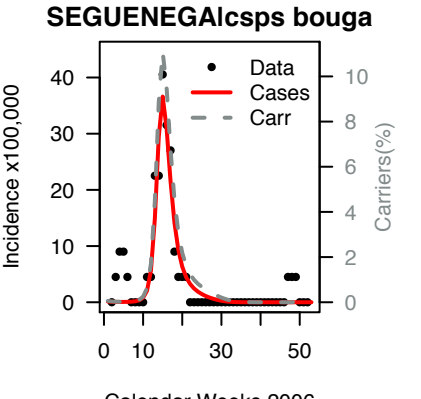
Figure 4. Model 3's trajectories matching plots of simulated and observed (weekly) data, for 64 health center–years with complete data, across four health distrits of Burkina faso (2004–2010).



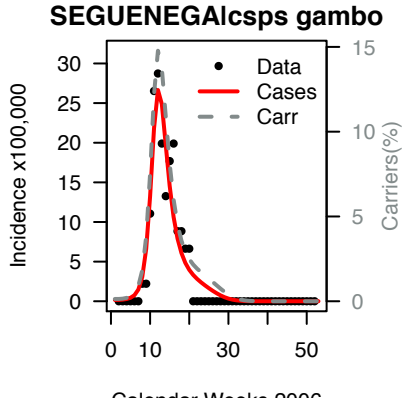
a_0–fold=2.4; β_0–fold=2.9; R^2=92



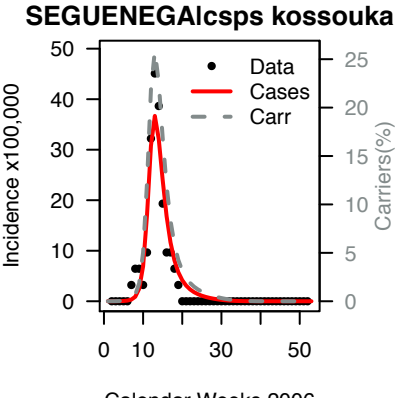
a_0–fold=1.9; β_0–fold=3.4; R^2=87



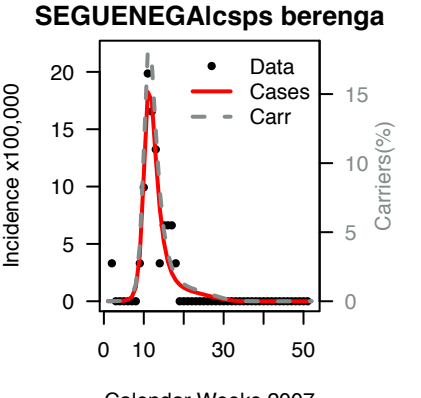
a_0–fold=7.1; β_0–fold=12.1; R^2=87



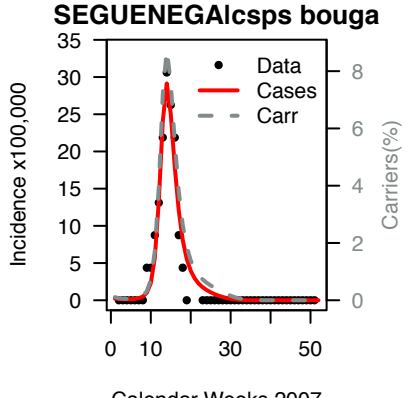
a_0–fold=3.9; β_0–fold=10.7; R^2=90



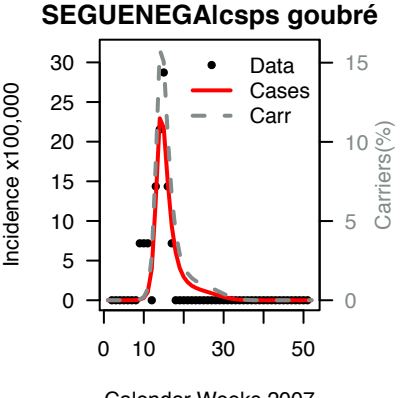
a_0–fold=2.6; β_0–fold=8.2; R^2=92



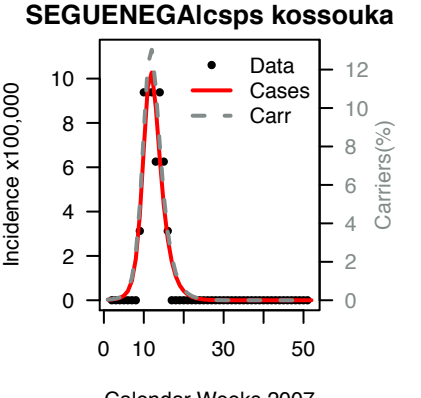
