

# Cálculo de umbrales y niveles de intensidad

El Método de las Epidemias Móviles

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Fundación Instituto de Estudios de Ciencias de la Salud de Castilla y León



*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 Tessa: Nov. 2010.
  - Piloto EuroFlu: 2012.

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International Congress Series xx (2004) xxx – xxx



www.ics-elsevier.com

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

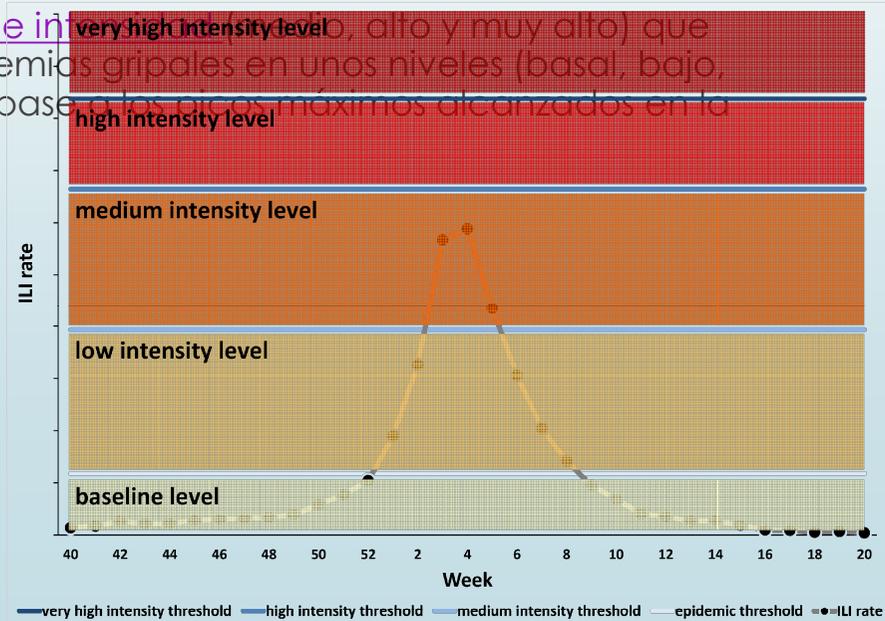
Tomás Vega Alonso<sup>a,\*</sup>, José E. Lozano Alonso<sup>a</sup>,  
Raúl Ortiz de Lejarazu<sup>b</sup>, Marisol Gutiérrez Pérez<sup>c</sup>

<sup>a</sup> 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

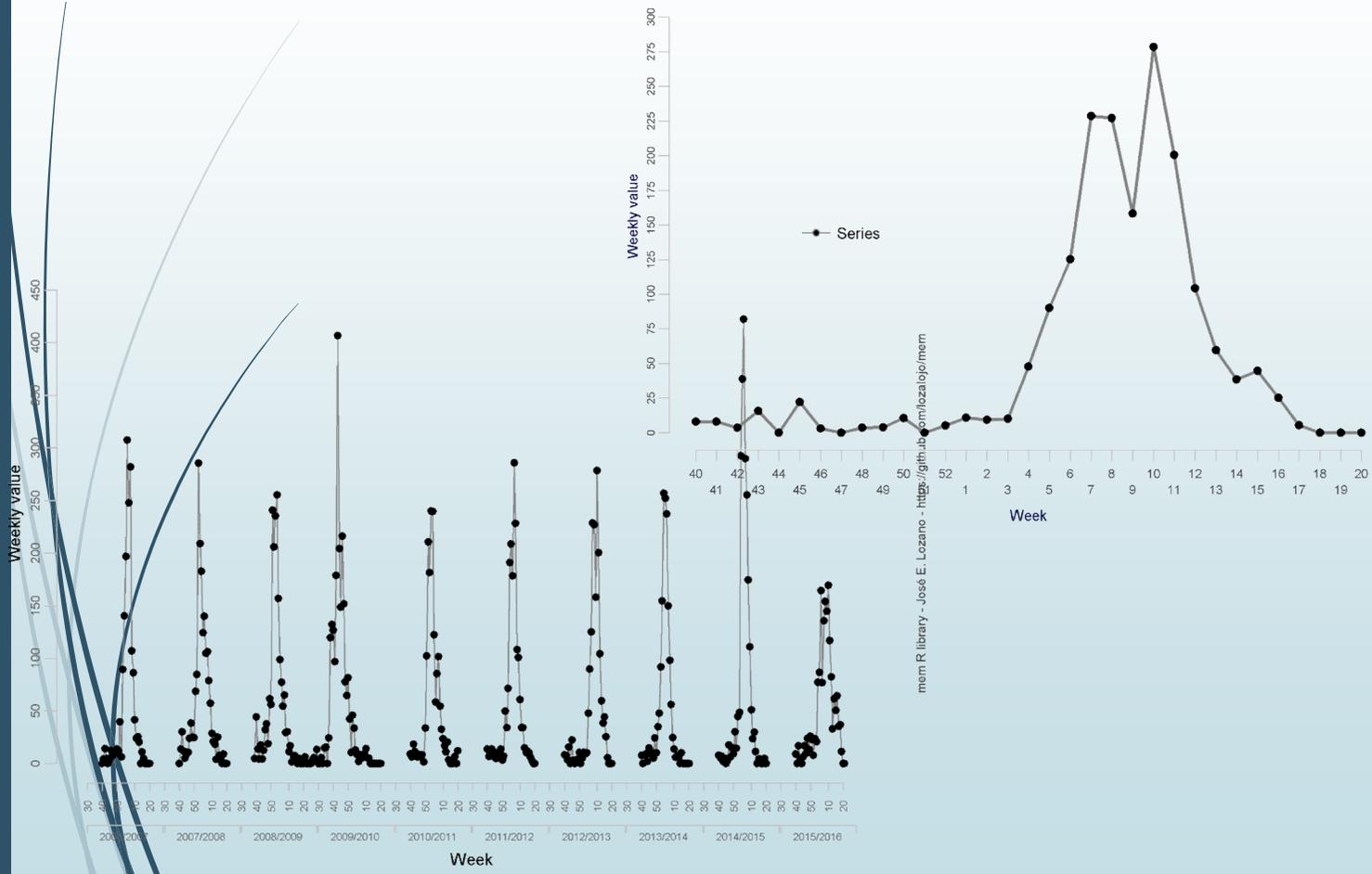
1  
2  
3  
4  
5  
6

# 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.



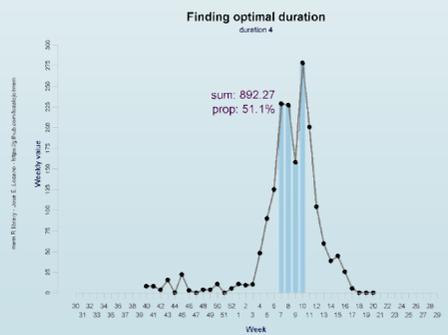
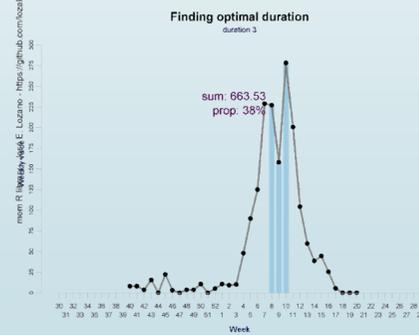
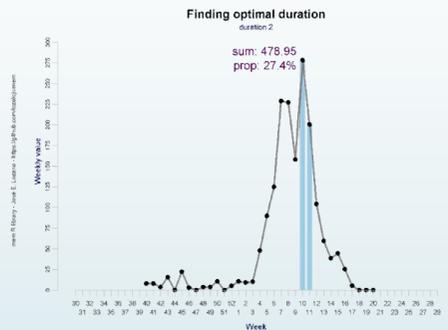
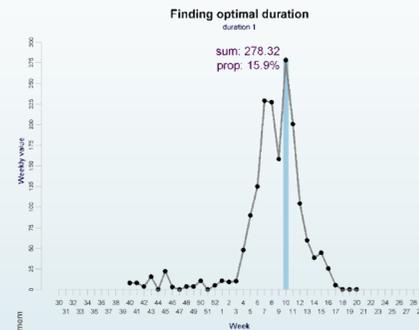
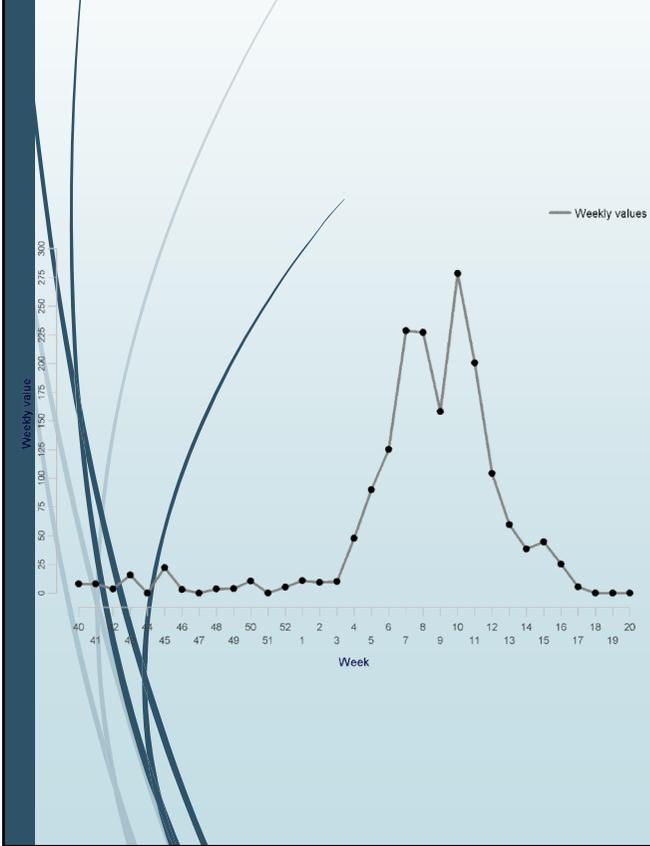
# Aproximación al problema



