

Cálculo de umbrales y niveles de intensidad

El Método de las Epidemias Móviles

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Jornada Científica del Programa de Vigilancia Integrada de la Gripe

Antecedentes



- European Influenza Surveillance Scheme (1996-2008)
 - Eurosentinel y ENS-CARE.
 - Instituto holandés de Investigación en Servicios Sanitarios (NIVEL).
 - Financiación: privada y pública (CE: 1999-2006 y ECDC: 2006-2008).
- The Moving Epidemics Method (MEM)
 - ENS-Care Madrid, 1996.
 - EISS Crete y EISS Siena, 2000.
 - Options Okinawa, 2003.
 - EISS Málaga, 2007.
- European Influenza Surveillance Network (2008-)
 - WHO European guidance for surveillance in humans, 2009.
 - Annual meeting Influenza Surveillance Network, Sofia, 2010.
 - Implementación en Tessy: Nov. 2010.
 - Piloto EuroFlu: 2012.

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Modelling influenza epidemic—can we detect the beginning and predict the intensity and duration?

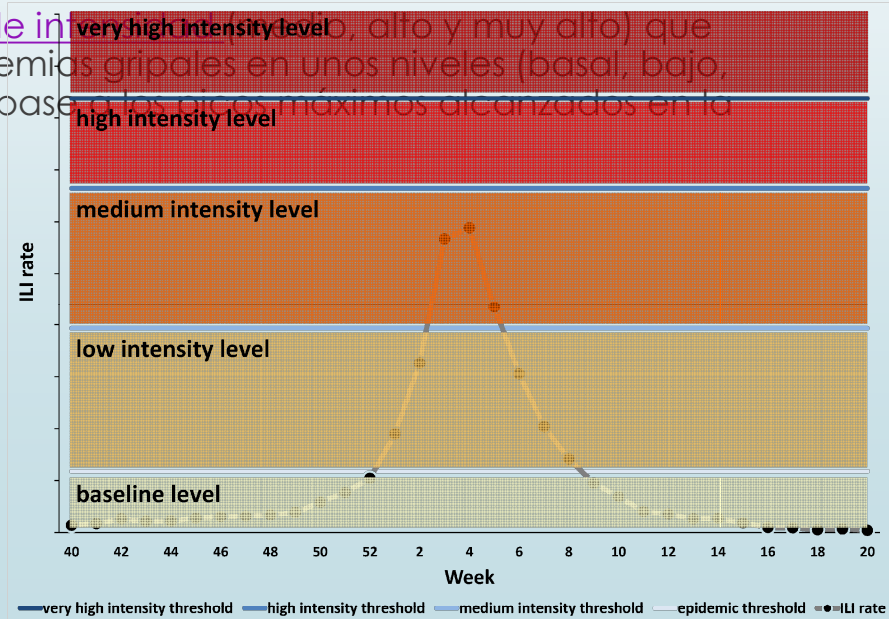
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Raúl Ortiz de Lejarazu^b, Marisol Gutiérrez Pérez^c

^a Observatorio de Salud Pública, Dirección General de Salud Pública y Consumo, Consejería de Sanidad, Junta de Castilla y León, Paseo de Zorrilla, no. 1, C. P.: 47071, Valladolid, Spain

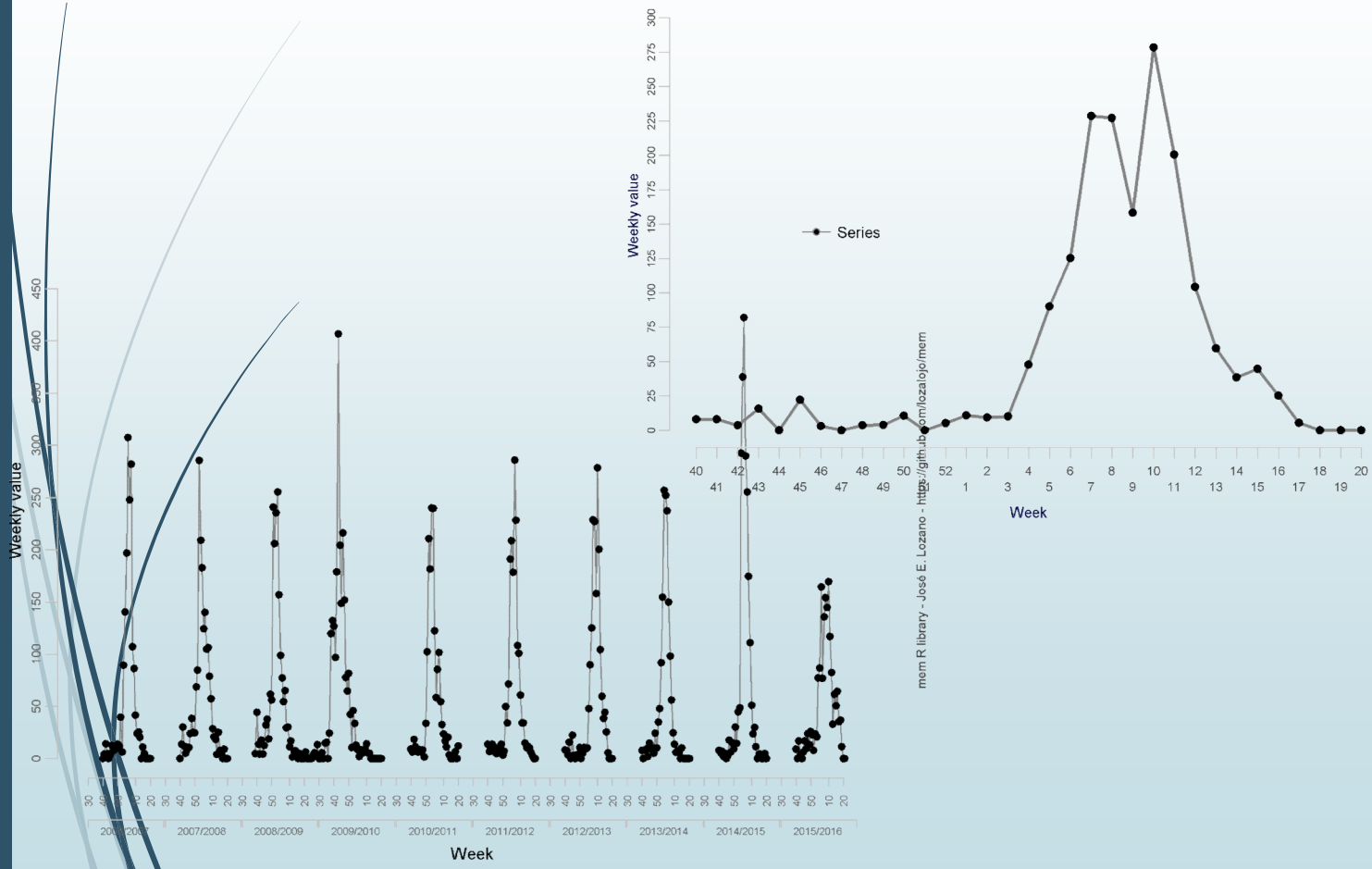
1
2
3
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5
6

Objetivo: La vigilancia

- ▶ Conocer el estado de la epidemia durante el periodo de vigilancia.
 - ▶ Establecer un umbral epidémico rebasado el cual existe una alta confianza de que la epidemia gripal ha comenzado.
- ▶ Conocer la magnitud de la epidemia actual en relación al histórico de la gripe en la región y compararla con otras regiones.
 - ▶ Establecer unos umbrales de intensidad (bajo, alto y muy alto) que permitan clasificar las epidemias gripales en unos niveles (basal, bajo, medio, alto y muy alto) en base a los picos máximos alcanzados en la temporada.



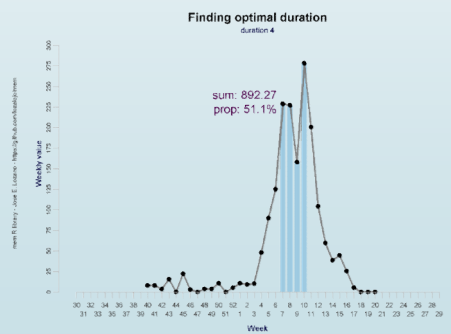
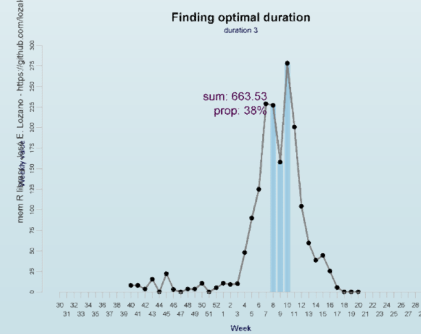
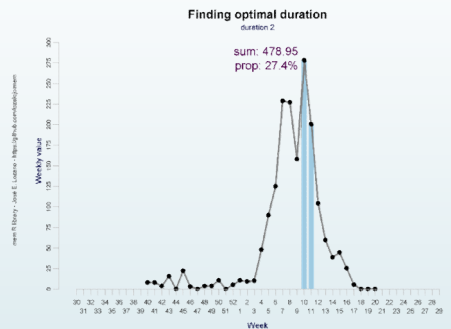
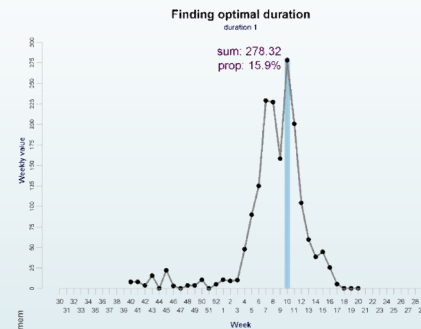
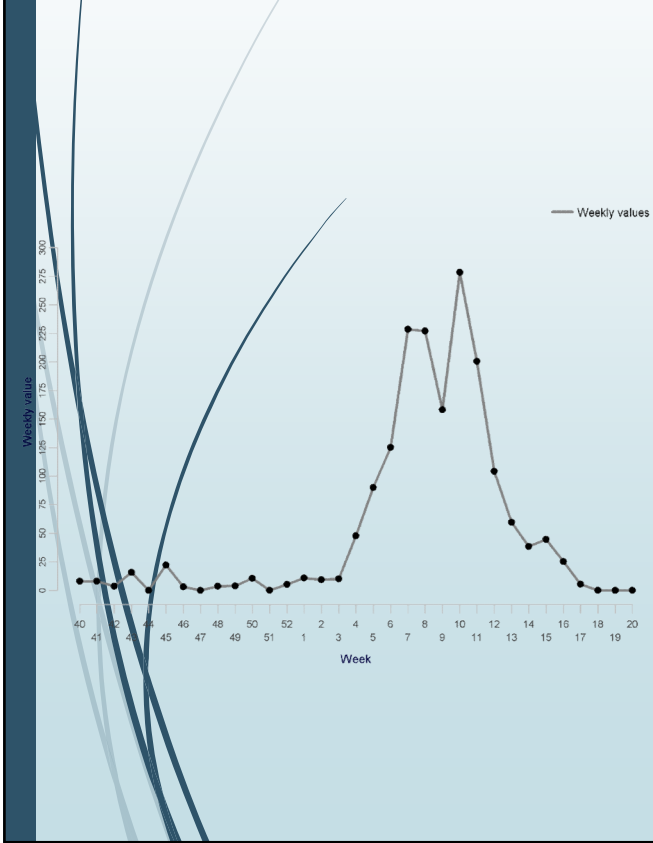
Aproximación al problema



