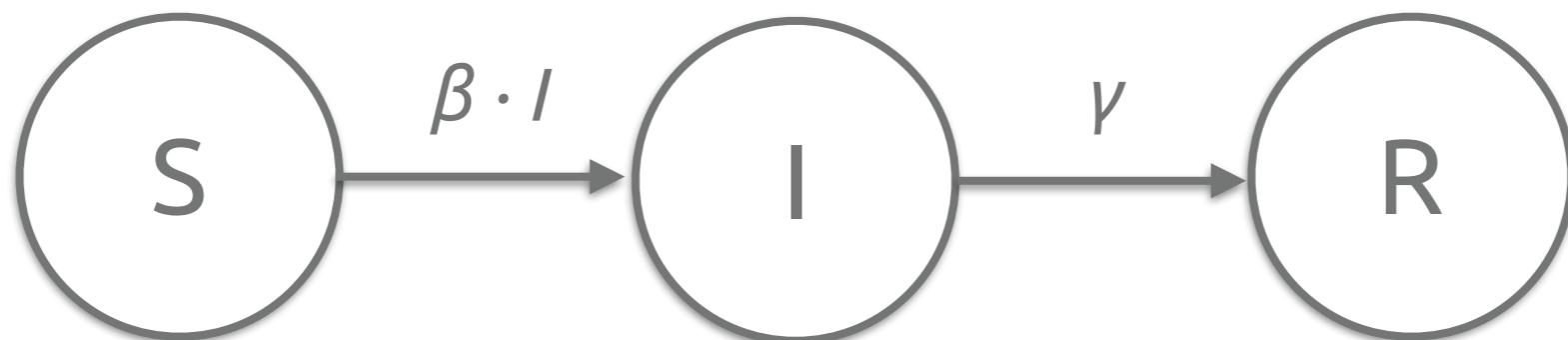


ZIKA VIRUS DISEASE

*Variation in the Basic Reproduction Number
for the 2015/2016 Colombia Outbreak*

William Rittasse & Stephen Thomas

MODELING DISEASE OUTBREAKS

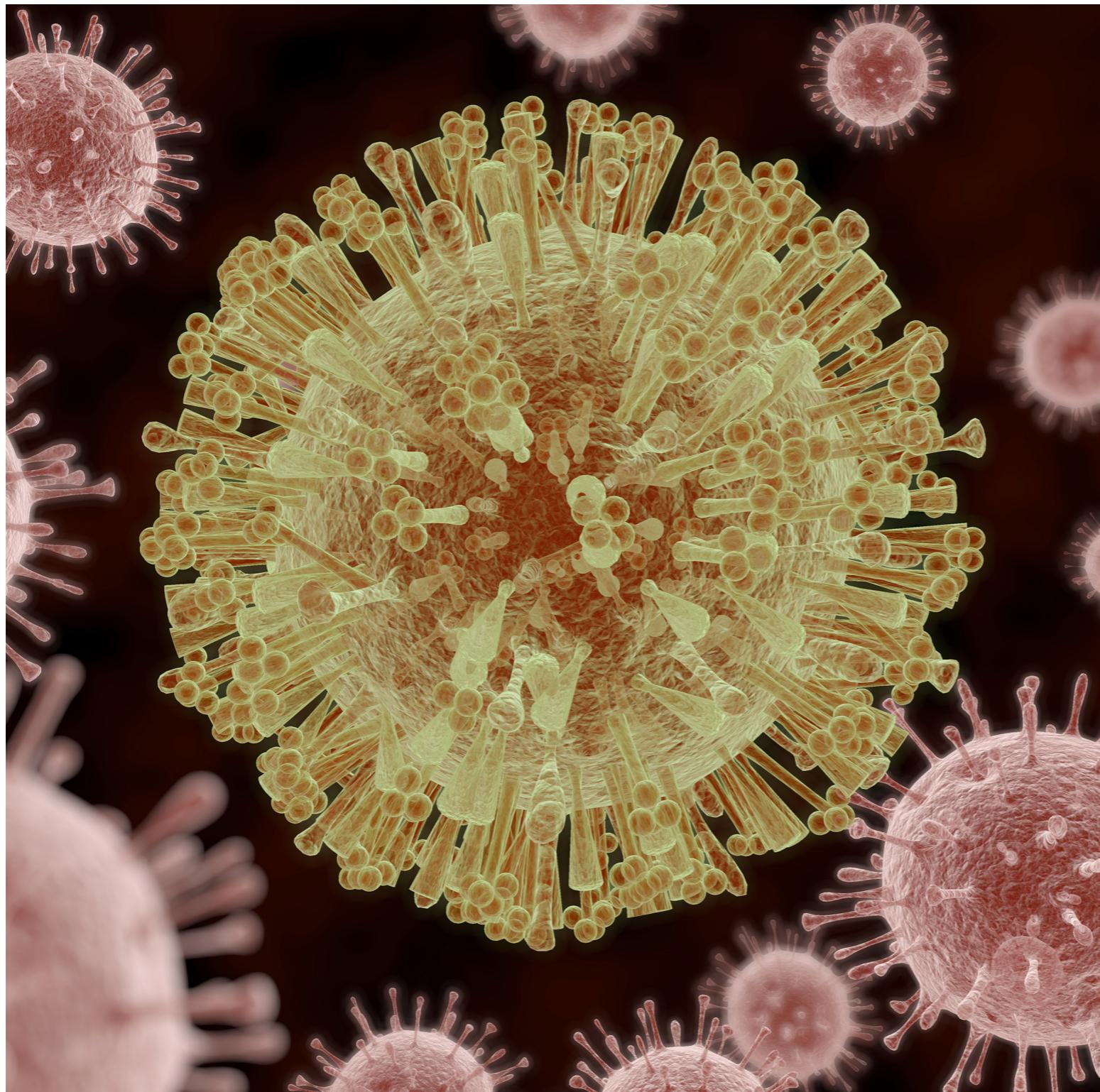


$$\frac{dS}{dt} = -\frac{\beta SI}{N}$$