a_0–fold=1.4; β_0–fold=14.4; R^2=92



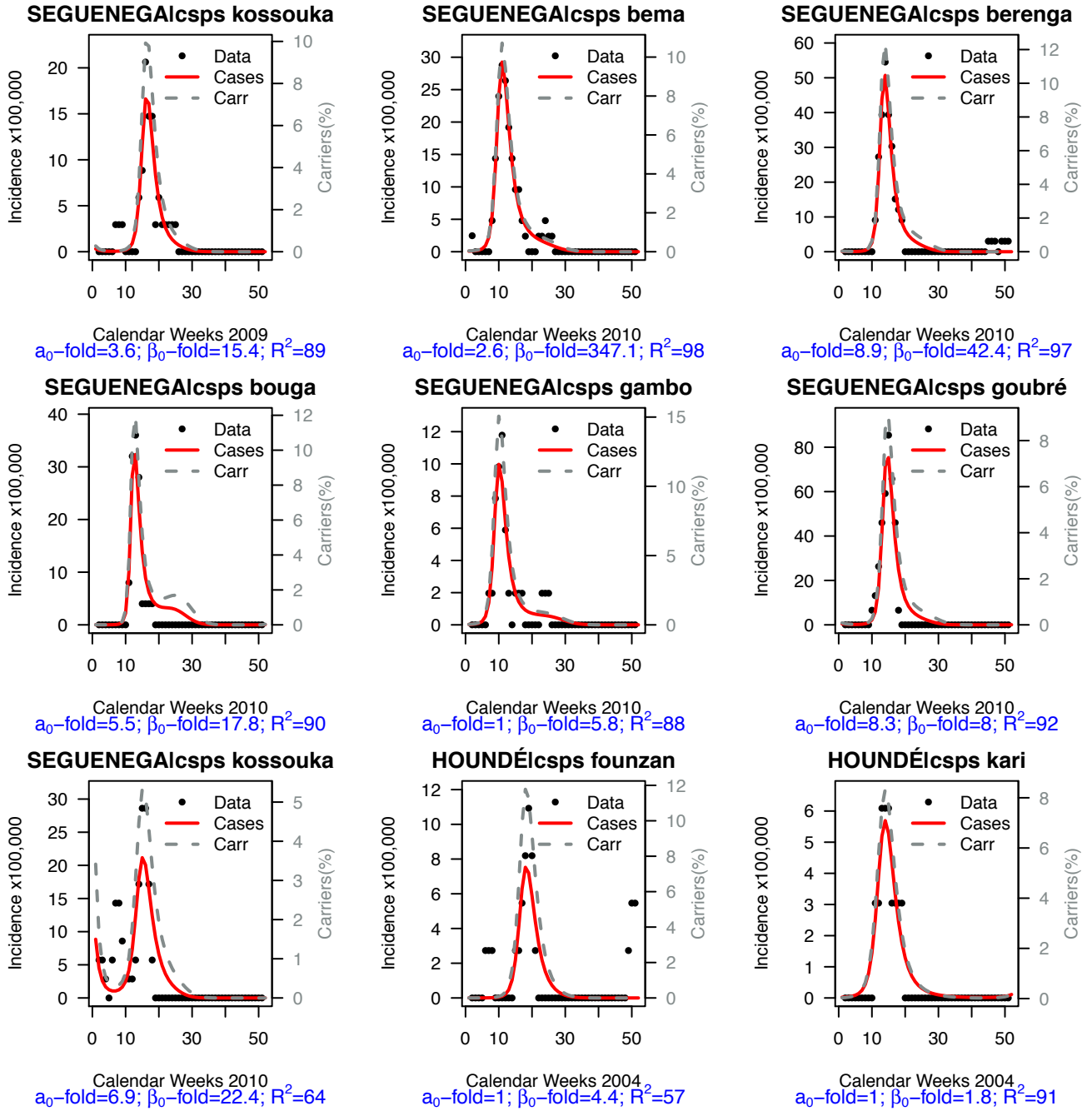
a_0–fold=7.1; β_0–fold=10; R^2=96

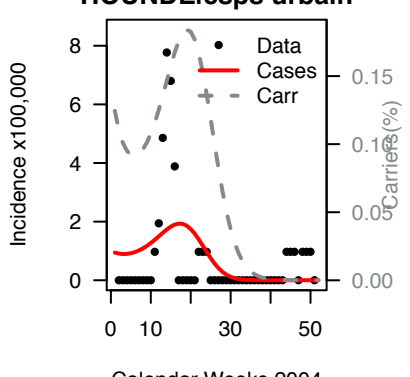


a_0–fold=1.6; β_0–fold=10.7; R^2=83

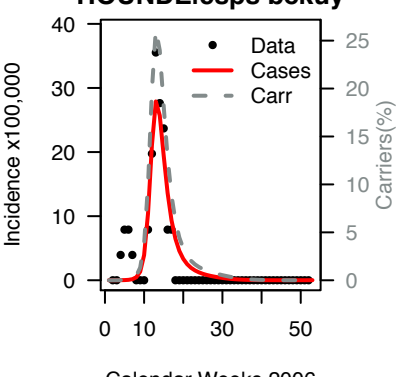


a_0–fold=1.7; β_0–fold=4; R^2=91

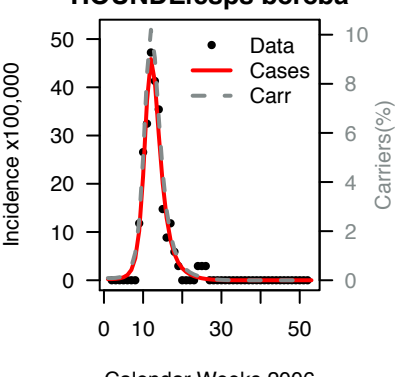

SEGUENEGAlcsps kossouka
Incidence x100,000
Carriers(%)
Data
Cases
Carr
Calendar Weeks 2009
a0−fold=3.6; β0−fold=15.4; R2=89
SEGUENEGAlcsps bema
Incidence x100,000
Carriers(%)
Data
Cases
Carr
Calendar Weeks 2010
a0−fold=2.6; β0−fold=347.1; R2=98
SEGUENEGAlcsps berenga
Incidence x100,000
Carriers(%)
Data
Cases
Carr
Calendar Weeks 2010
a0−fold=8.9; β0−fold=42.4; R2=97
SEGUENEGAlcsps bouga
Incidence x100,000
Carriers(%)
Data
Cases
Carr
Calendar Weeks 2010
a0−fold=5.5; β0−fold=17.8; R2=90
SEGUENEGAlcsps gambo
Incidence x100,000
Carriers(%)
Data
Cases
Carr
Calendar Weeks 2010
a0−fold=1; β0−fold=5.8; R2=88
SEGUENEGAlcsps goubré
Incidence x100,000
Carriers(%)
Data
Cases
Carr
Calendar Weeks 2010
a0−fold=8.3; β0−fold=8; R2=92
SEGUENEGAlcsps kossouka
Incidence x100,000
Carriers(%)
Data
Cases
Carr
Calendar Weeks 2010
a0−fold=6.9; β0−fold=22.4; R2=64
HOUNDÉlcsps founzan
Incidence x100,000
Carriers(%)
Data
Cases
Carr
Calendar Weeks 2004
a0−fold=1; β0−fold=4.4; R2=57
HOUNDÉlcsps kari
Incidence x100,000
Carriers(%)
Data
Cases
Carr
Calendar Weeks 2004
a0−fold=1; β0−fold=1.8; R2=91