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%



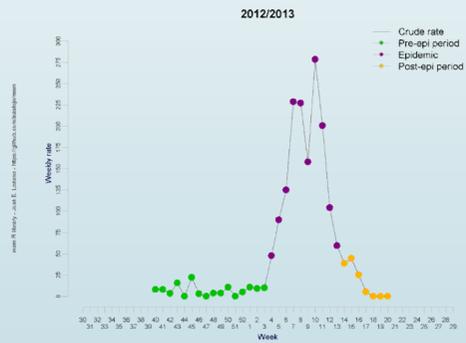
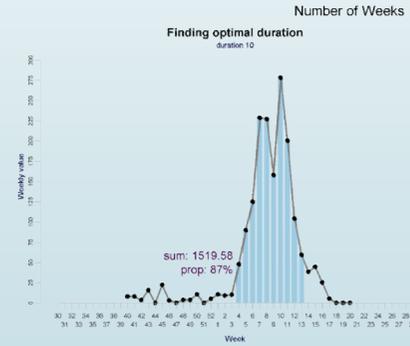
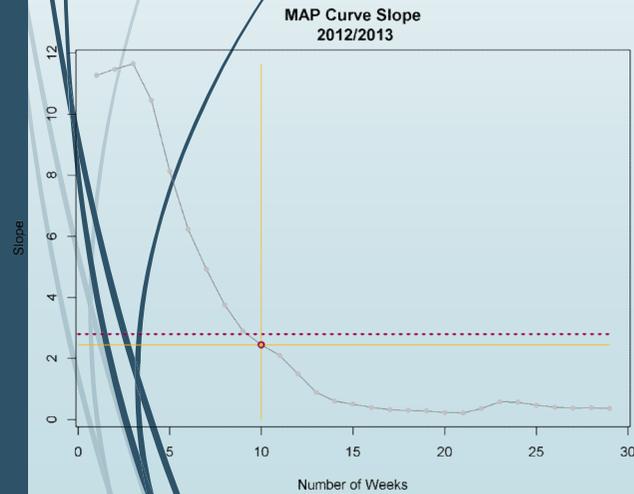
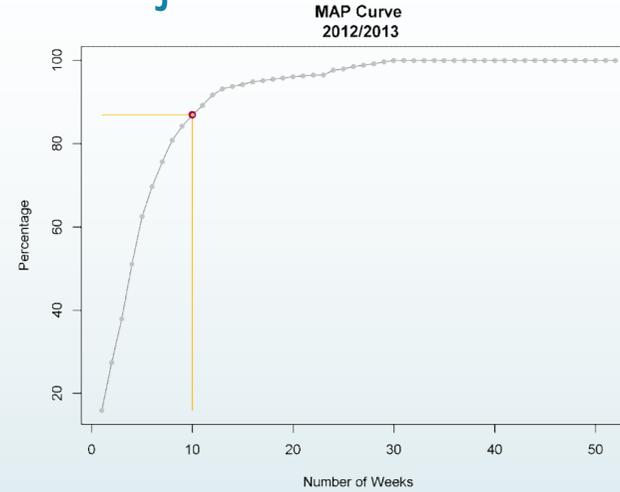
mem R library - José E. Lezama - <https://github.com/lezaej/mem>

# La curva de porcentajes máximos acumulados

Métodos:

➤ Criterio fijo.

➤ Parámetro de ventana.



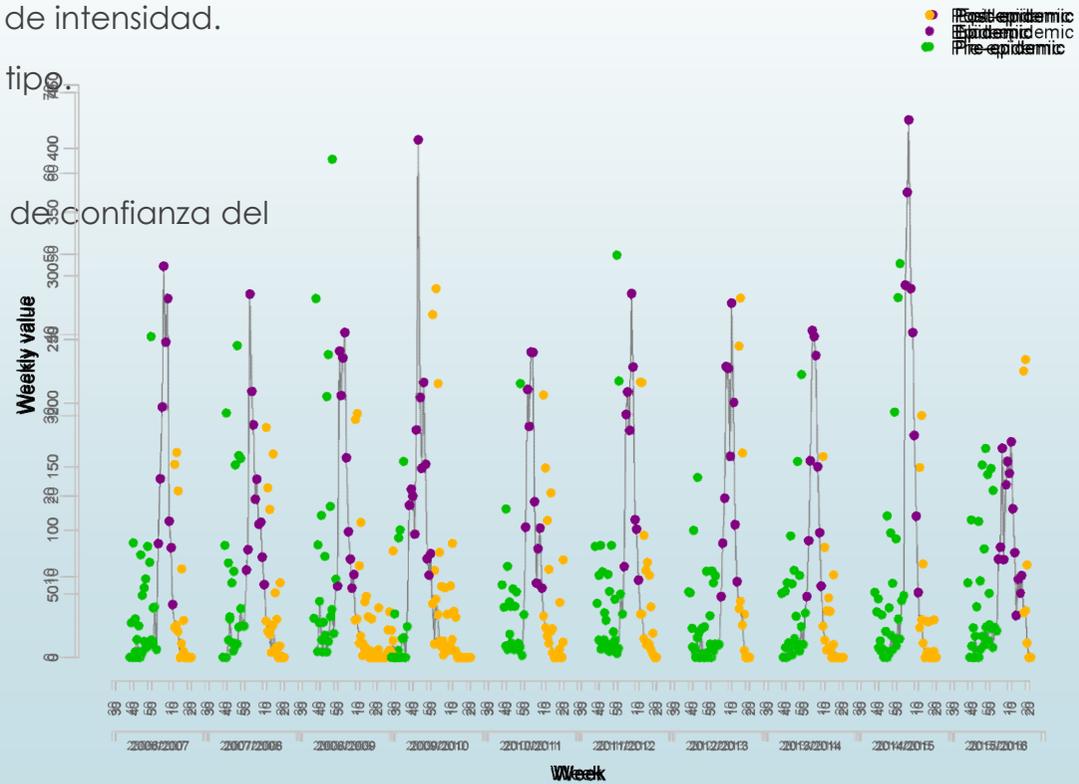
# Umbrales

## Valores:

- Pre-epidémicos: umbral epidémico.
- Epidémicos: niveles de intensidad.
- Toda la serie: curva tipo.

## Métodos:

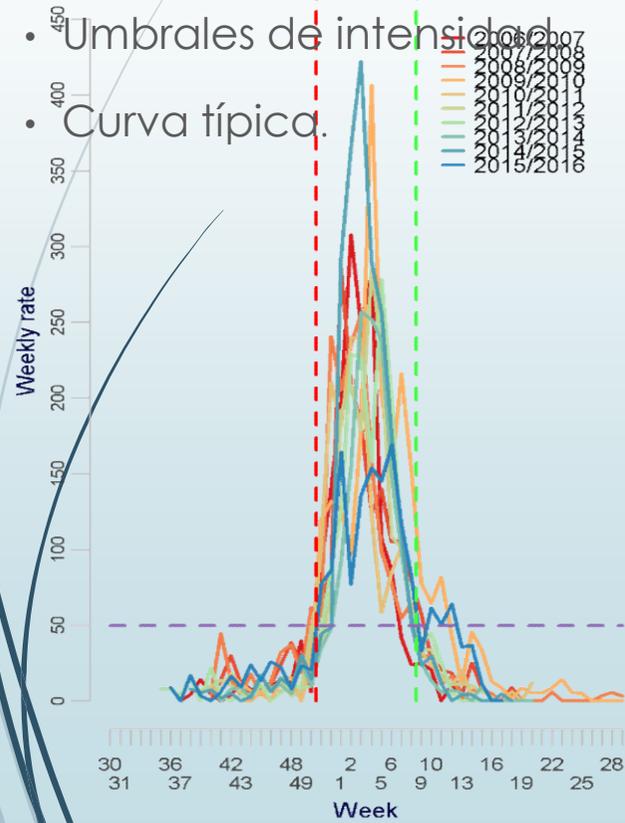
- Media y el intervalo de confianza del punto de una cola.