mem R library - José E. Lozano - <https://github.com/lozalojo/mem>

Localización

Para conocer dónde se produjo la epidemia, podemos fijarnos en duración de la misma.



Porcentaje

Finding optimal duration duration: 1

Cada duración posible representa un porcentaje con respecto al total.

sum: 278.32
prop: 15.9%



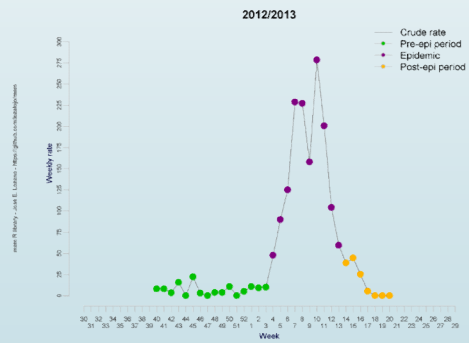
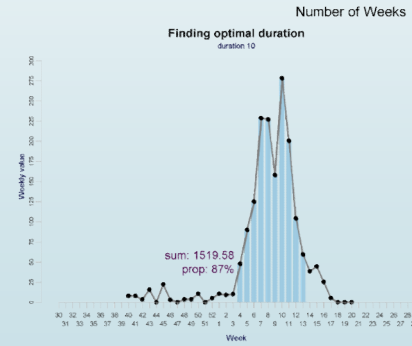
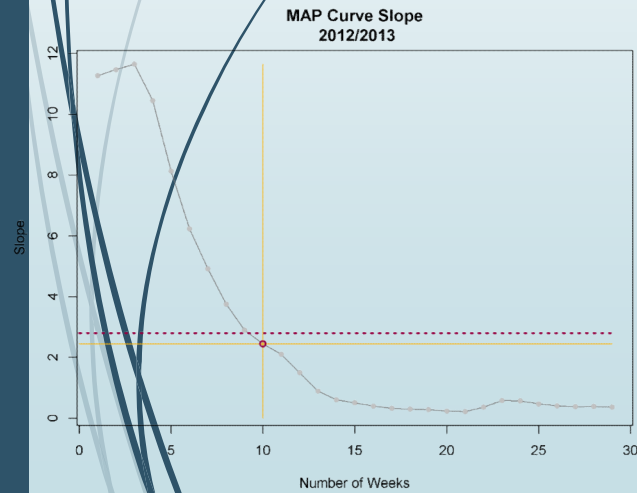
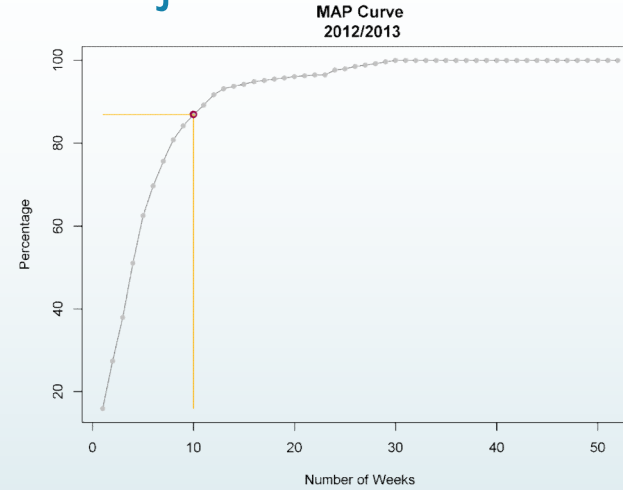
mem R library = José E. Lezama = <https://github.com/lozajoj/mem>

La curva de porcentajes máximos acumulados

➤ Métodos:

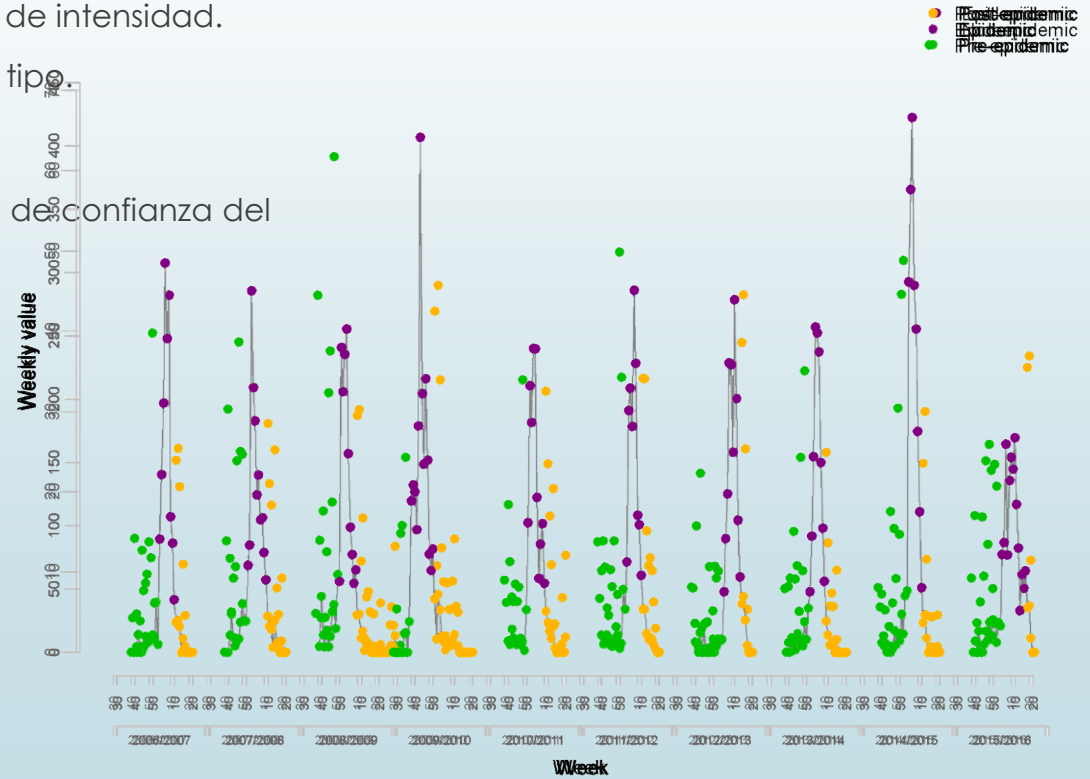
➤ Criterio fijo.

➤ Parámetro de ventana.



Umbrales

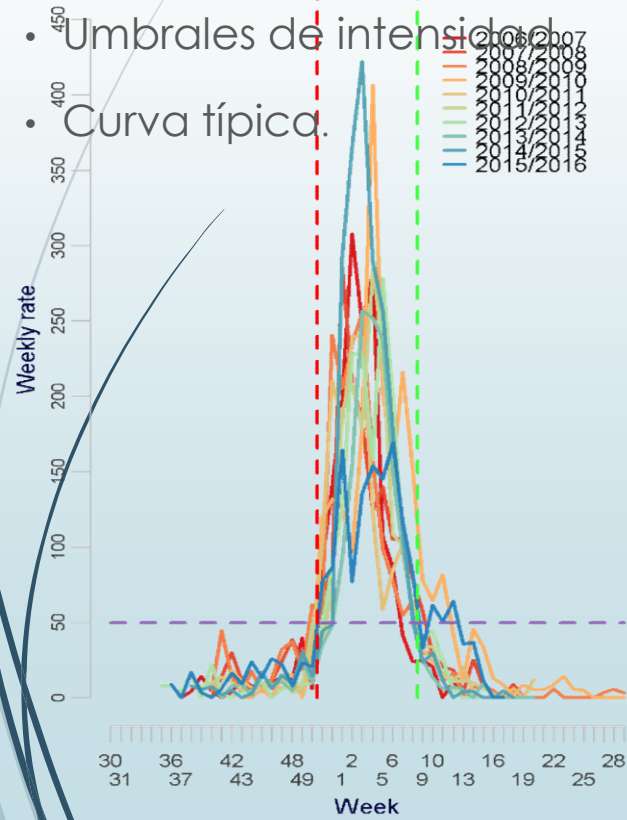
- Valores:
 - Pre-epidémicos: umbral epidémico.
 - Epidémicos: niveles de intensidad.
 - Toda la serie: curva tipo.
- Métodos:
 - Media y el intervalo de confianza del punto de una cola.