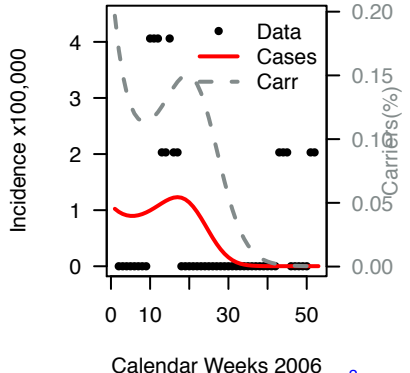
a_0–fold=21; β_0–fold=2.7; R^2=19



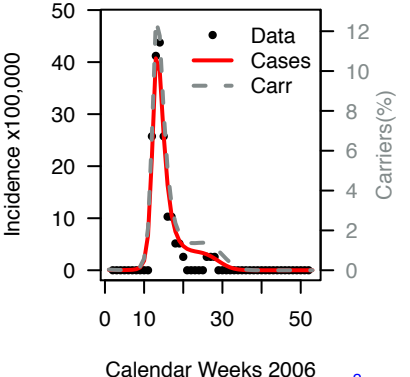
a_0–fold=2.3; β_0–fold=3.7; R^2=87



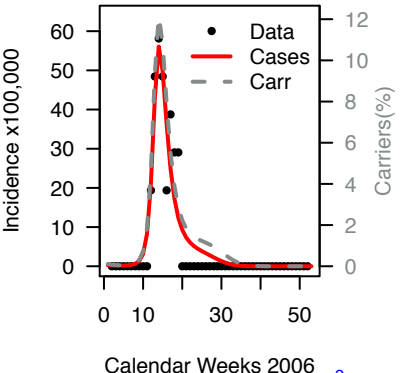
a_0–fold=5.4; β_0–fold=74.1; R^2=97



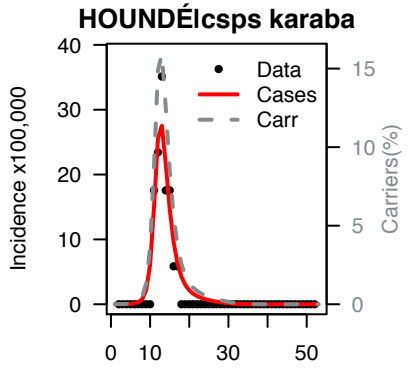
a_0–fold=16.2; β_0–fold=1.7; R^2=7



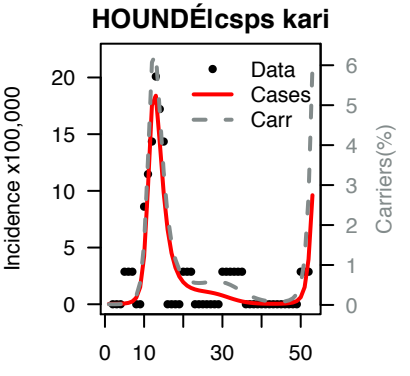
a_0–fold=4; β_0–fold=131893.6; R^2=95



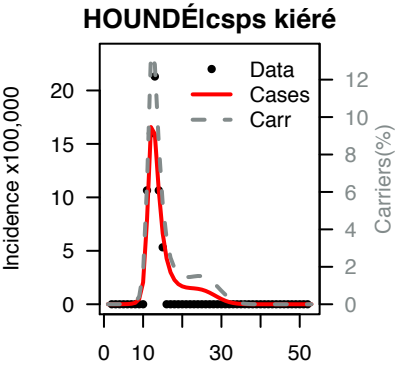
a_0–fold=9.9; β_0–fold=10.3; R^2=88



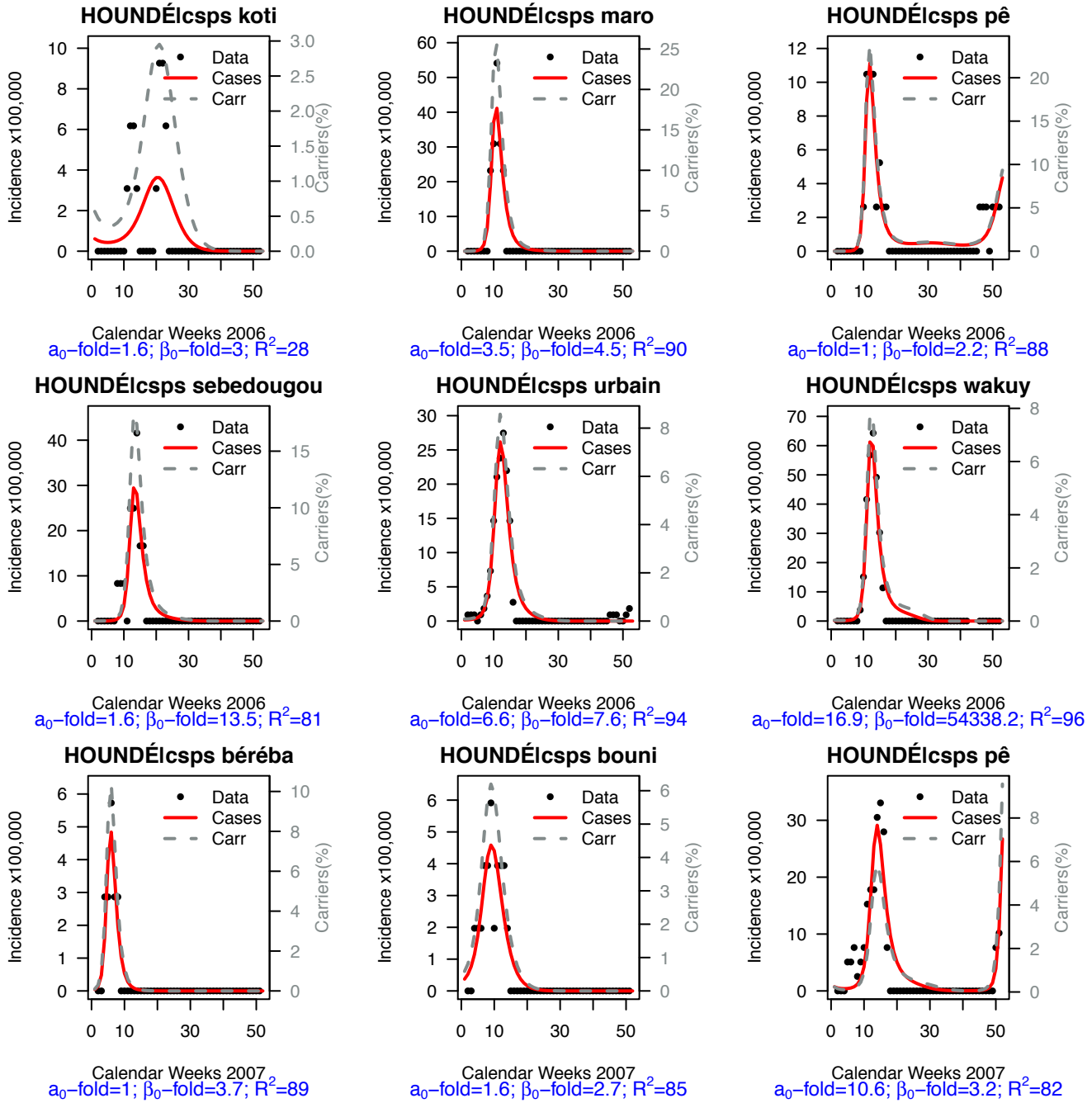
a_0–fold=2.7; β_0–fold=7.5; R^2=92

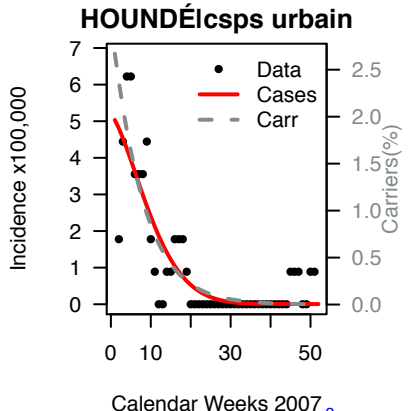


a_0–fold=6.3; β_0–fold=3.7; R^2=80

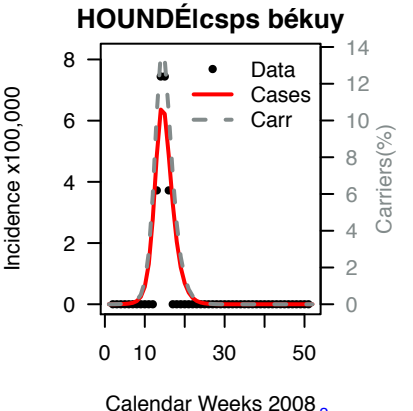


a_0–fold=2.7; β_0–fold=30; R^2=89

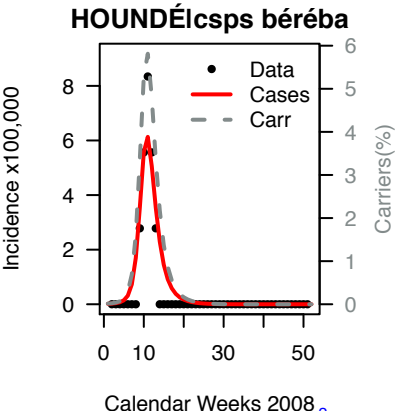

HOUNDÉIcsps koti
Incidence x100,000
Carriers(%)
Data
Cases
Carr
Calendar Weeks 2006
a0−fold=1.6; β0−fold=3; R2=28
HOUNDÉIcsps maro
Incidence x100,000