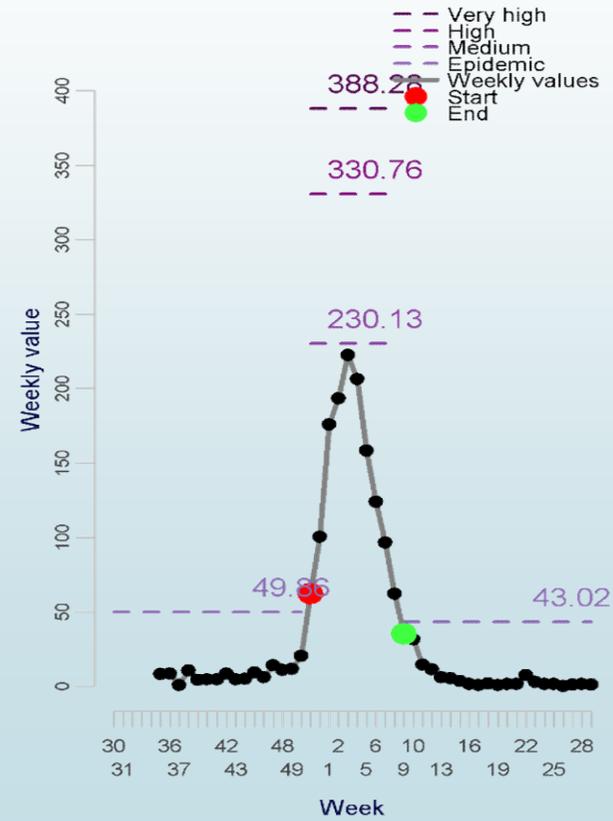
mem R library - José E. Lezcano - <https://github.com/lezalejo/mem>

# El modelo MEM

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



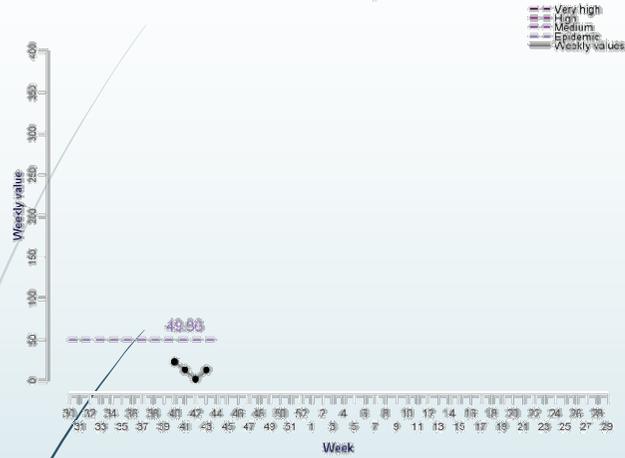
mem R library - José E. Lozano - <https://github.com/lozalojo/mem>



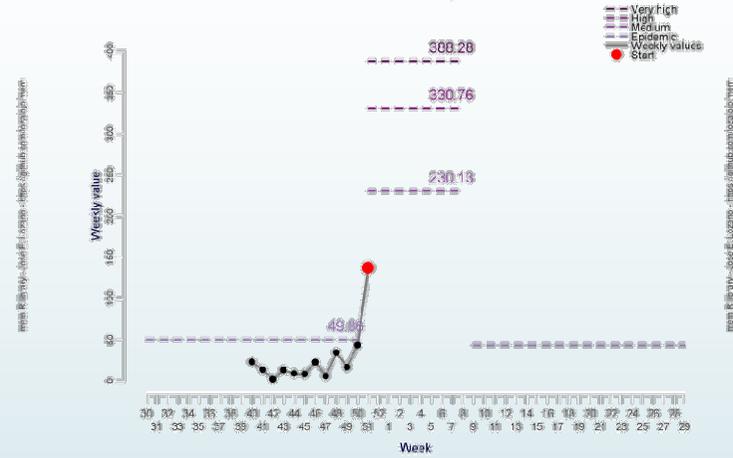
mem R library - José E. Lozano - <https://github.com/lozalojo/mem>

# La vigilancia con el MEM (I)

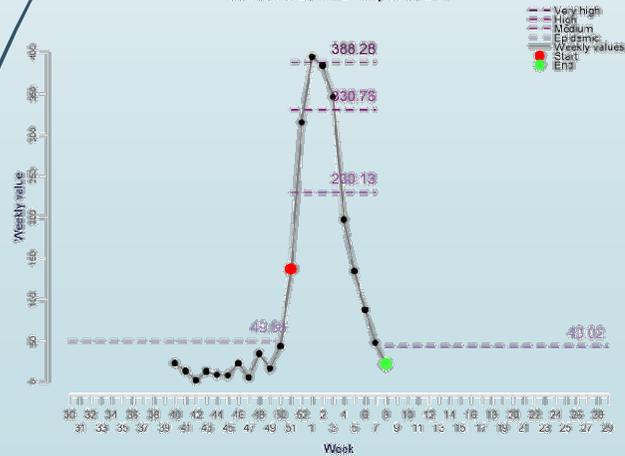
Season: 2016/2017, Week: 43



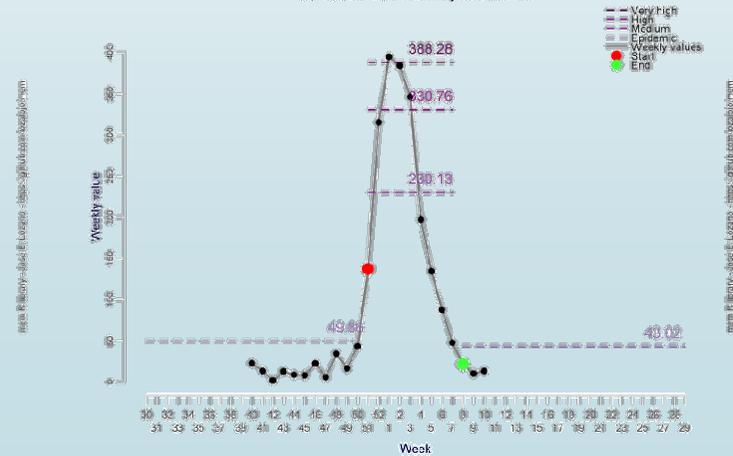
Season: 2016/2017, Week: 51



Season: 2016/2017, Week: 8



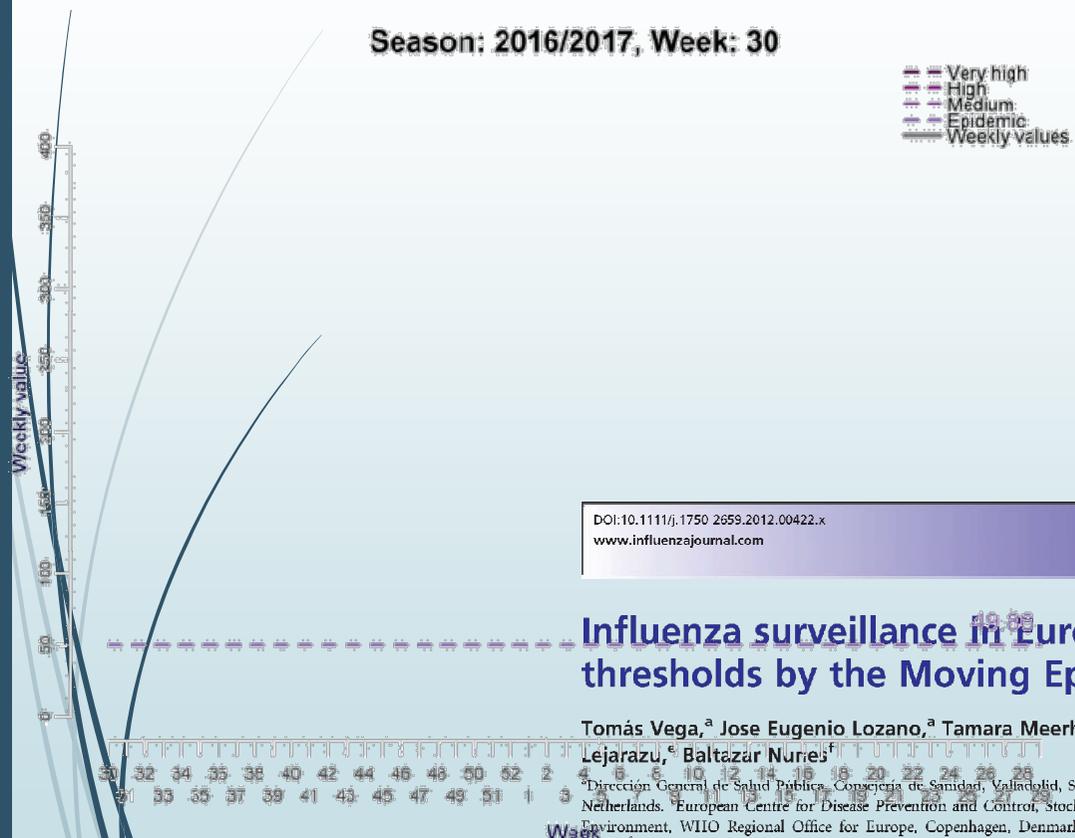
Season: 2016/2017, Week: 17



# La vigilancia con el MEM (II)



Season: 2016/2017, Week: 30



DOI:10.1111/ijl.1750.2659.2012.00422.x  
www.influenzajournal.com

Original Article

## Influenza surveillance in Europe: establishing epidemic thresholds by the Moving Epidemic Method

Tomás Vega,<sup>a</sup> Jose Eugenio Lozano,<sup>a</sup> Tamara Meerhoff,<sup>b</sup> René Snacken,<sup>c</sup> Joshua Mott,<sup>d</sup> Raul Ortiz de Lejarazu,<sup>e</sup> Baltazar Nunes<sup>f</sup>

<sup>a</sup>Dirección General de Salud Pública, Consejería de Sanidad, Valladolid, Spain. <sup>b</sup>The Radboud University Nijmegen Medical Centre, Nijmegen, The Netherlands. <sup>c</sup>European Centre for Disease Prevention and Control, Stockholm, Sweden. <sup>d</sup>Division of Health Security, Infectious Diseases and the Environment, WIIO Regional Office for Europe, Copenhagen, Denmark. <sup>e</sup>Centro Nacional de Gripe de Valladolid, Universidad de Valladolid, Spain. <sup>f</sup>Instituto Nacional de Saude Doctor Ricardo Jorge, Lisboa, Portugal.  
Correspondence: Tomás Vega, Dirección General de Salud Pública, Consejería de Sanidad, Paseo de Zorrilla, 1. 47071 Valladolid, Spain. E-mail: vegaloto@jcy.es

Accepted 27 June 2012. Published Online 16 August 2012.