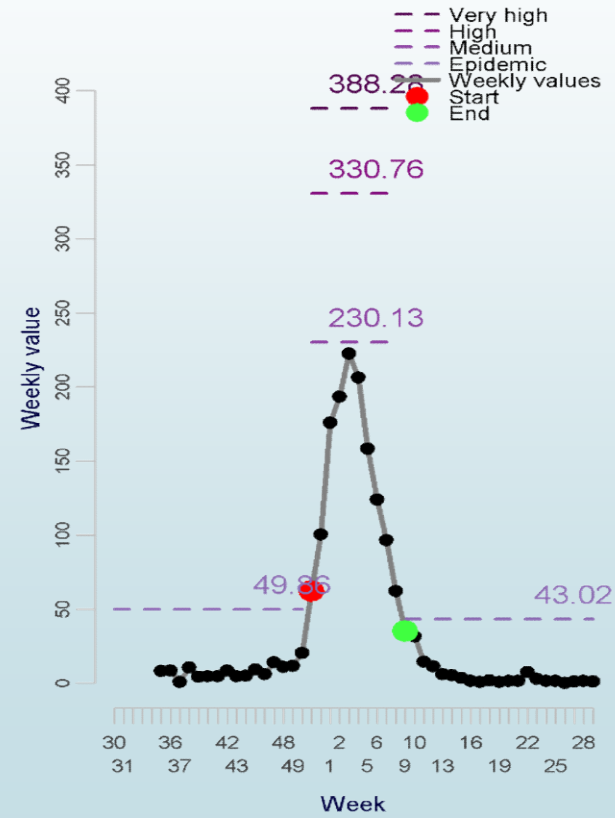
mem R library - José E. Lezcano - <https://github.com/lezalejo/mem>

El modelo MEM

- Umbral epidémico.
- Umbrales de intensidad.
- Curva típica.



mem R library - José E. Lozano - <https://github.com/lozalojo/mem>

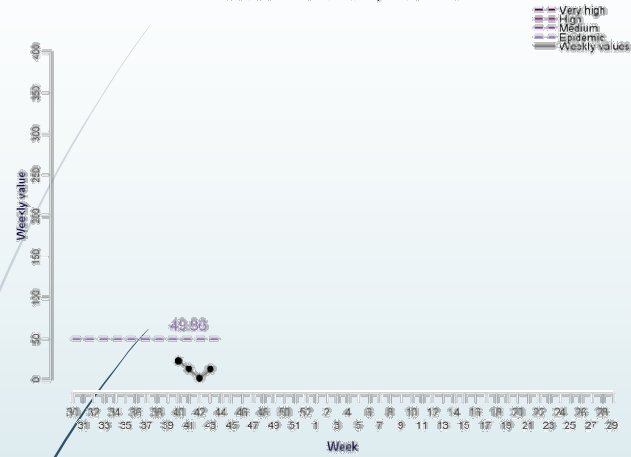


mem R library - José E. Lozano - <https://github.com/lozalojo/mem>

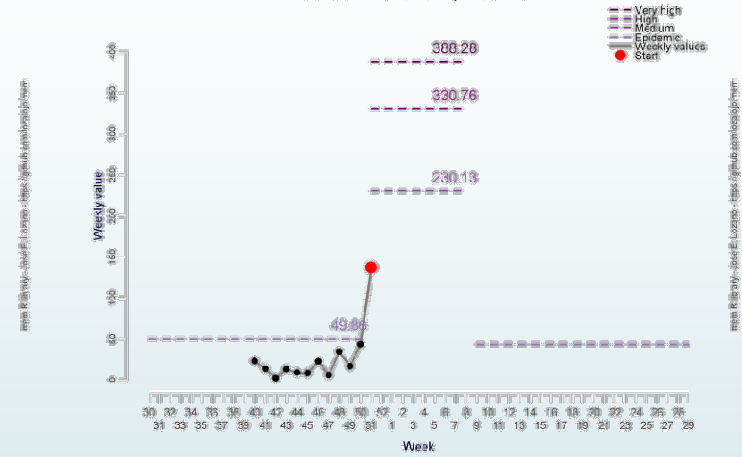
La vigilancia con el MEM (I)



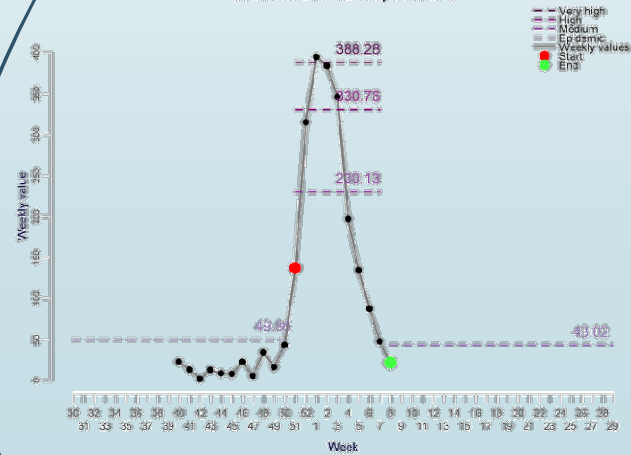
Season: 2016/2017, Week: 43



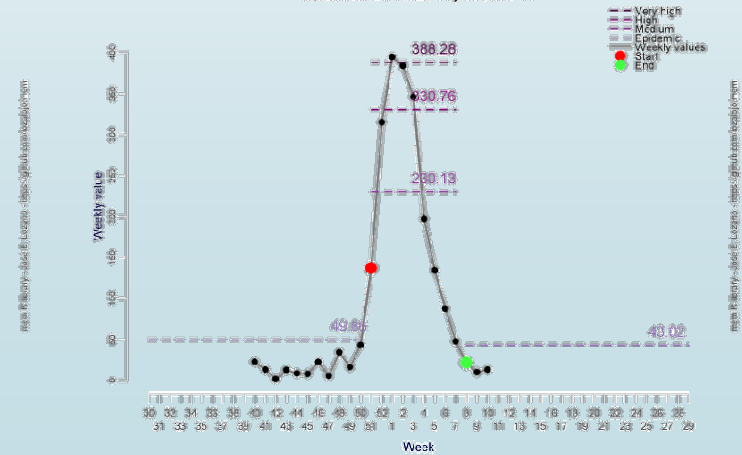
Season: 2016/2017, Week: 51



Season: 2016/2017, Week: 8



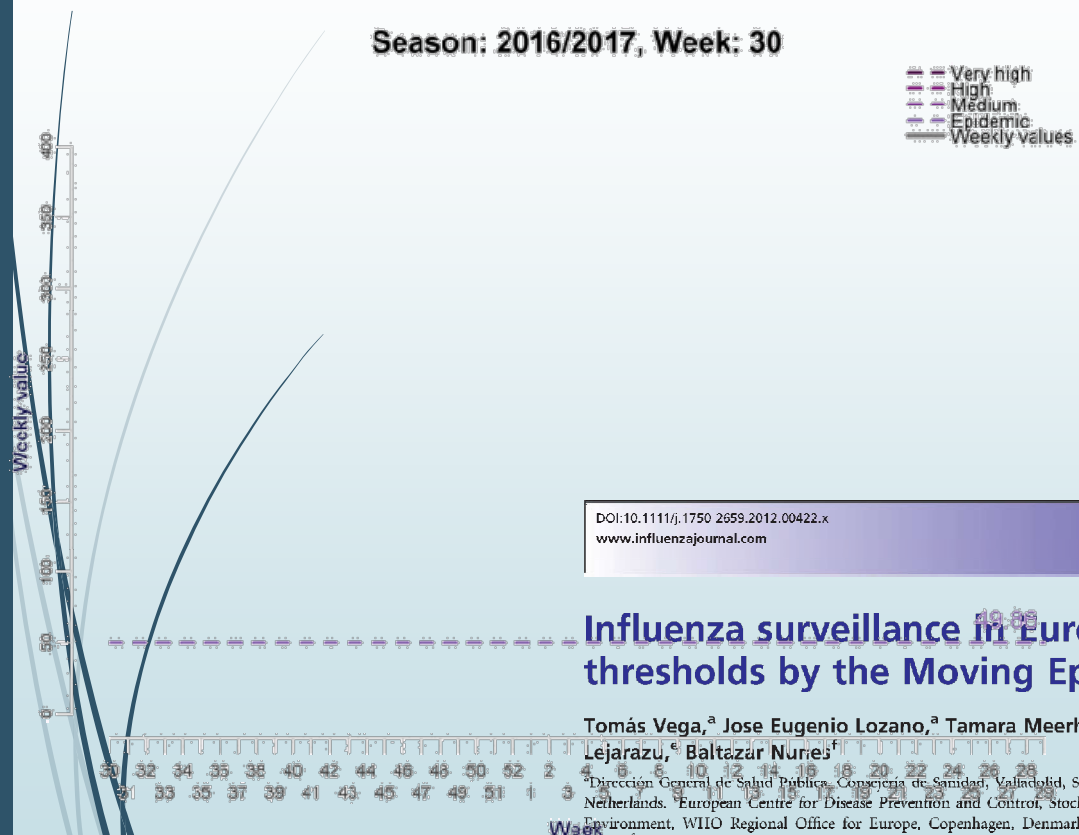
Season: 2016/2017, Week: 17



La vigilancia con el MEM (II)