$$\frac{dI}{dt} = \frac{\beta SI}{N} - \gamma I$$

$$\frac{dR}{dt} = \gamma I$$

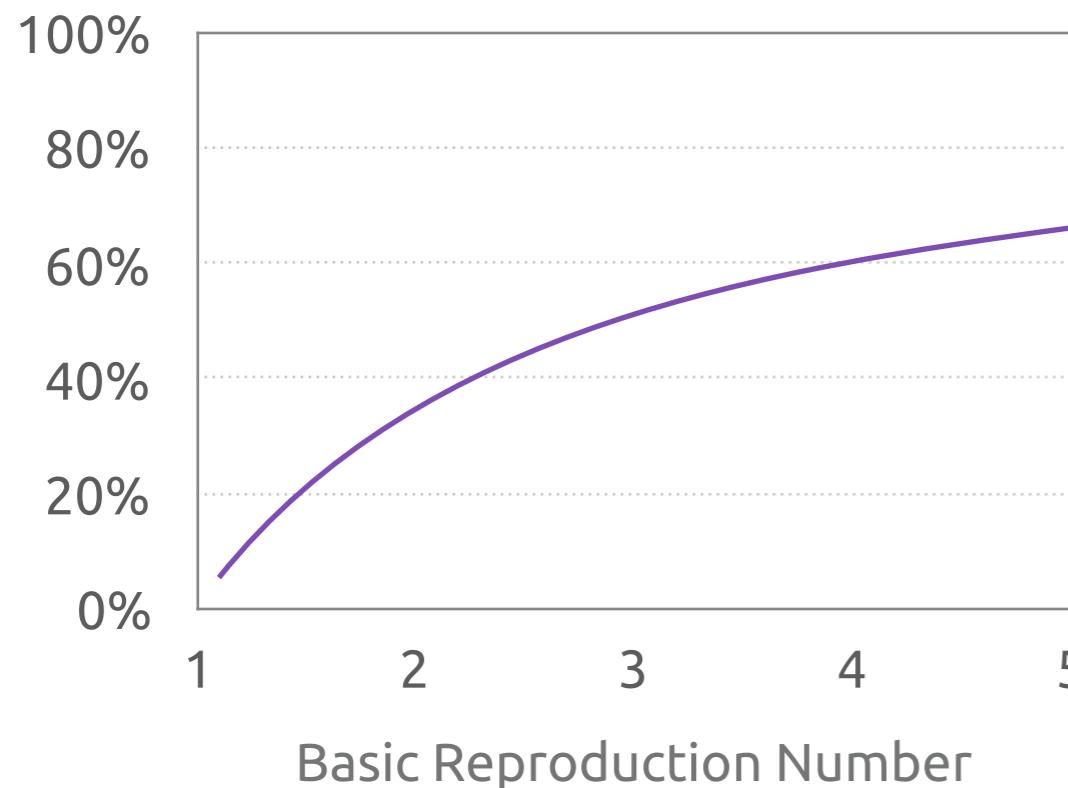
Kermack, W. O.; McKendrick, A. G. (1927). "A Contribution to the Mathematical Theory of Epidemics". *Proceedings of the Royal Society A: Mathematical, Physical and Engineering Sciences* **115** (772): 700