# Bondad de ajuste

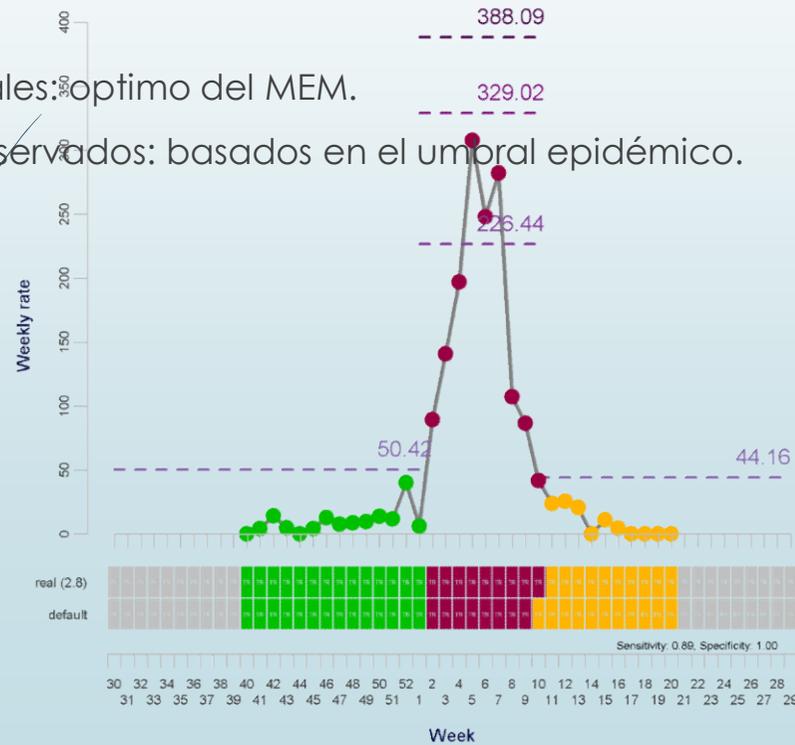


► Método:

- Validación cruzada.
- Validación secuencial.

► Cálculo:

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

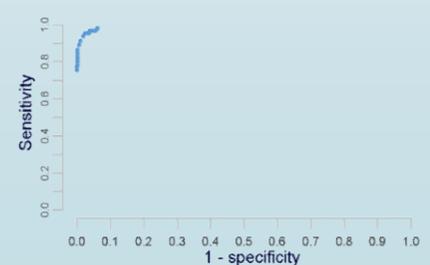
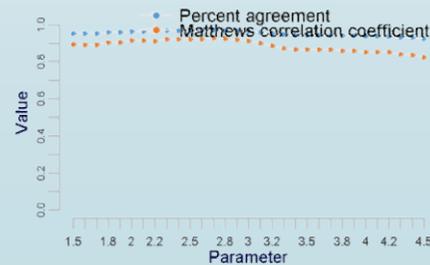
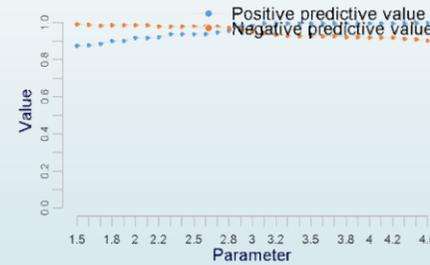
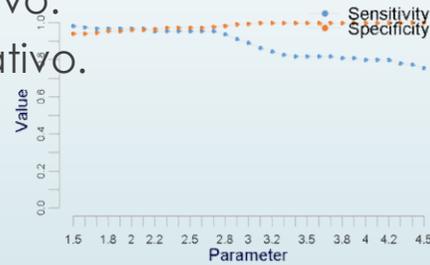


- - - Very high thr
- - - High thr
- - - Medium thr
- - - Epidemic thr
- Weekly rates
- Post
- Epidemic
- Pre

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

# Optimización

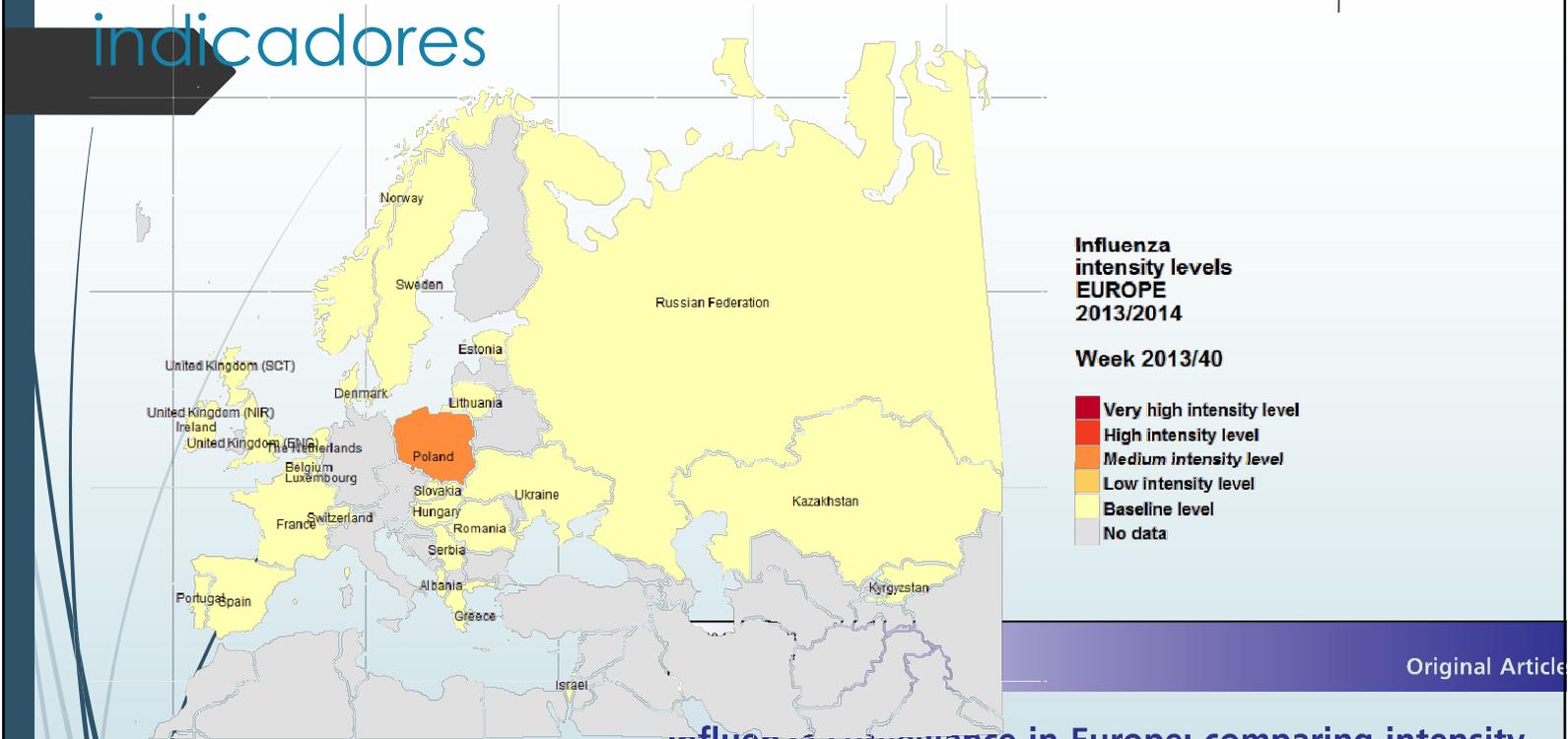
- Sensibilidad.
- Especificidad.
- Porcentaje de acuerdo.
- Coeficiente de correlación de Matthews.
- Valor predictivo positivo.
- Valor predictivo negativo.



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

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# Comparabilidad de los indicadores