Season: 2016/2017, Week: 30



Bondad de ajuste

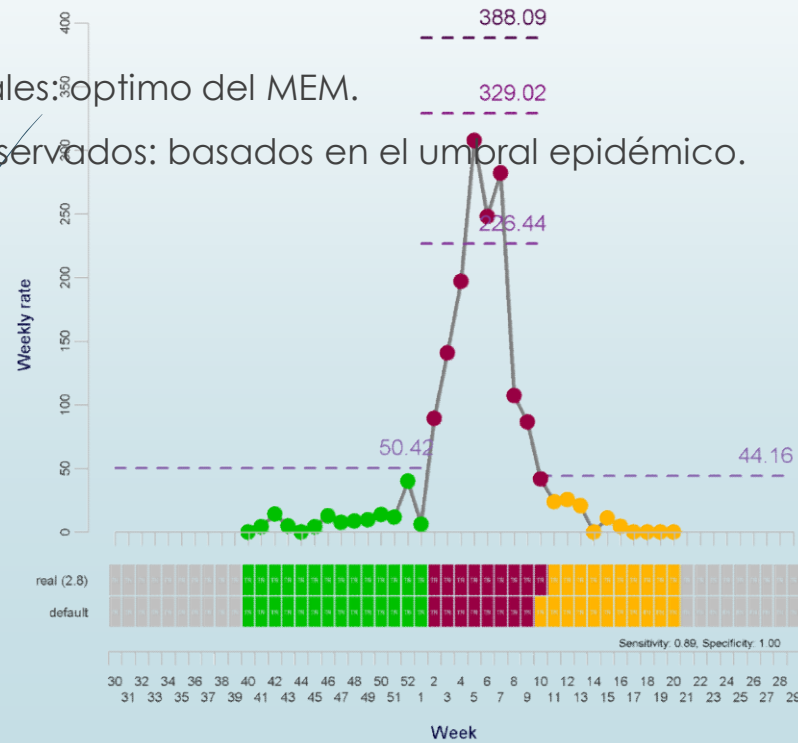


► Método:

- Validación cruzada.
- Validación secuencial.

► Cálculo:

- Valores reales: optimo del MEM.
- Valores observados: basados en el umbral epidémico.

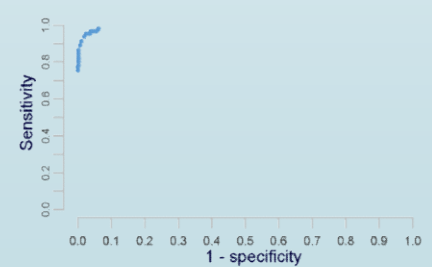
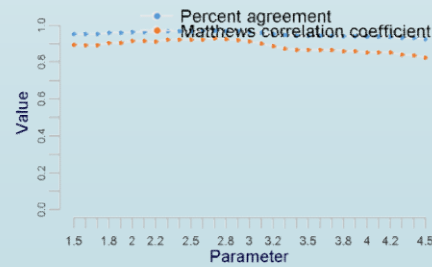
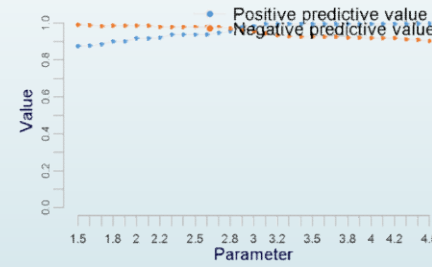
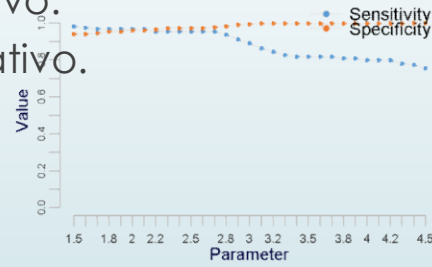


- - - Very high thr
- - - High thr
- - - Medium thr
- - - Epidemic thr
- Weekly rates
- Post
- Epidemic
- Pre

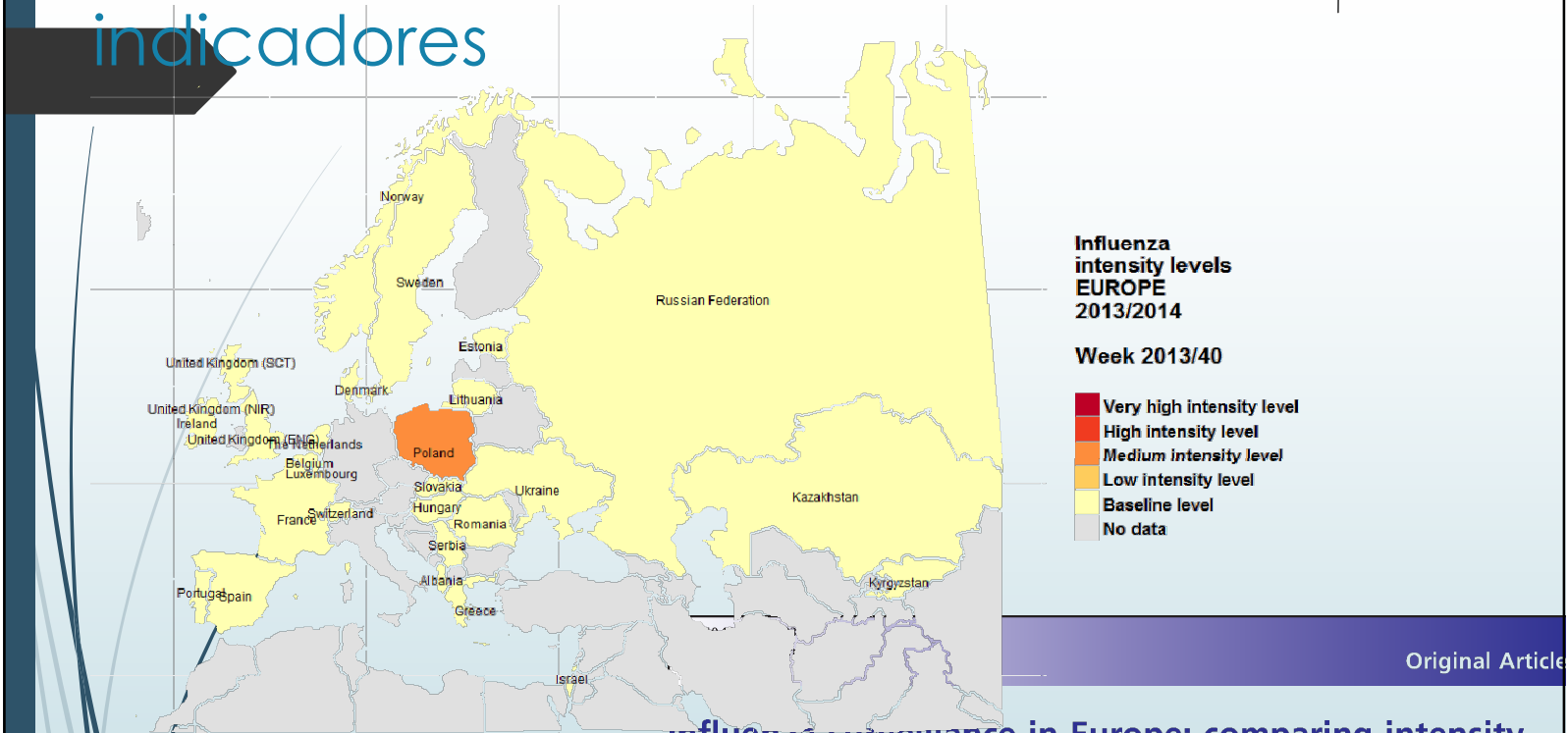
	Values
Weeks	520
Non-missing weeks	351
True positives	1104
False positives	51
True negatives	2631
False negatives	75
Sensitivity	0,94
Specificity	0,98
Positive predictive value	0,96
Negative predictive value	0,97
Positive likelihood ratio	49,24
Negative likelihood ratio	0,06
Percent agreement	0,97
Matthews correlation coefficient	0,92

Optimización

- Sensibilidad.
- Especificidad.
- Porcentaje de acuerdo.
- Coeficiente de correlación de Matthews.
- Valor predictivo positivo.
- Valor predictivo negativo.