Carriers(%)
Data
Cases
Carr
Calendar Weeks 2006
a0−fold=3.5; β0−fold=4.5; R2=90
HOUNDÉIcsps pê
Incidence x100,000
Carriers(%)
Data
Cases
Carr
Calendar Weeks 2006
a0−fold=1; β0−fold=2.2; R2=88
HOUNDÉIcsps sebedougou
Incidence x100,000
Carriers(%)
Data
Cases
Carr
Calendar Weeks 2006
a0−fold=1.6; β0−fold=13.5; R2=81
HOUNDÉIcsps urbain
Incidence x100,000
Carriers(%)
Data
Cases
Carr
Calendar Weeks 2006
a0−fold=6.6; β0−fold=7.6; R2=94
HOUNDÉIcsps wakuy
Incidence x100,000
Carriers(%)
Data
Cases
Carr
Calendar Weeks 2006
a0−fold=16.9; β0−fold=54338.2; R2=96
HOUNDÉIcsps béréba
Incidence x100,000
Carriers(%)
Data
Cases
Carr
Calendar Weeks 2007
a0−fold=1; β0−fold=3.7; R2=89
HOUNDÉIcsps bouni
Incidence x100,000
Carriers(%)
Data
Cases
Carr
Calendar Weeks 2007
a0−fold=1.6; β0−fold=2.7; R2=85
HOUNDÉIcsps pê
Incidence x100,000
Carriers(%)
Data
Cases
Carr
Calendar Weeks 2007
a0−fold=10.6; β0−fold=3.2; R2=82