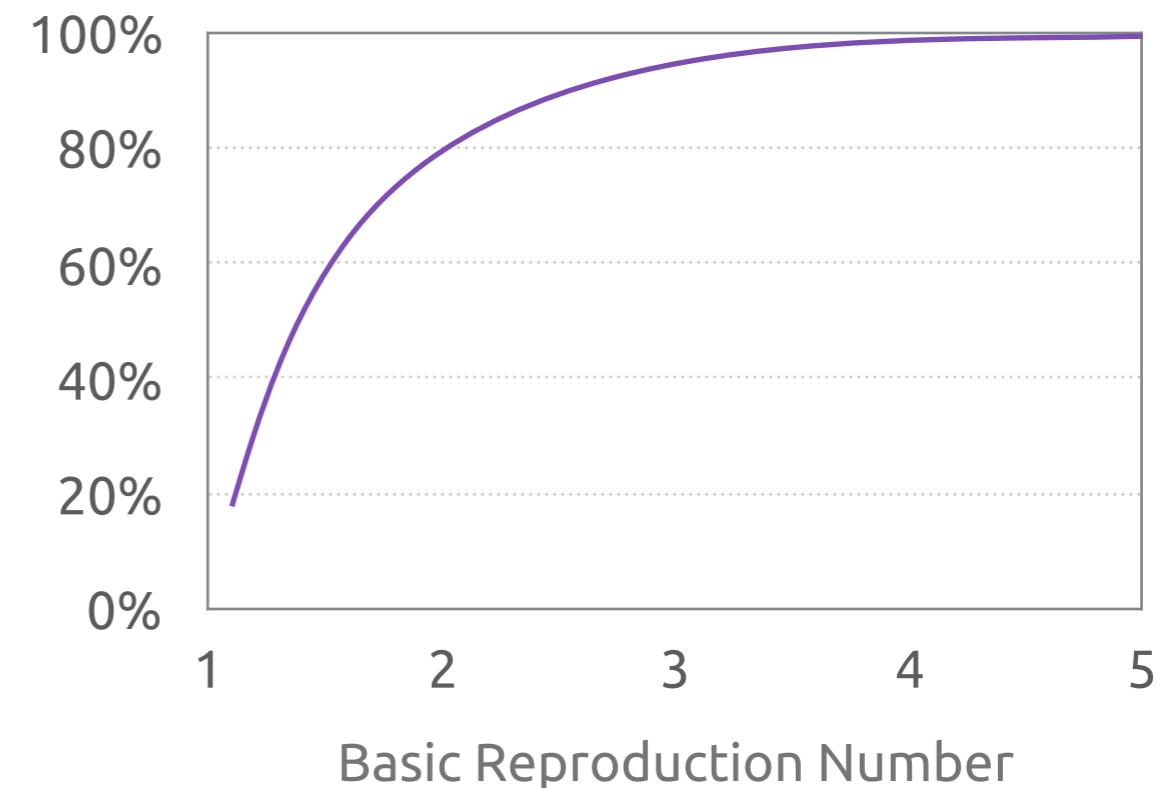
BASIC REPRODUCTION NUMBER: $R_0 = \beta/\gamma$

R_0 DESCRIBES KEY CHARACTERISTICS OF AN EPIDEMIC

Peak Infection Rate



Final Size of Epidemic



Critical Vaccination Threshold:

$$P_c = \frac{1}{\varepsilon} \left(1 - \frac{1}{R_0} \right)$$

DATA: COLOMBIA NATIONAL INSTITUTE OF HEALTH

BES
BOLETÍN EPIDEMIOLÓGICO SEMANAL

Contenido

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Dirección de Vigilancia y Análisis del Riesgo en Salud Pública
INSTITUTO NACIONAL DE SALUD
TODOS POR UN NUEVO PAÍS
PAZ EQUIDAD EDUCACIÓN

Semana epidemiológica número 01 de 2016 (03 ene. al 09 ene.)