Original Article

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

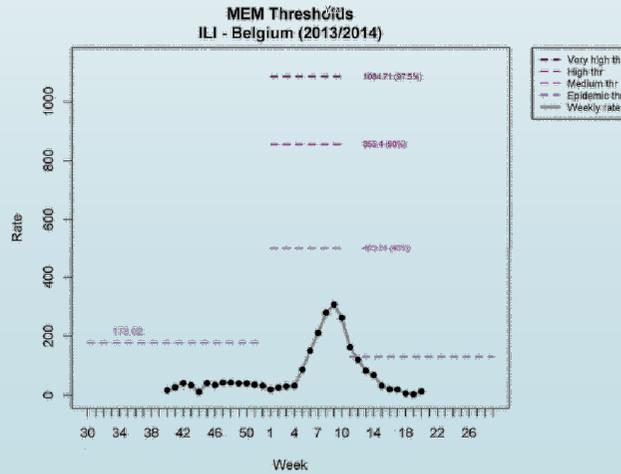
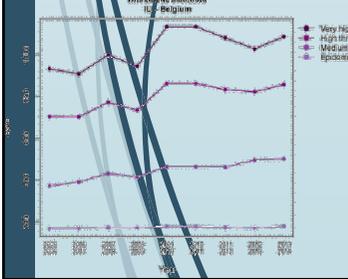
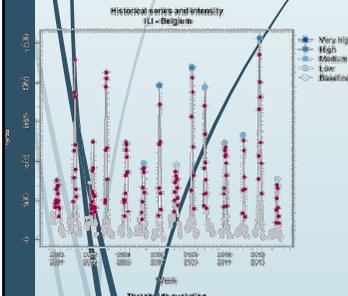
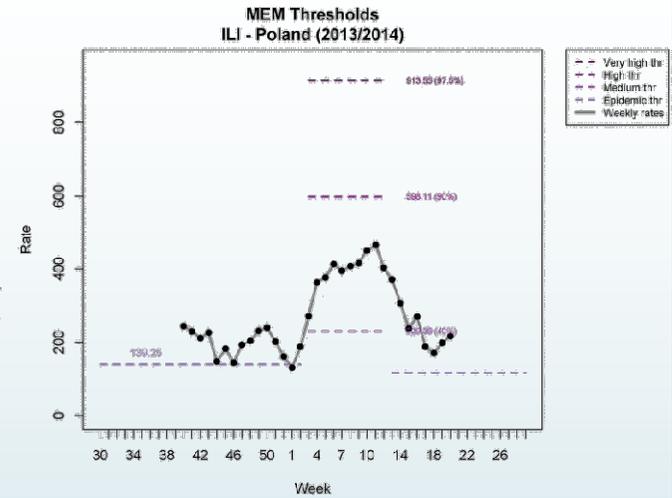
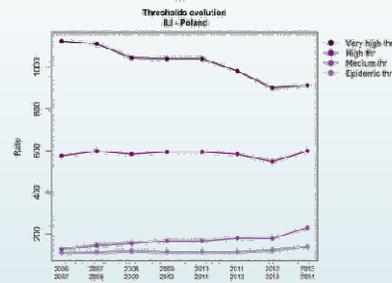
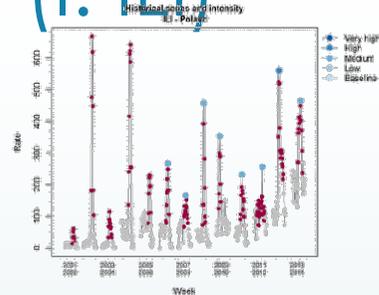
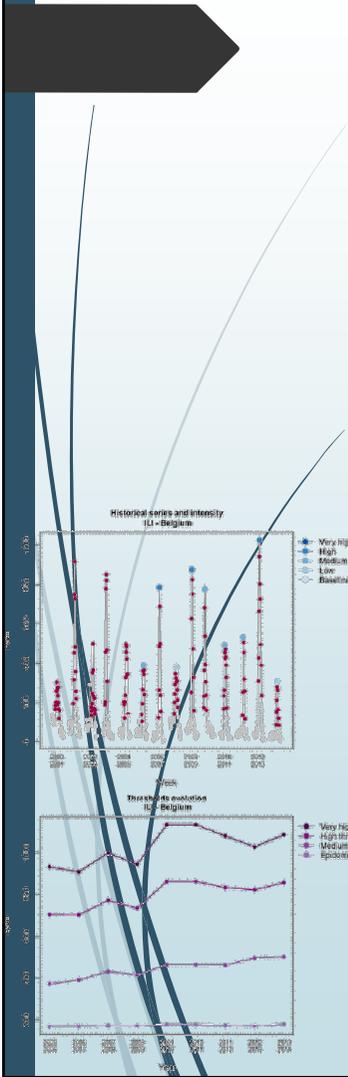
Tomás Vega,<sup>a</sup> José E. Lozano,<sup>a</sup> Tamara Meerhoff,<sup>b</sup> René Snacken,<sup>c</sup> Julien Beauté,<sup>c</sup> Pernille Jorgensen,<sup>d</sup> Raúl Ortiz de Lejarazu,<sup>e</sup> Lisa Domegan,<sup>f</sup> Joël Mossong,<sup>g</sup> Jens Nielsen,<sup>h</sup> Rita Born,<sup>i</sup>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

<sup>a</sup>Public Health Directorate, Castilla y León Regional Health Ministry, Valladolid, Spain. <sup>b</sup>The Radboud University Nijmegen Medical Centre, Nijmegen, The Netherlands. <sup>c</sup>European Centre for Disease Prevention and Control, Stockholm, Sweden. <sup>d</sup>Division of Health Security, Infectious Diseases and Environment, WHO Regional Office for Europe, Copenhagen, Denmark. <sup>e</sup>National Influenza Centre, University of Valladolid, Valladolid, Spain. <sup>f</sup>Health Protection Surveillance Centre, Dublin, Ireland. <sup>g</sup>Laboratoire National de Santé, Luxembourg, Luxembourg. <sup>h</sup>Statens Serum Institut, Copenhagen, Denmark. <sup>i</sup>Division of Communicable Diseases, Federal Office of Public Health, Directorates of Public Health, Bern, Switzerland. <sup>j</sup>CIIB Epidemiología y Salud Pública (CIBERESP), Institute of Health Carlos III, Madrid, Spain.

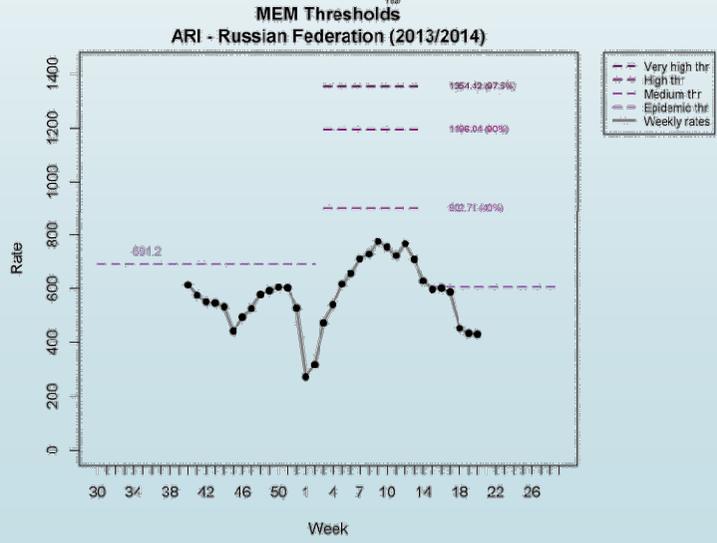
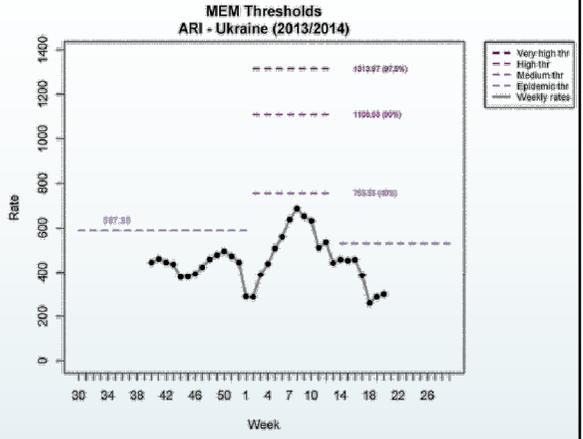
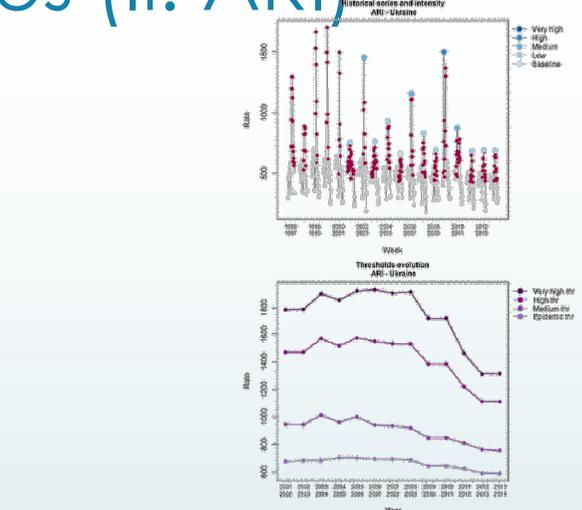
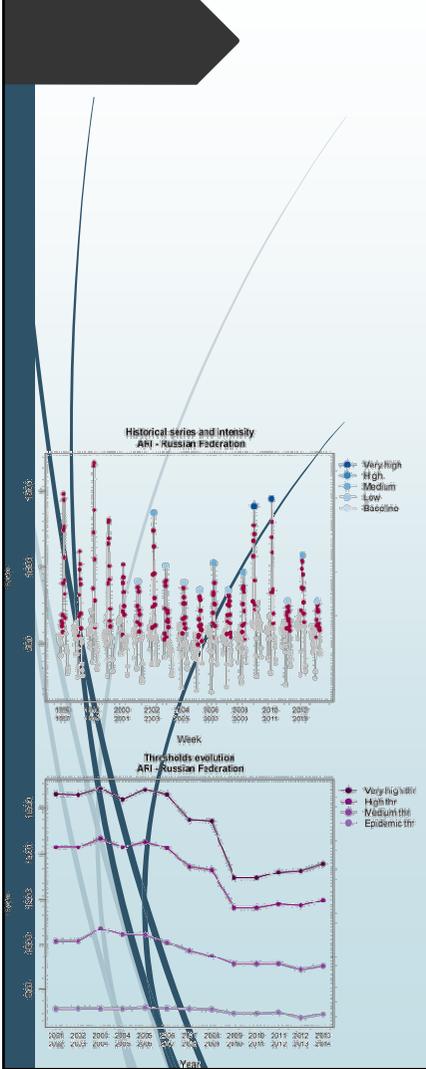
Correspondence: Tomás Vega, Public Health Directorate, Castilla y León Regional Health Ministry, Paseo de Zorrilla, 1, 47071 Valladolid, Spain. E-mail: vegaloto@jcy.es