Comparabilidad de los indicadores



Original Article

influenza surveillance in Europe: comparing intensity levels calculated using the moving epidemic method

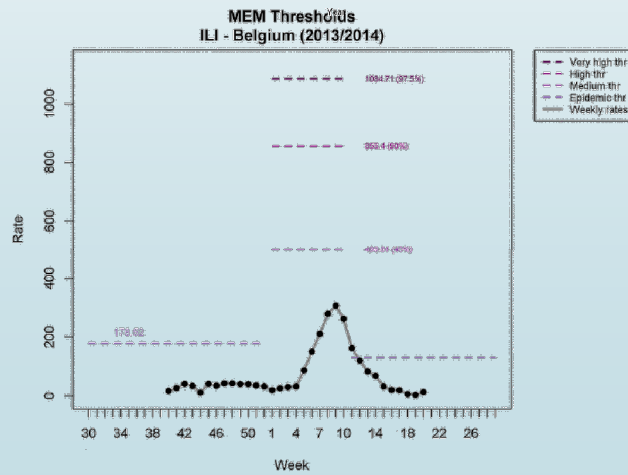
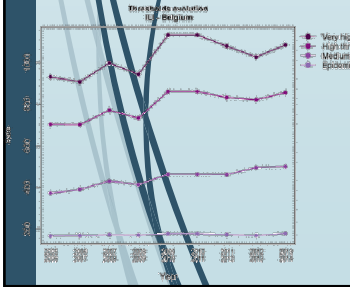
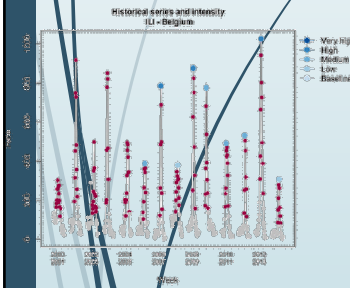
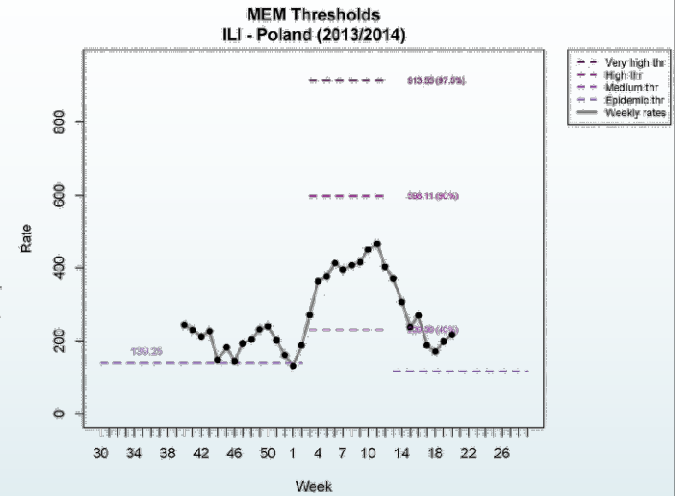
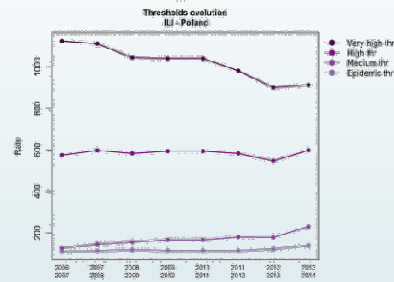
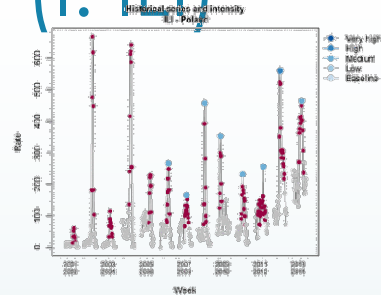
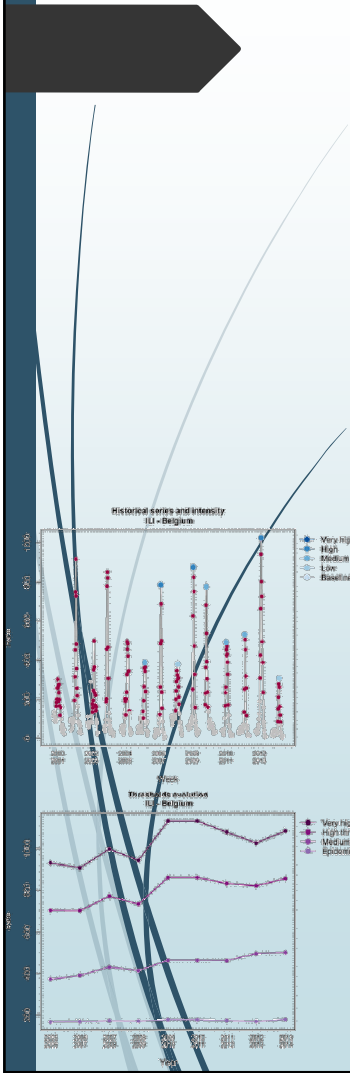
Tomás Vega,^a José E. Lozano,^a Tamara Meerhoff,^b René Snacken,^c Julien Beauté,^c Pernille Jorgensen,^d Raúl Ortiz de Lejarazu,^e Lisa Domegan,^f Joël Mossong,^g Jens Nielsen,^h Rita Born,ⁱ Amparo Larrauri,^j Caroline Brown^d

^aPublic Health Directorate, Castilla y León Regional Health Ministry, Valladolid, Spain. ^bThe Radboud University Nijmegen Medical Centre, Nijmegen, The Netherlands. ^cEuropean Centre for Disease Prevention and Control, Stockholm, Sweden. ^dDivision of Health Security, Infectious Diseases and Environment, WHO Regional Office for Europe, Copenhagen, Denmark. ^eNational Influenza Centre, University of Valladolid, Valladolid, Spain. ^fHealth Protection Surveillance Centre, Dublin, Ireland. ^gLaboratoire National de Santé, Luxembourg, Luxembourg. ^hStatens Serum Institute, Copenhagen, Denmark. ⁱDivision of Communicable Diseases, Federal Office of Public Health, Directorates of Public Health, Bern, Switzerland. ^jCIPI Epidemiología y Salud Pública (CIBERESP), Institute of Health Carlos III, Madrid, Spain.

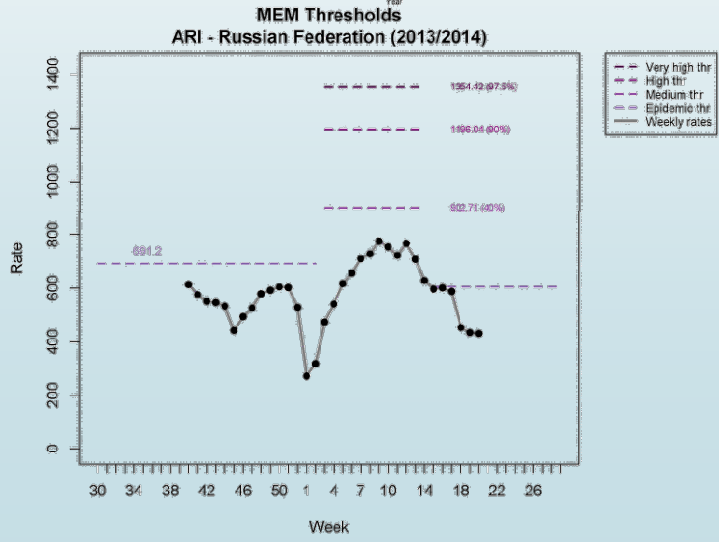
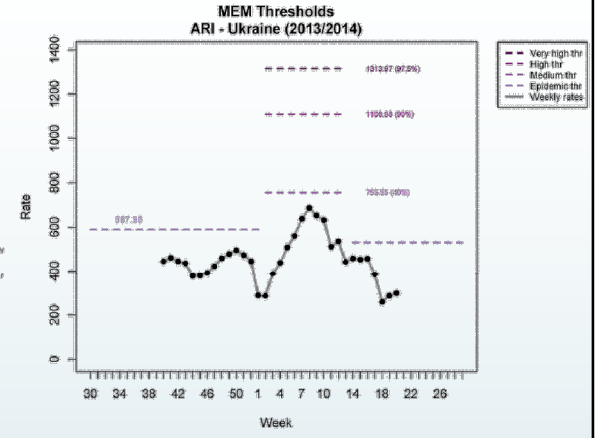
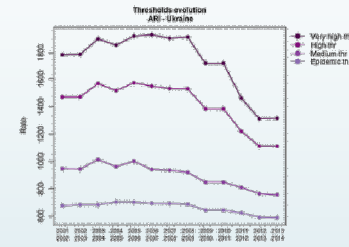
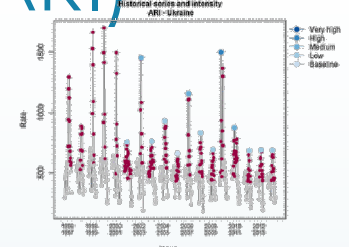
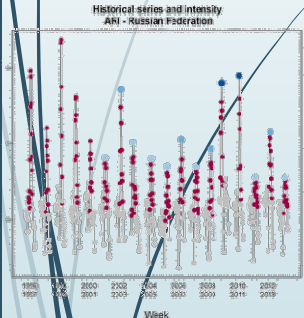
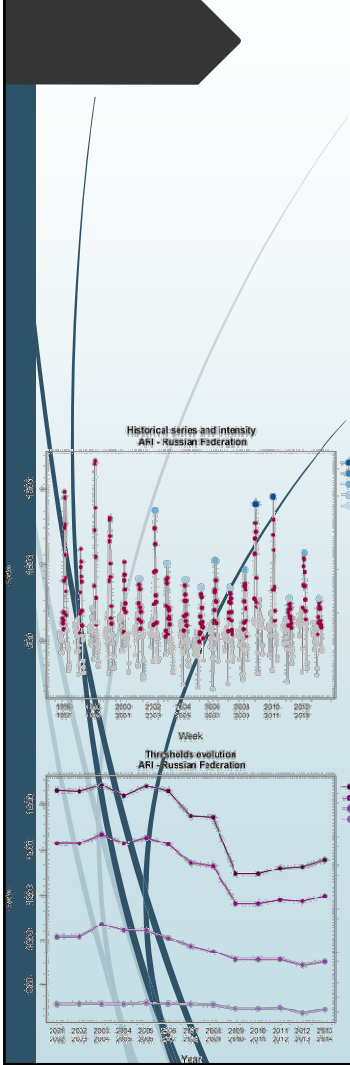
Correspondence: Tomás Vega, Public Health Directorate, Castilla y León Regional Health Ministry, Paseo de Zorrilla, 1, 47071 Valladolid, Spain. E-mail: vegaloto@jcy.es