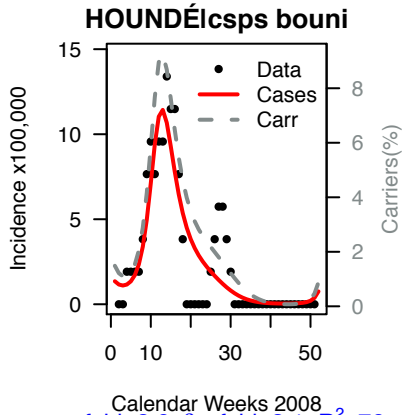
a_0–fold=6.2; β_0–fold=1; R^2=71



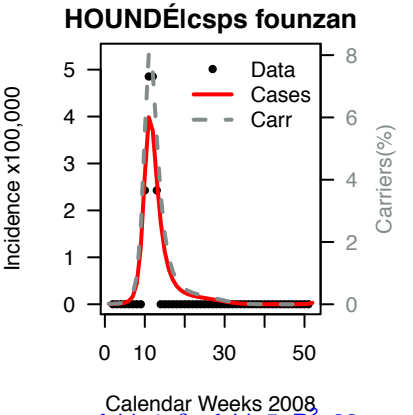
a_0–fold=1; β_0–fold=6.9; R^2=75



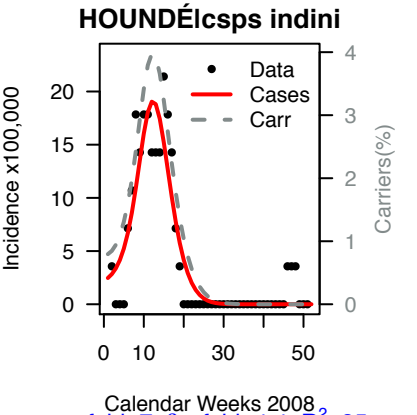
a_0–fold=1; β_0–fold=4.2; R^2=86



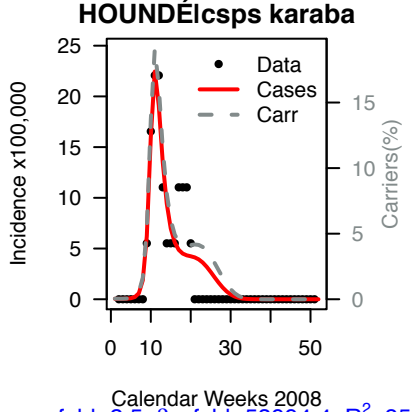
a_0–fold=2.6; β_0–fold=3.1; R^2=76



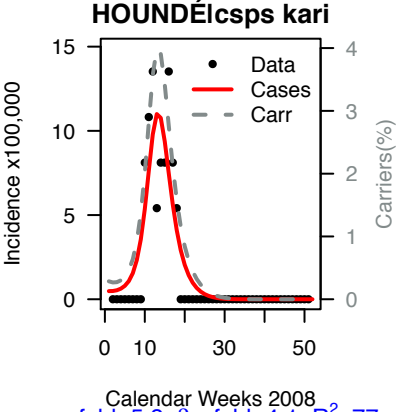
a_0–fold=1; β_0–fold=5; R^2=83



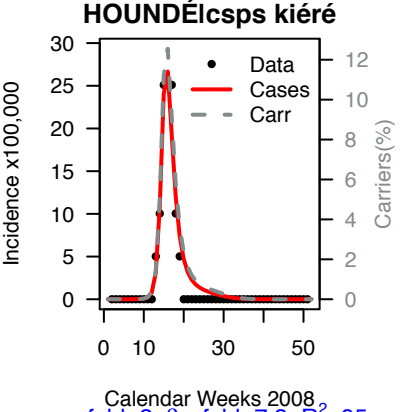
a_0–fold=7; β_0–fold=4.4; R^2=85



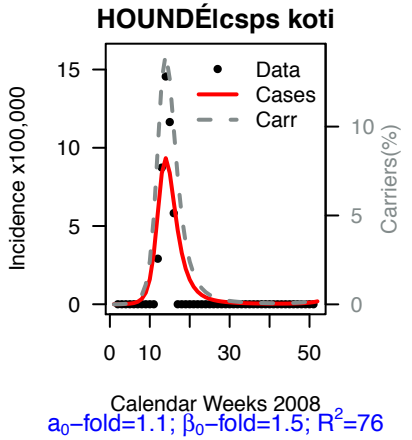
a_0–fold=2.5; β_0–fold=53994.4; R^2=85



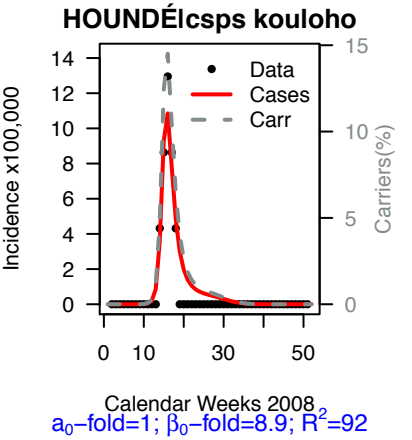
a_0–fold=5.8; β_0–fold=4.1; R^2=77



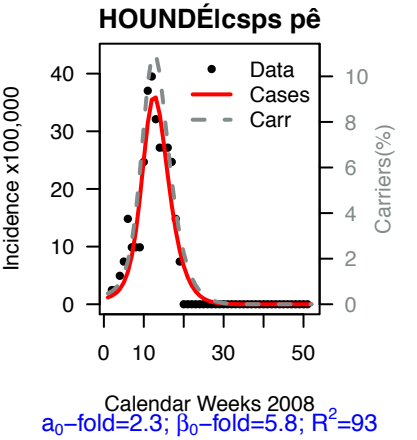
a_0–fold=2; β_0–fold=7.3; R^2=95