Accepted 21 May 2015

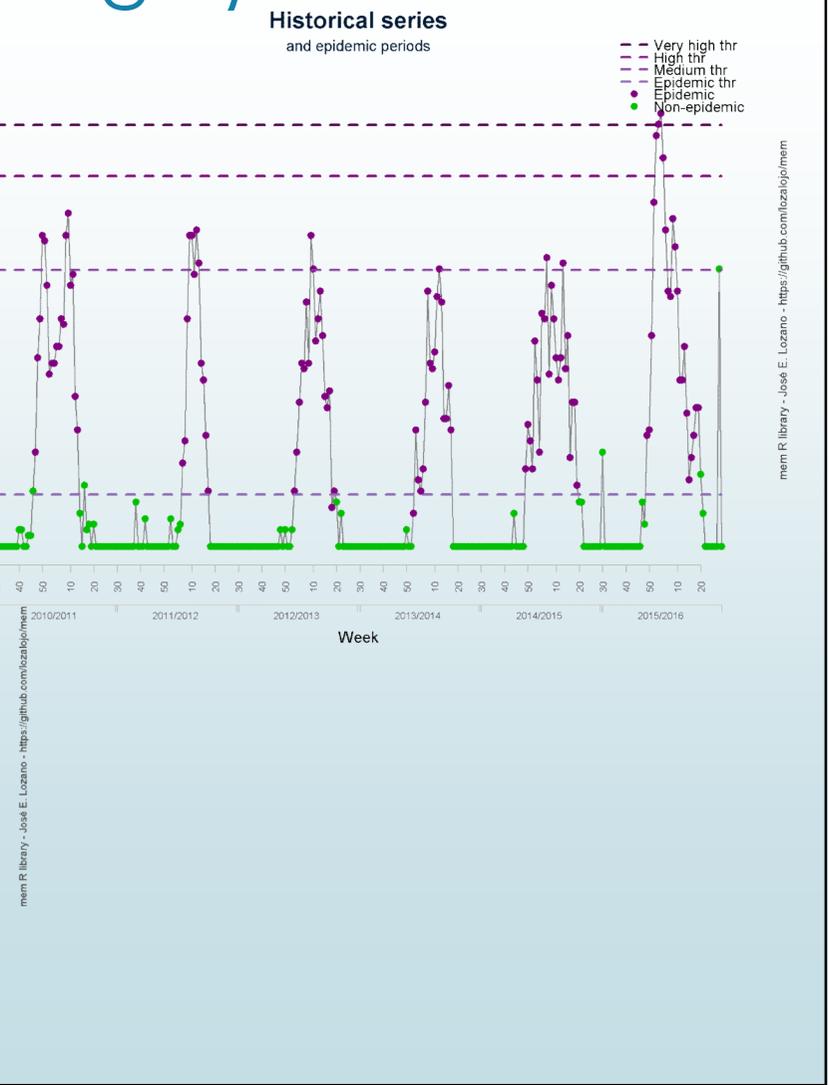
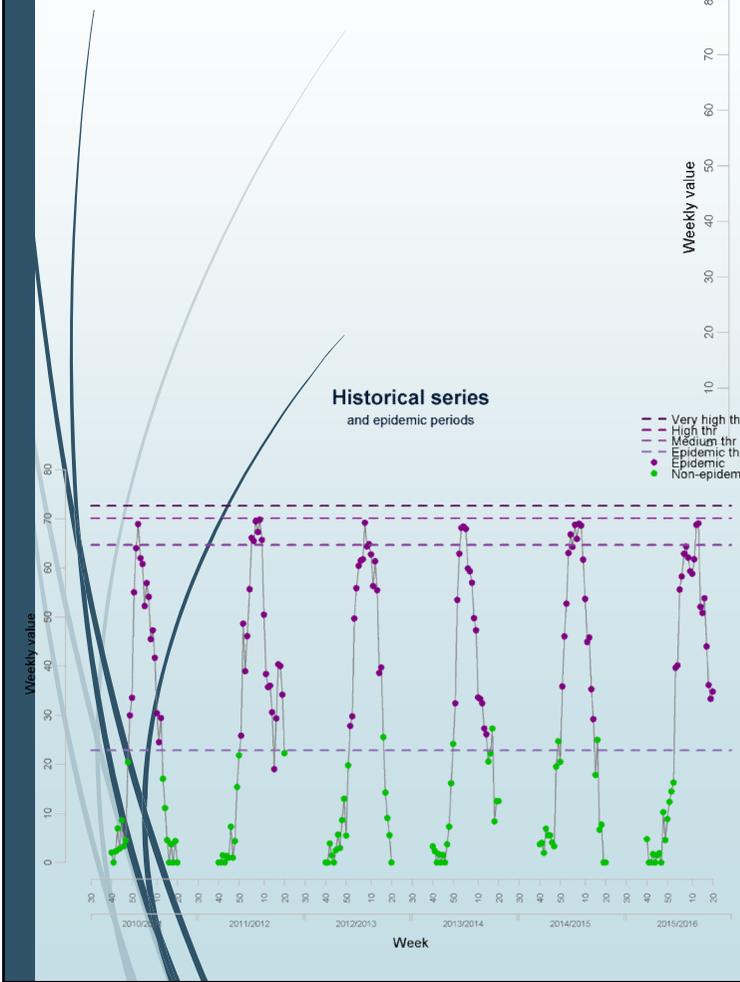
# Extensiones (I: III)



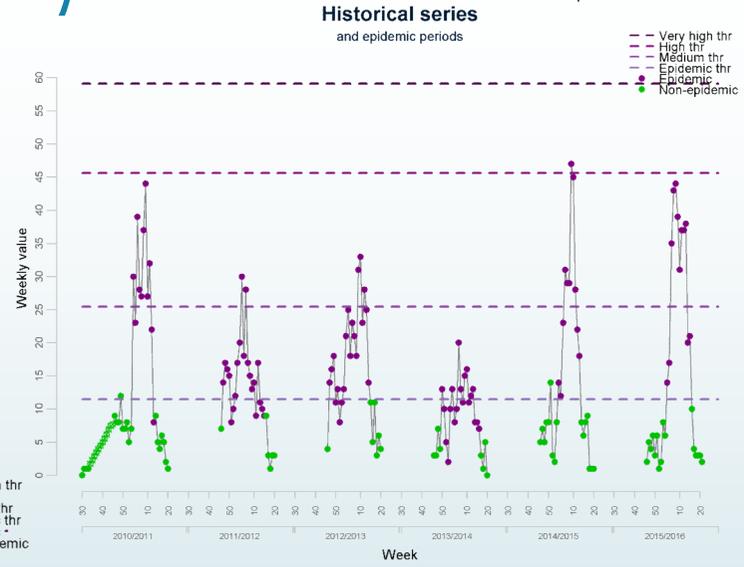
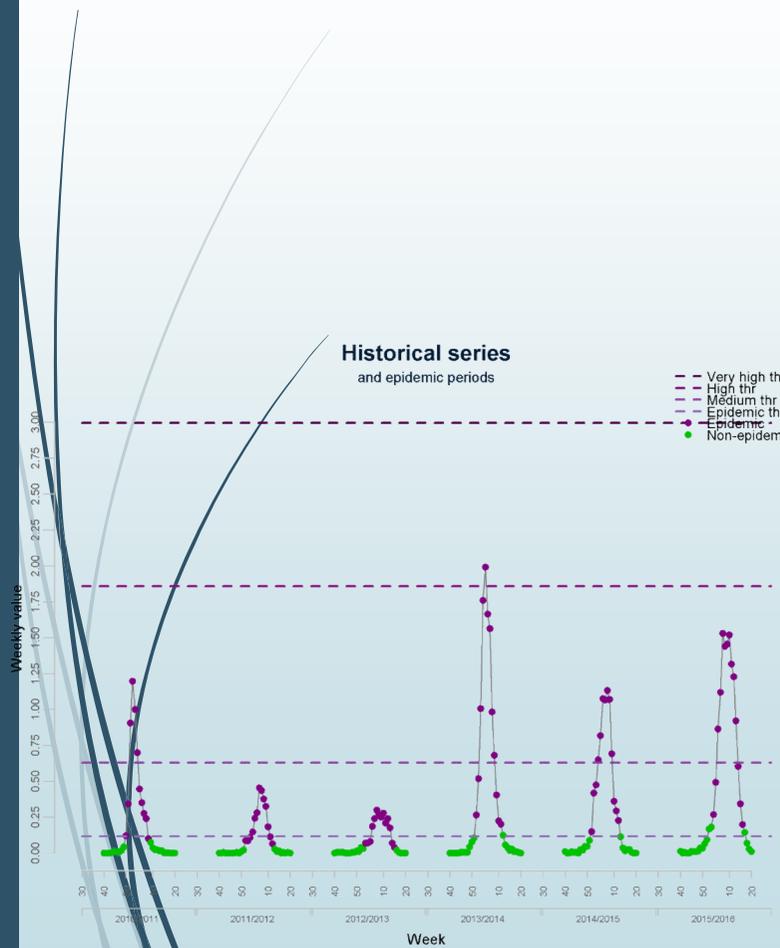
# Extensiones (II: ARI)