Accepted 21 May 2015

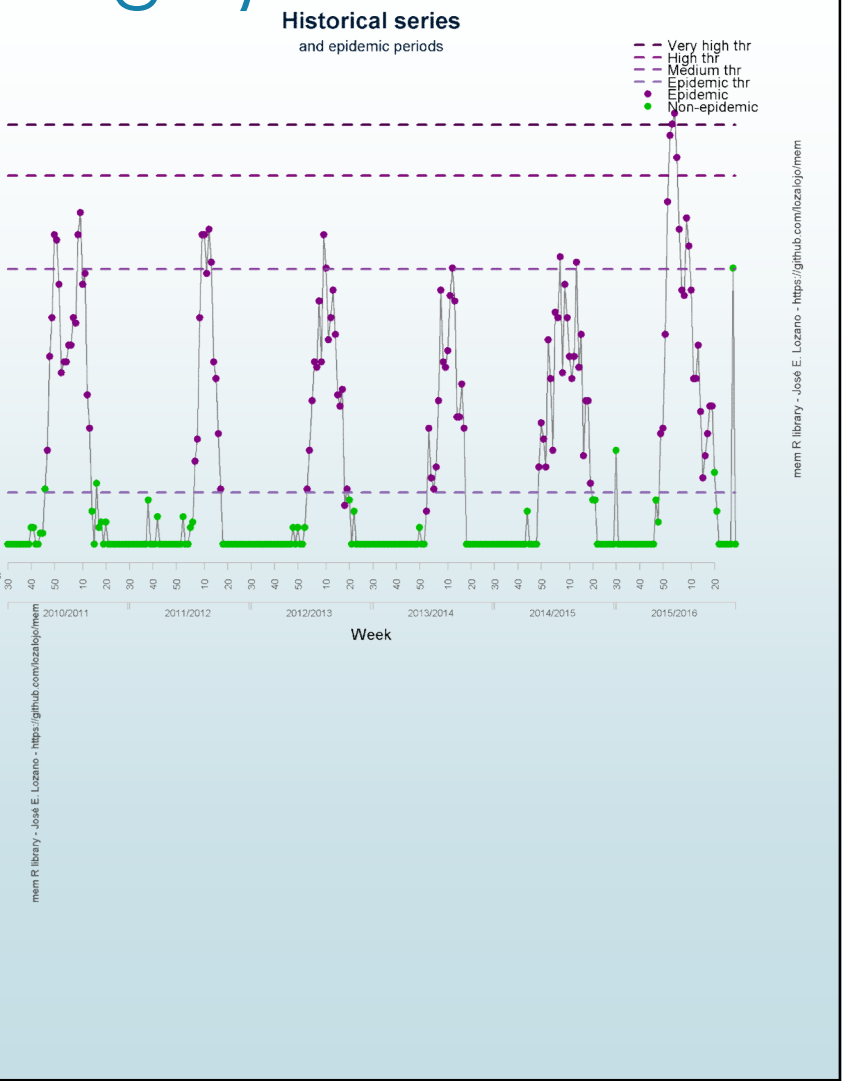
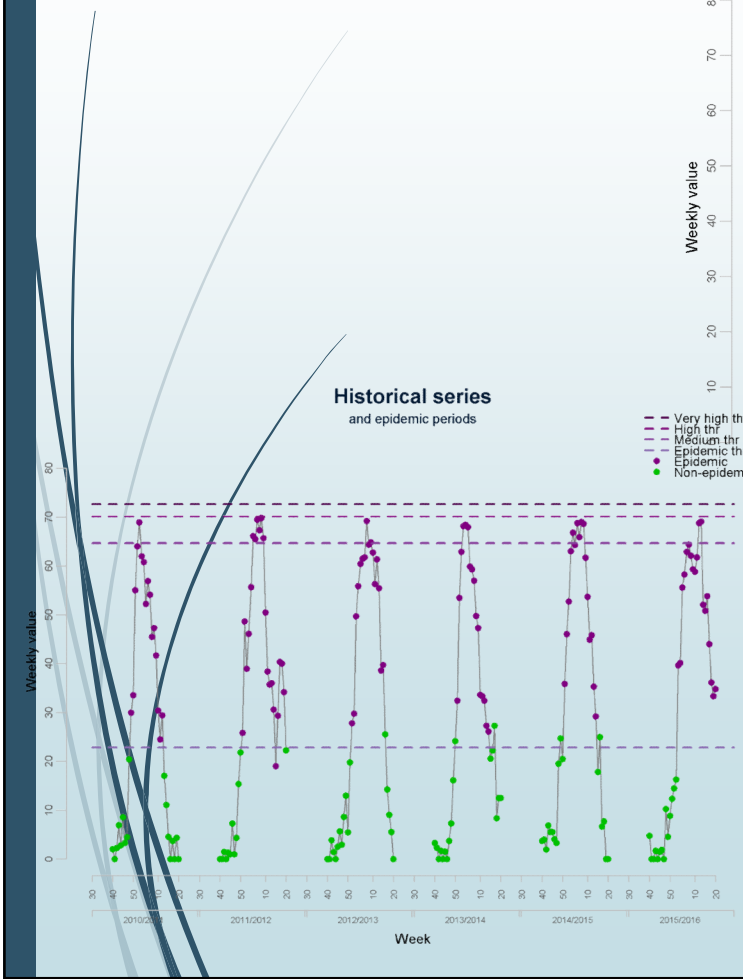
Extensiones (I: III)



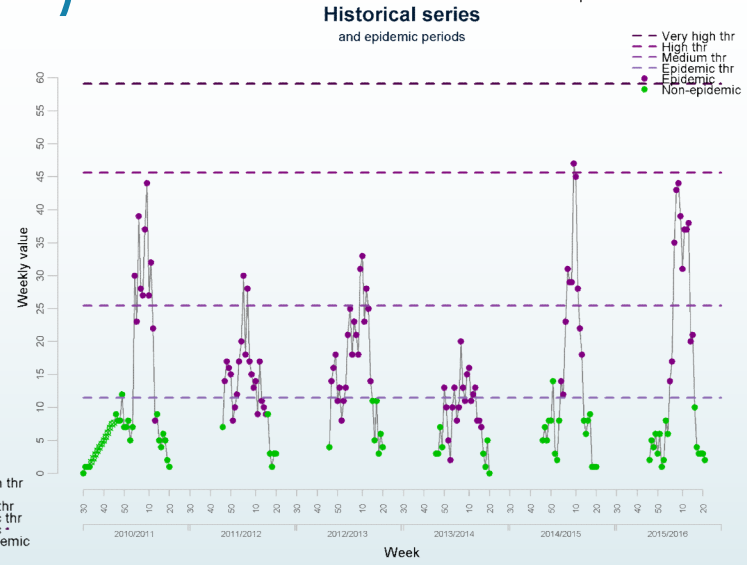
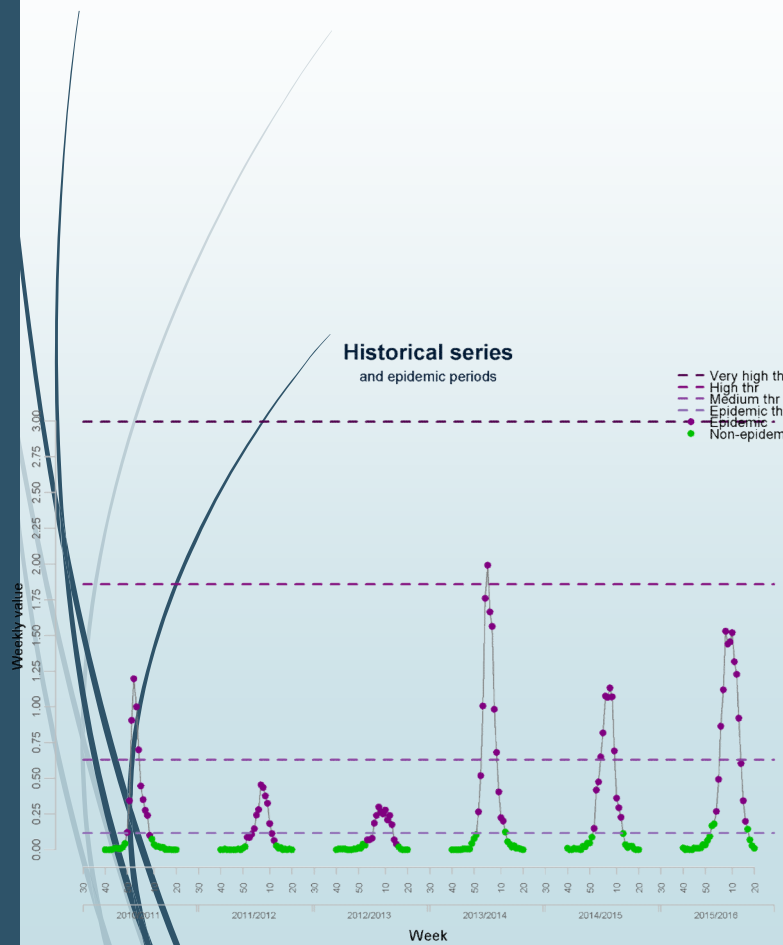
Extensiones (II: ARI)



Extensiones (Iii: virología)