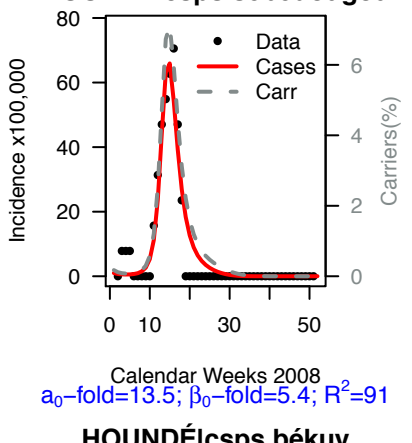
a_0–fold=1.1; β_0–fold=1.5; R^2=76



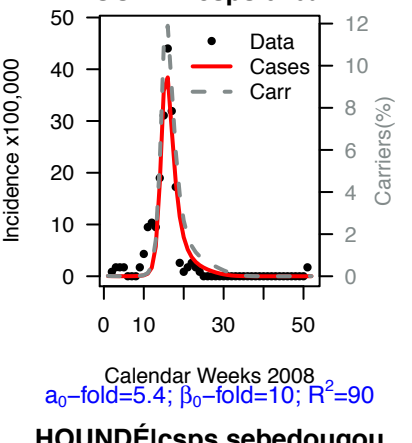
a_0–fold=1; β_0–fold=8.9; R^2=92



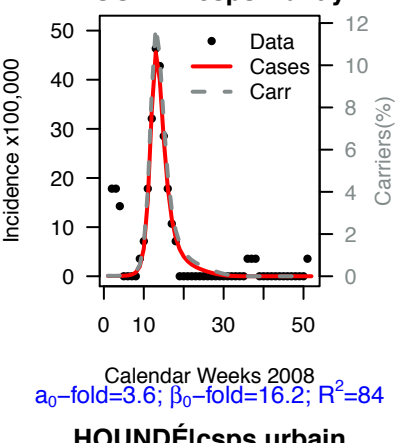
a_0–fold=2.3; β_0–fold=5.8; R^2=93



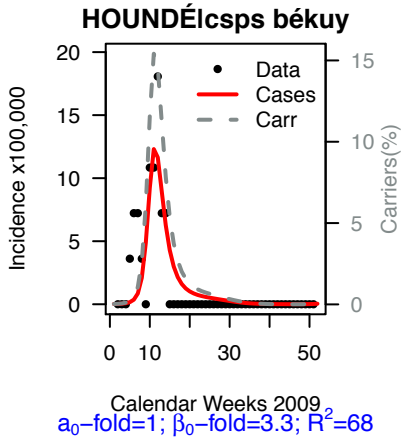
a_0–fold=13.5; β_0–fold=5.4; R^2=91



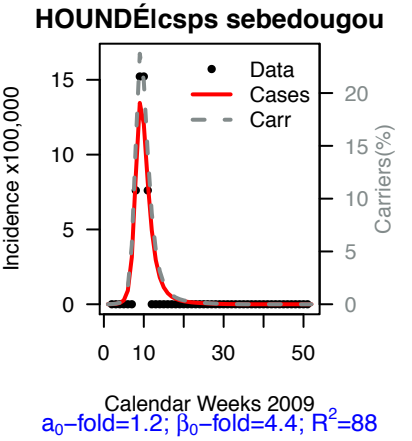
a_0–fold=5.4; β_0–fold=10; R^2=90



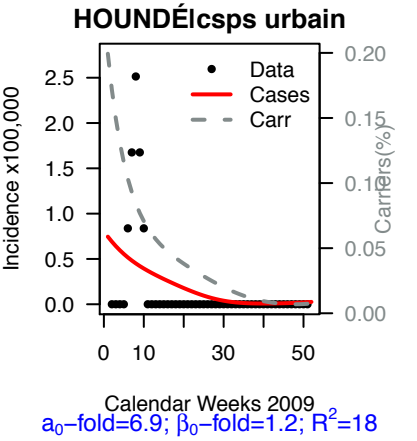
a_0–fold=3.6; β_0–fold=16.2; R^2=84



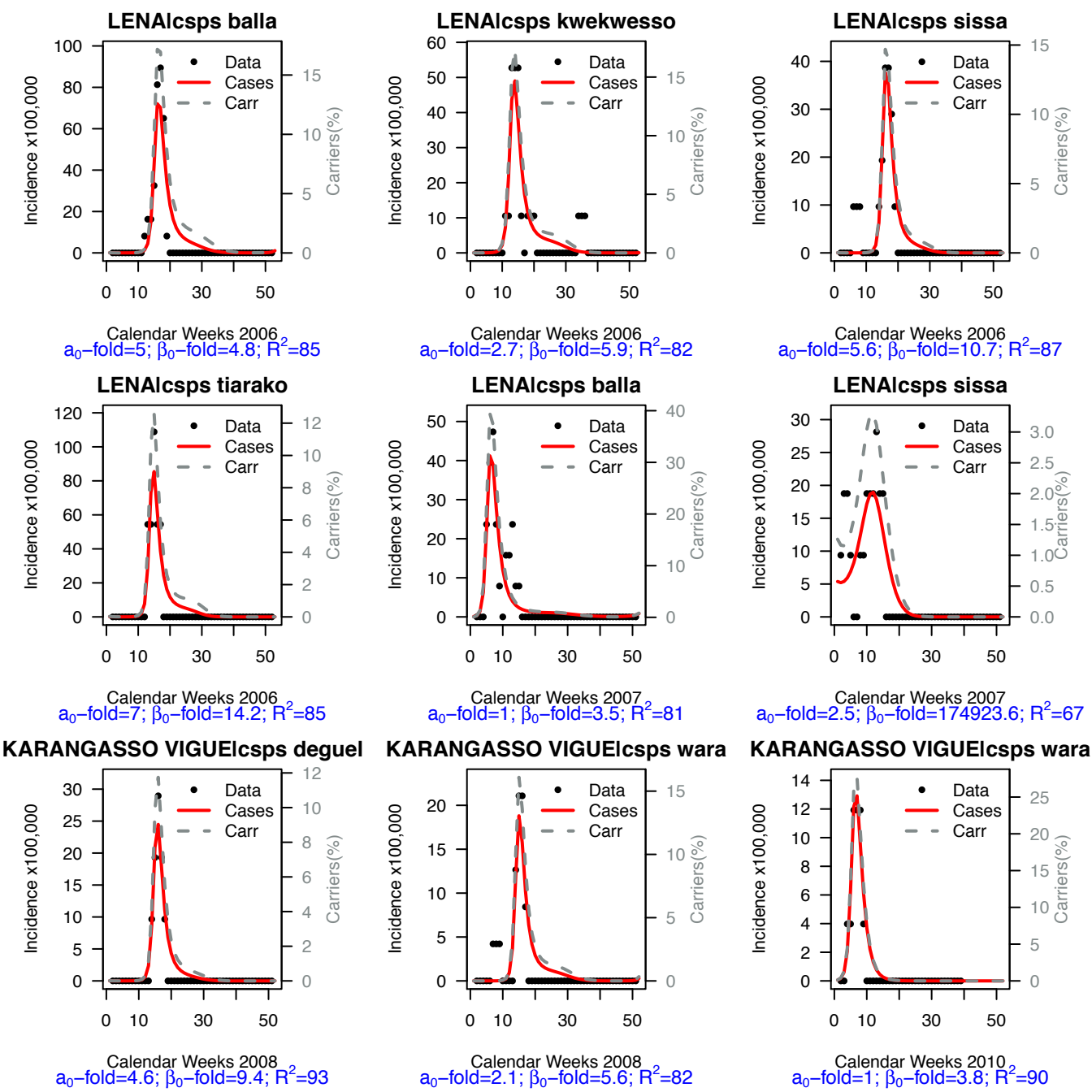
a_0–fold=1; β_0–fold=3.3; R^2=68



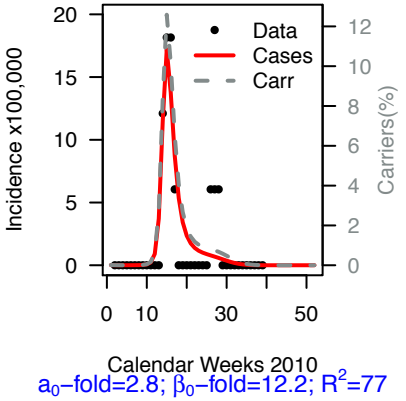
a_0–fold=1.2; β_0–fold=4.4; R^2=88



a_0–fold=6.9; β_0–fold=1.2; R^2=18


LENAIcsps balla
Incidence x100,000
Carriers(%)
Data
Cases
Carr
Calendar Weeks 2006
a0−fold=5; β0−fold=4.8; R2=85
LENAIcsps kwekwesso
Calendar Weeks 2006
a0−fold=2.7; β0−fold=5.9; R2=82
LENAIcsps sissa
Calendar Weeks 2006
a0−fold=5.6; β0−fold=10.7; R2=87
LENAIcsps tiarako
Calendar Weeks 2006
a0−fold=7; β0−fold=14.2; R2=85
LENAIcsps balla
Calendar Weeks 2007
a0−fold=1; β0−fold=3.5; R2=81
LENAIcsps sissa
Calendar Weeks 2007
a0−fold=2.5; β0−fold=174923.6; R2=67
KARANGASSO VIGUEIcsps deguel
Calendar Weeks 2008
a0−fold=4.6; β0−fold=9.4; R2=93
KARANGASSO VIGUEIcsps wara
Calendar Weeks 2008
a0−fold=2.1; β0−fold=5.6; R2=82
KARANGASSO VIGUEIcsps wara
Calendar Weeks 2010
a0−fold=1; β0−fold=3.8; R2=90

KARANGASSO VIGUEldispe dioss



a_0–fold=2.8; β_0–fold=12.2; R^2=77