# Extensiones (Iii: virología)



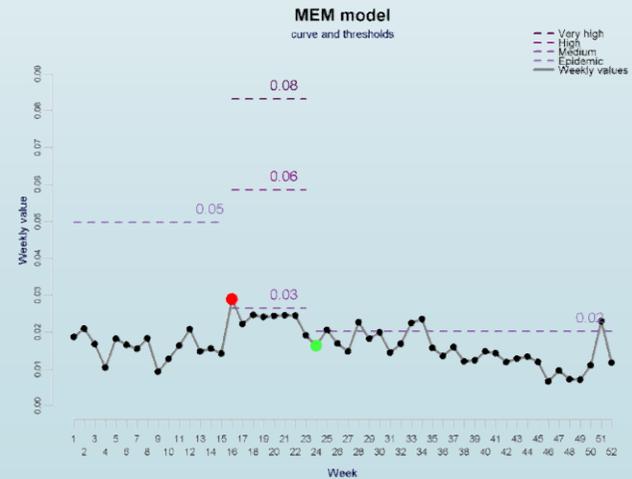
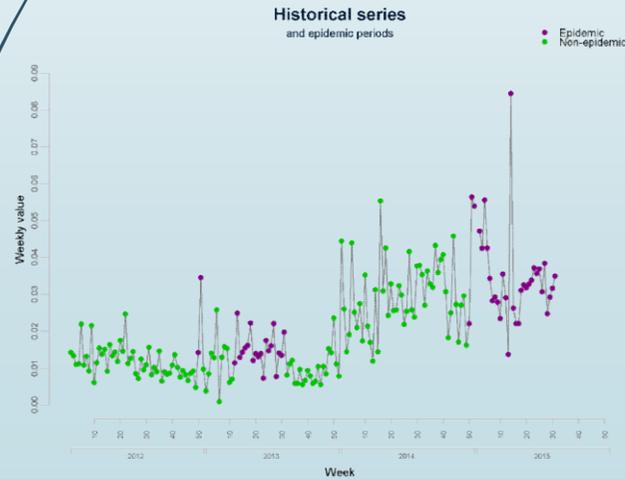
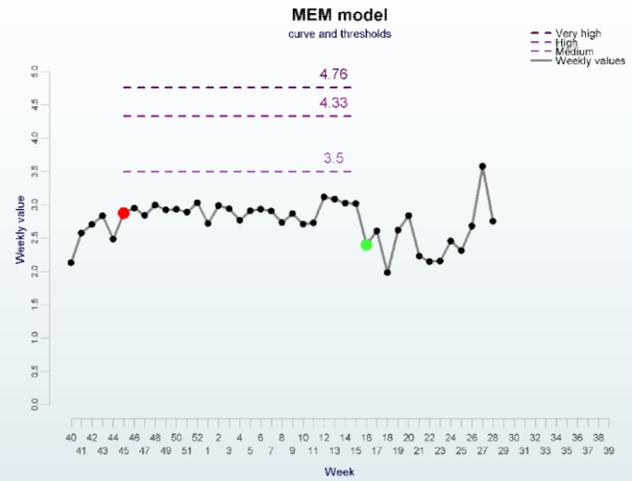
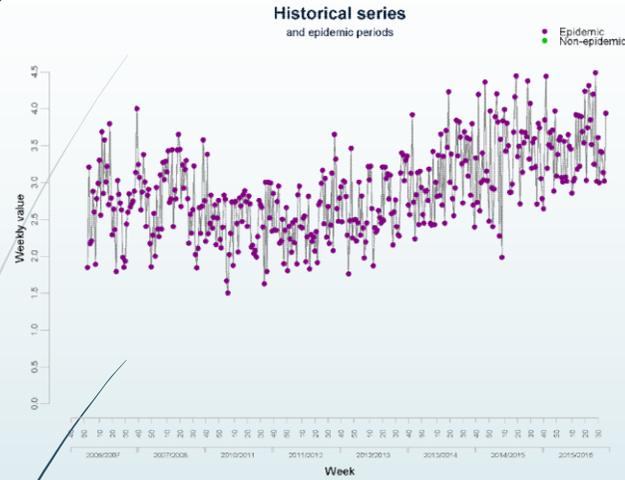
# Extensiones (Iv: SARI)



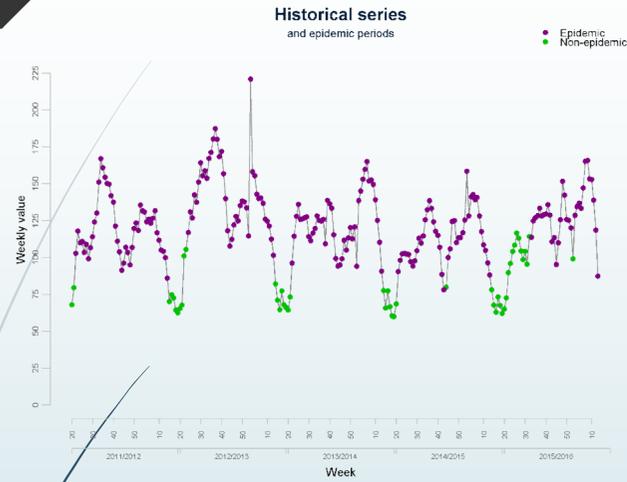
mem R library - José E. Lozano - <https://github.com/lozajo/mem>

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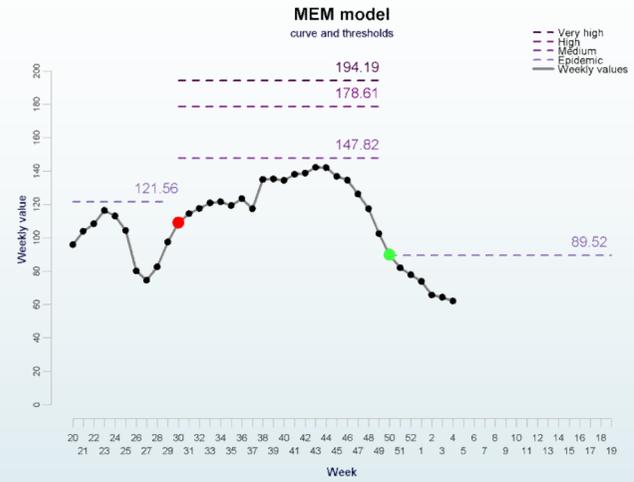
# Extensiones (V: otros indicadores)



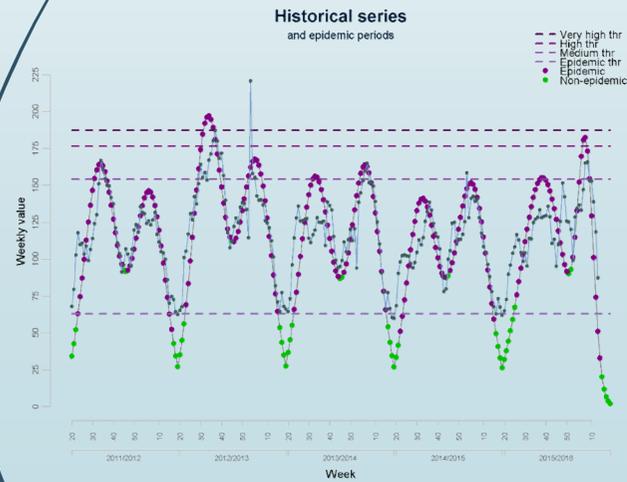
# Extensiones (Vi: dos ondas)



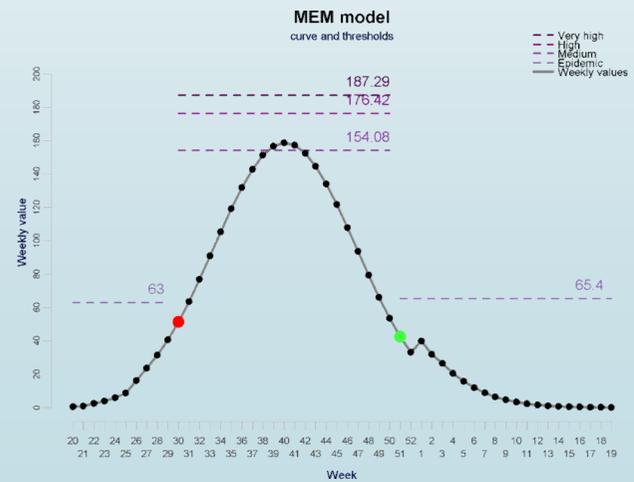
mem R library - José E. Lucano - <https://github.com/lozajolmem>



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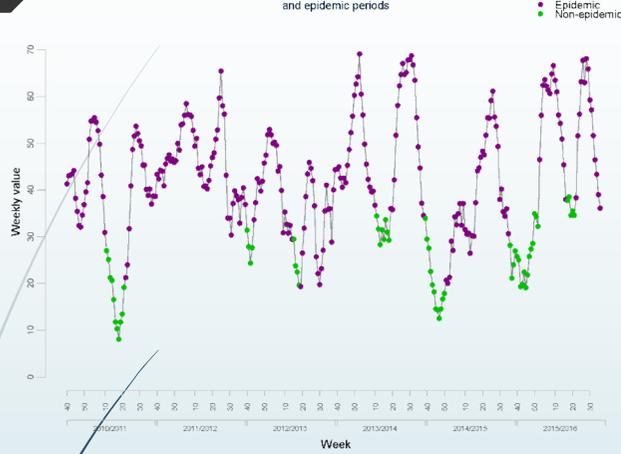


mem R library - José E. Lucano - <https://github.com/lozajolmem>

# Extensiones (VII: dos ondas)



Historical series and epidemic periods



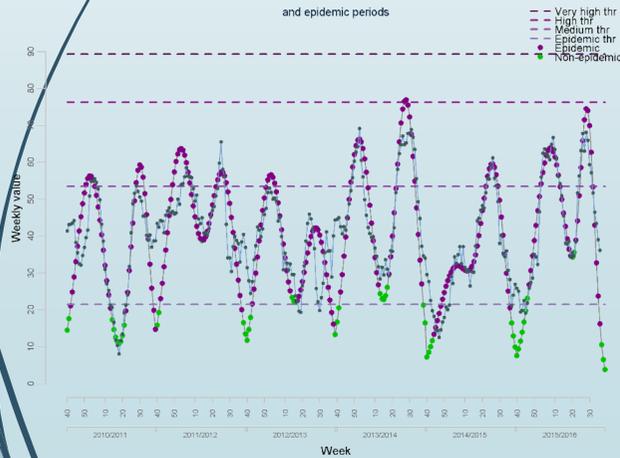
mem R library - José E. Lozano - <https://github.com/lozanojmem>