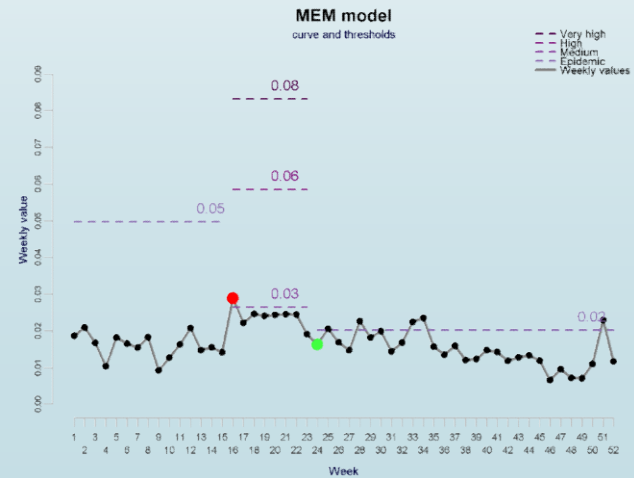
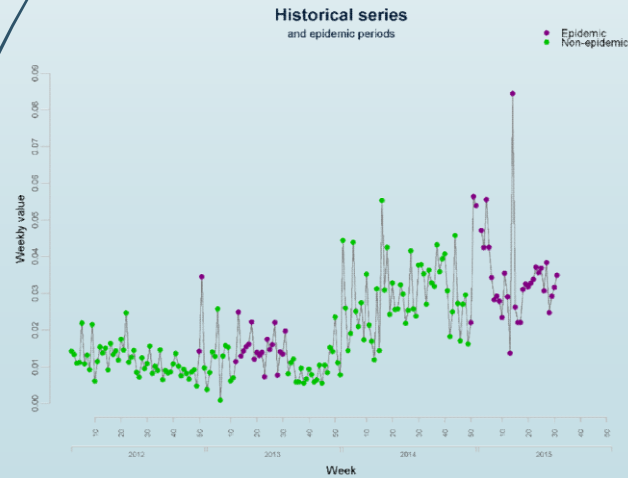
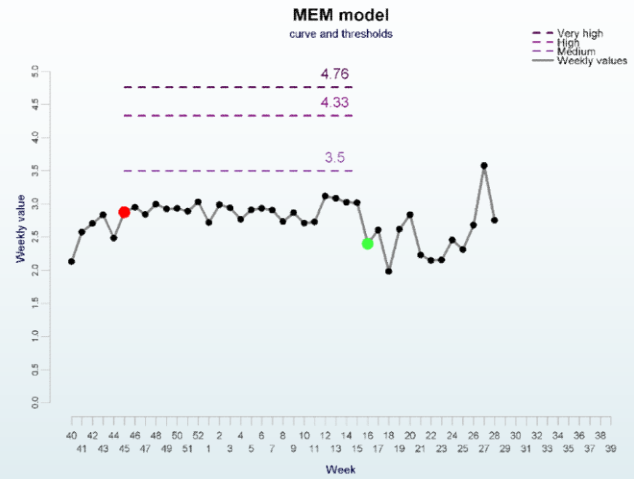
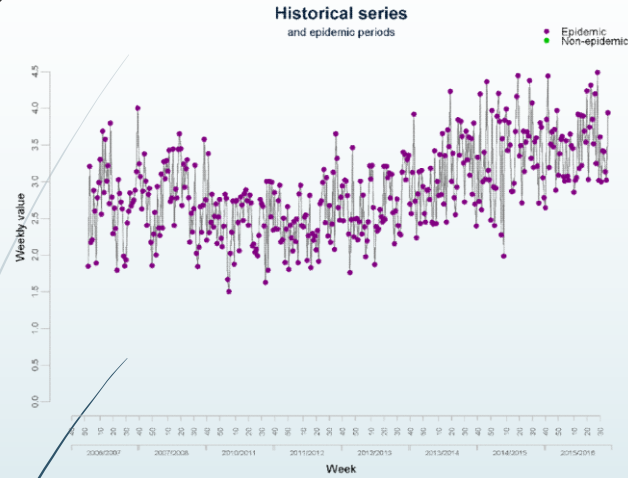
Extensiones (Iv: SARI)



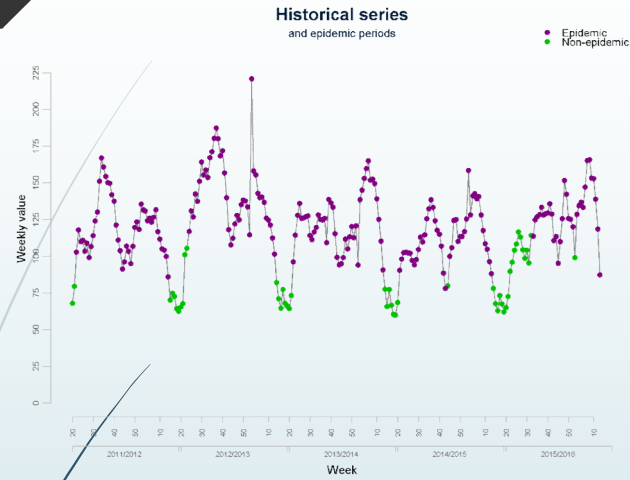
mem R library - José E. Lozano - <https://github.com/lozajo/mem>

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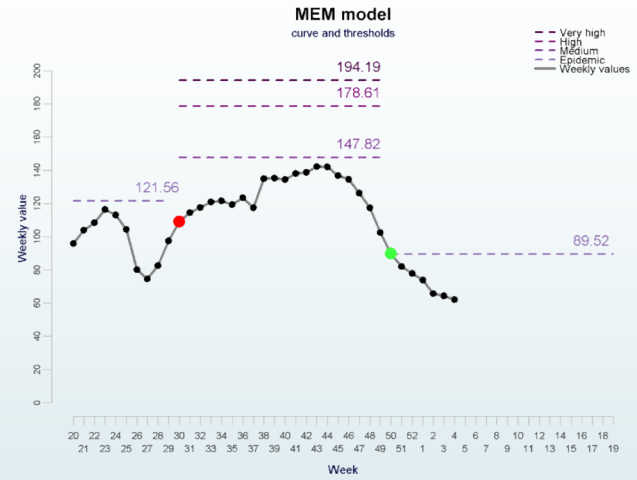
Extensiones (V: otros indicadores)



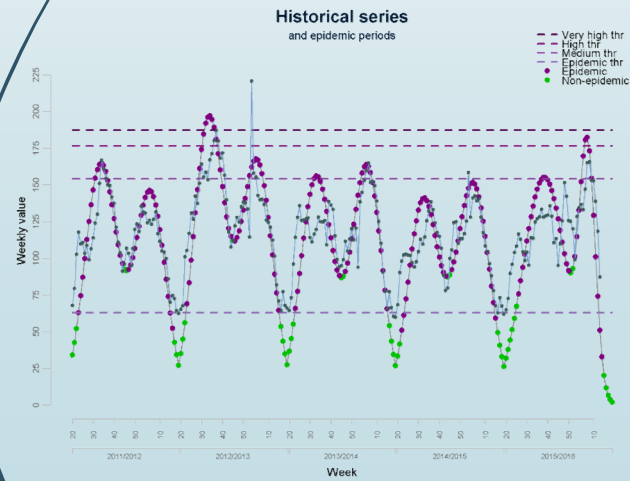
Extensiones (Vi: dos ondas)



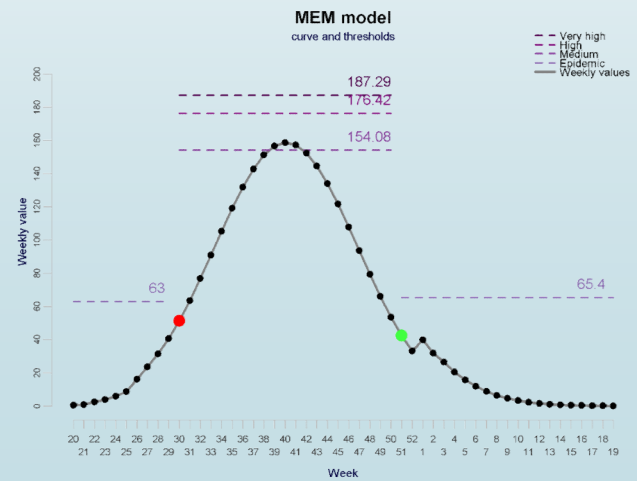
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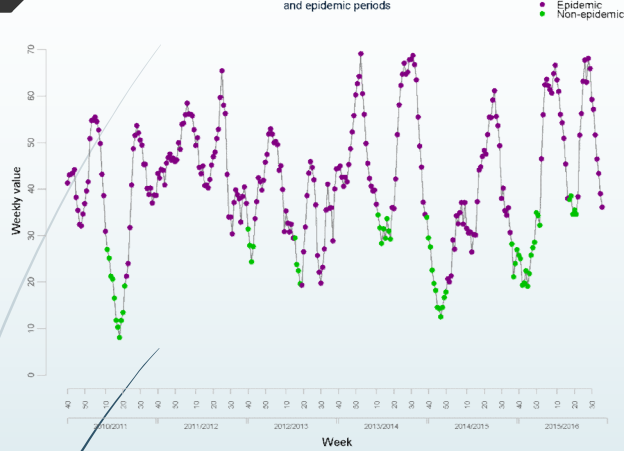
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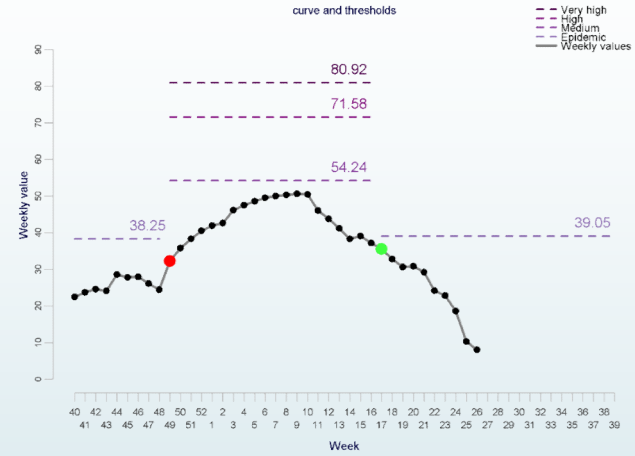
Extensiones (VII: dos ondas)