MEM model curve and thresholds



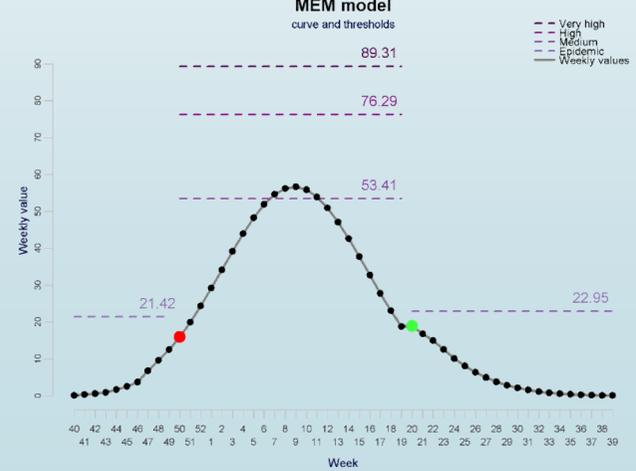
mem R library - José E. Lozano - <https://github.com/lozanojmem>

Historical series and epidemic periods



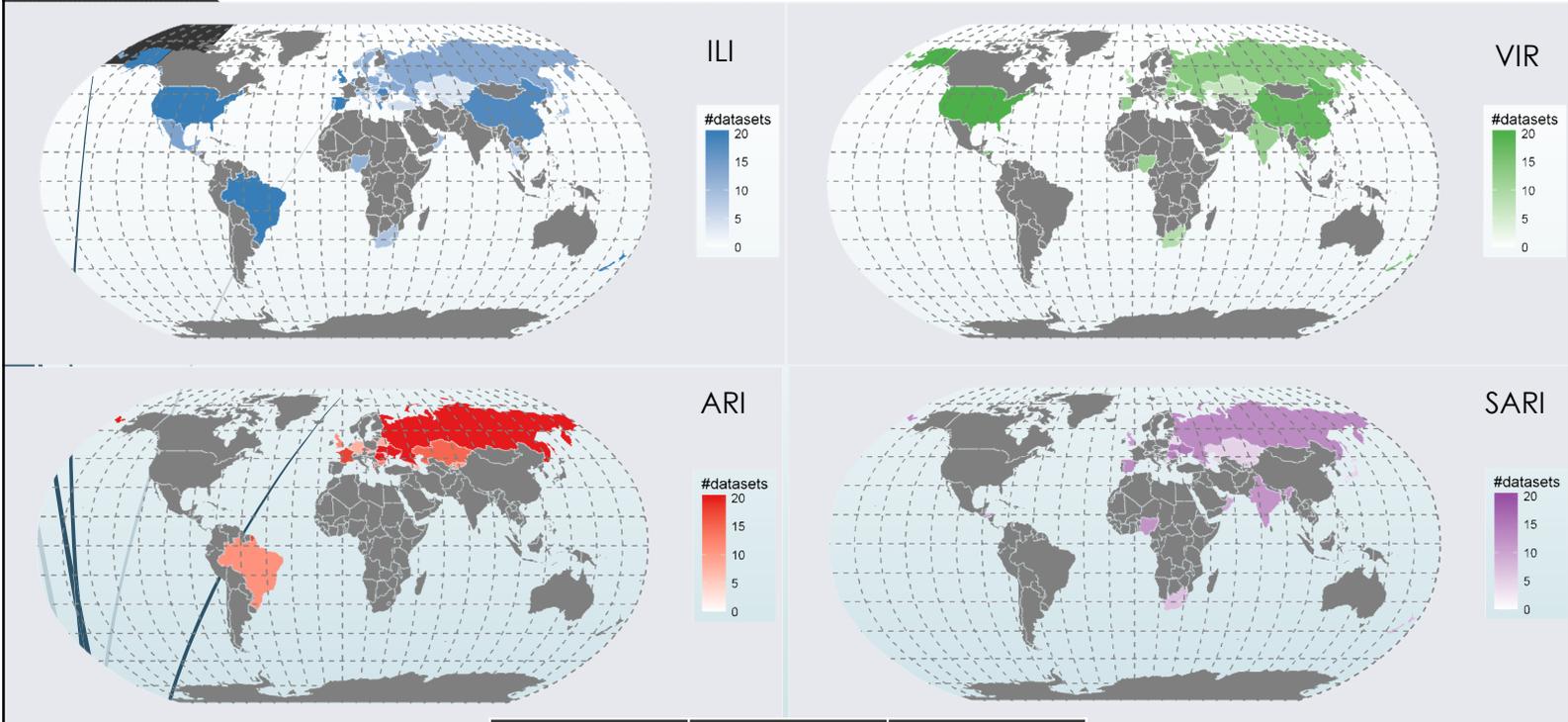
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MEM model curve and thresholds



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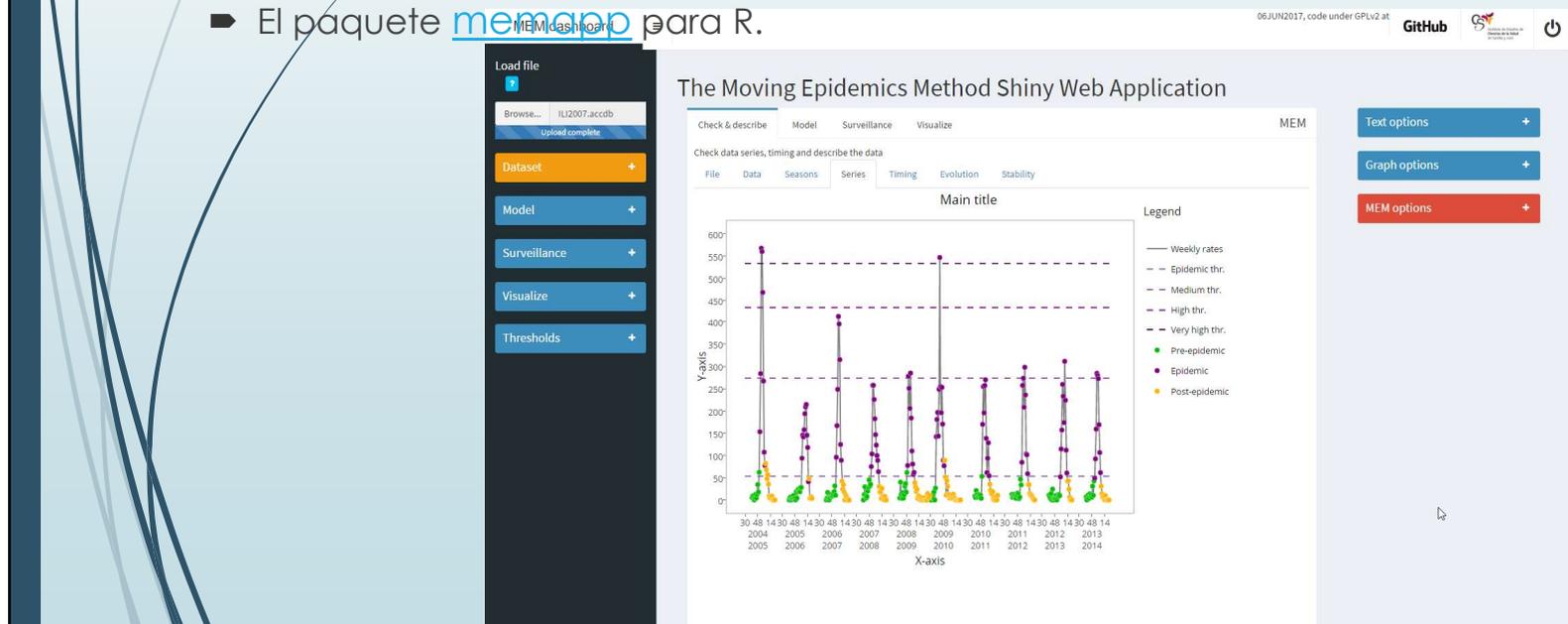
# Expansión del MEM

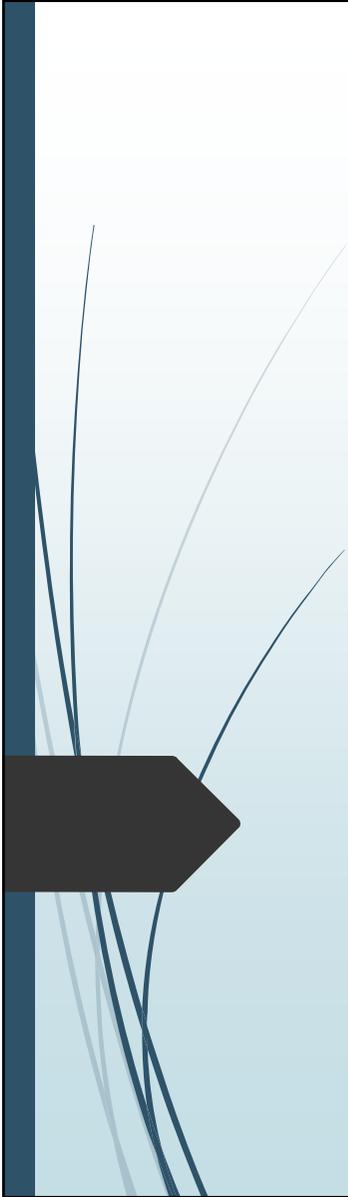


type	countries	datasets
ari	21	262
ili	51	624
pne	3	28
sari	23	194
vir	26	285
<b>total</b>	<b>56</b>	<b>1393</b>

# 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