Historical series and epidemic periods



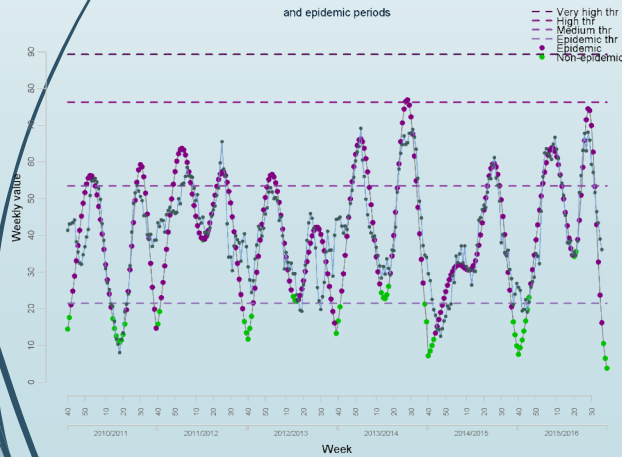
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MEM model curve and thresholds



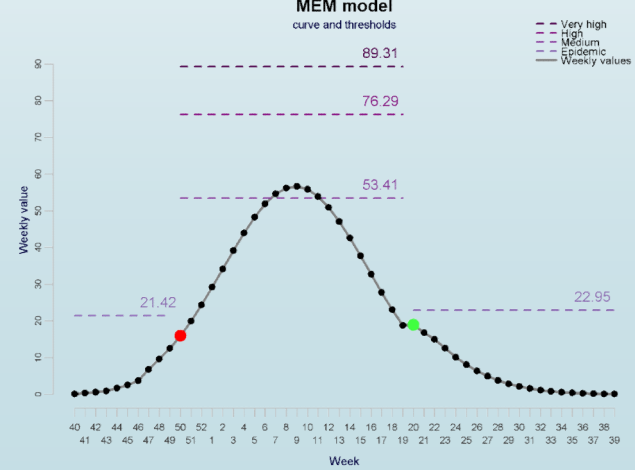
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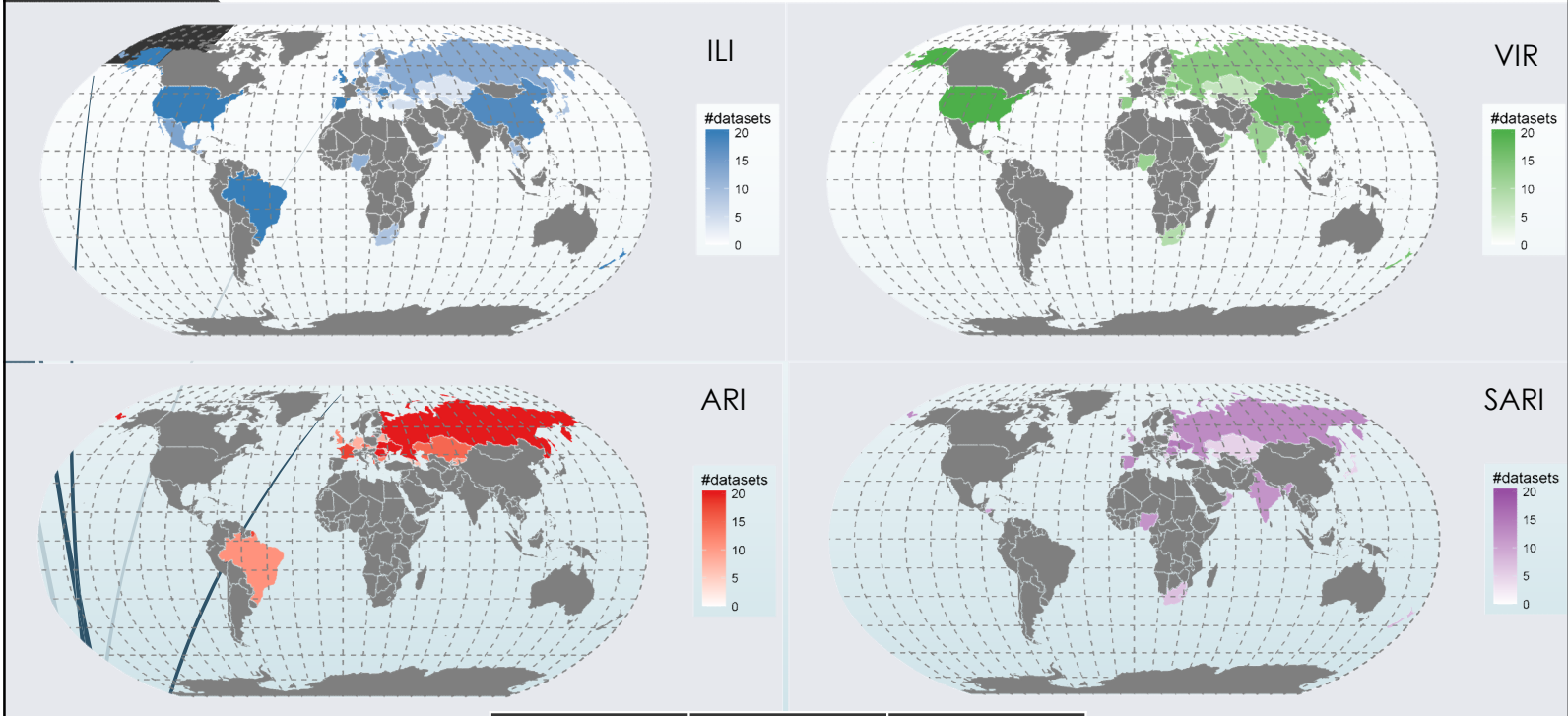
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MEM model curve and thresholds



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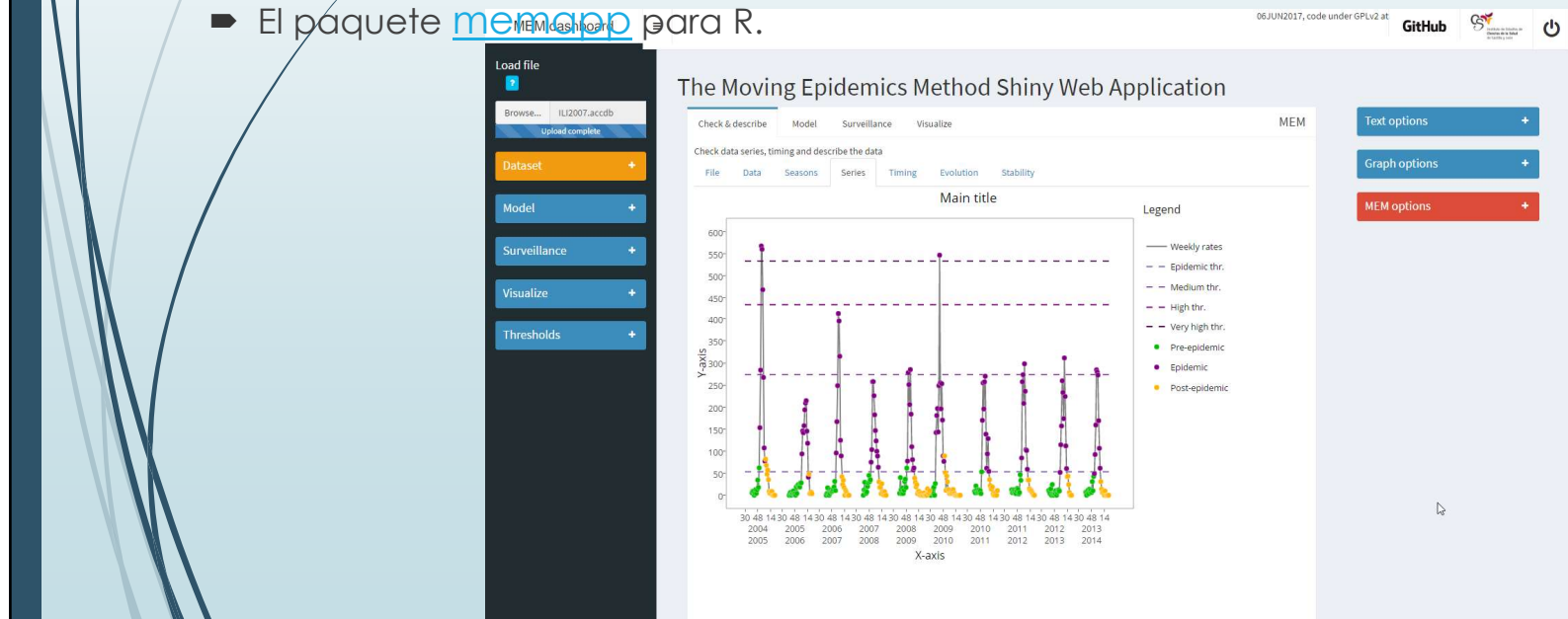
Expansión del MEM



type	countries	datasets
ari	21	262
ili	51	624
pne	3	28
sari	23	194
vir	26	285
total	56	1393

Implementación en R

- Entorno de programación libre para la computación estadística y la creación de gráficos.
- Aportaciones de la comunidad: las librerías para R.
- El paquete [mem](#) para R.
- 2017: Desarrollo de la versión con interfaz web.
 - El paquete [memapp](#) para R.





Gracias por su atención

Agradecimientos: Red Centinela Sanitaria de Castilla y León, Centro Nacional de Gripe de Valladolid y a todos los países que han cedido sus datos para el desarrollo de esta metodología