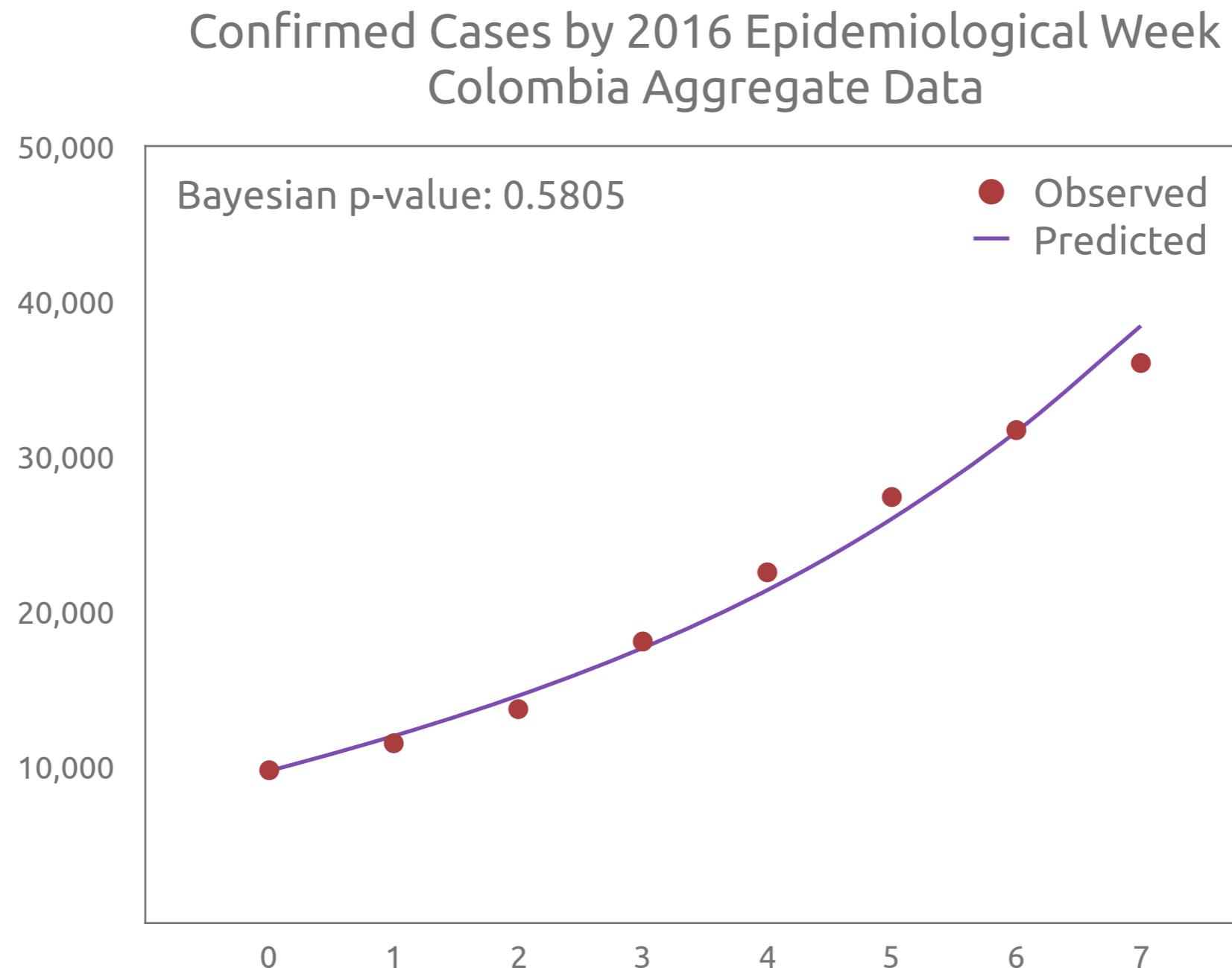
"FIN DEL BROTE MÁS RECENTE DE ÉBOLA EN LIBERIA, PERO NO PUEDEN DESCARTARSE NUEVOS BROTES".

14 de enero de 2016 -- La OMS declara hoy el fin del brote más reciente de enfermedad por el virus del Ébola en Liberia. No obstante, la Organización advierte de que la tarea no se ha

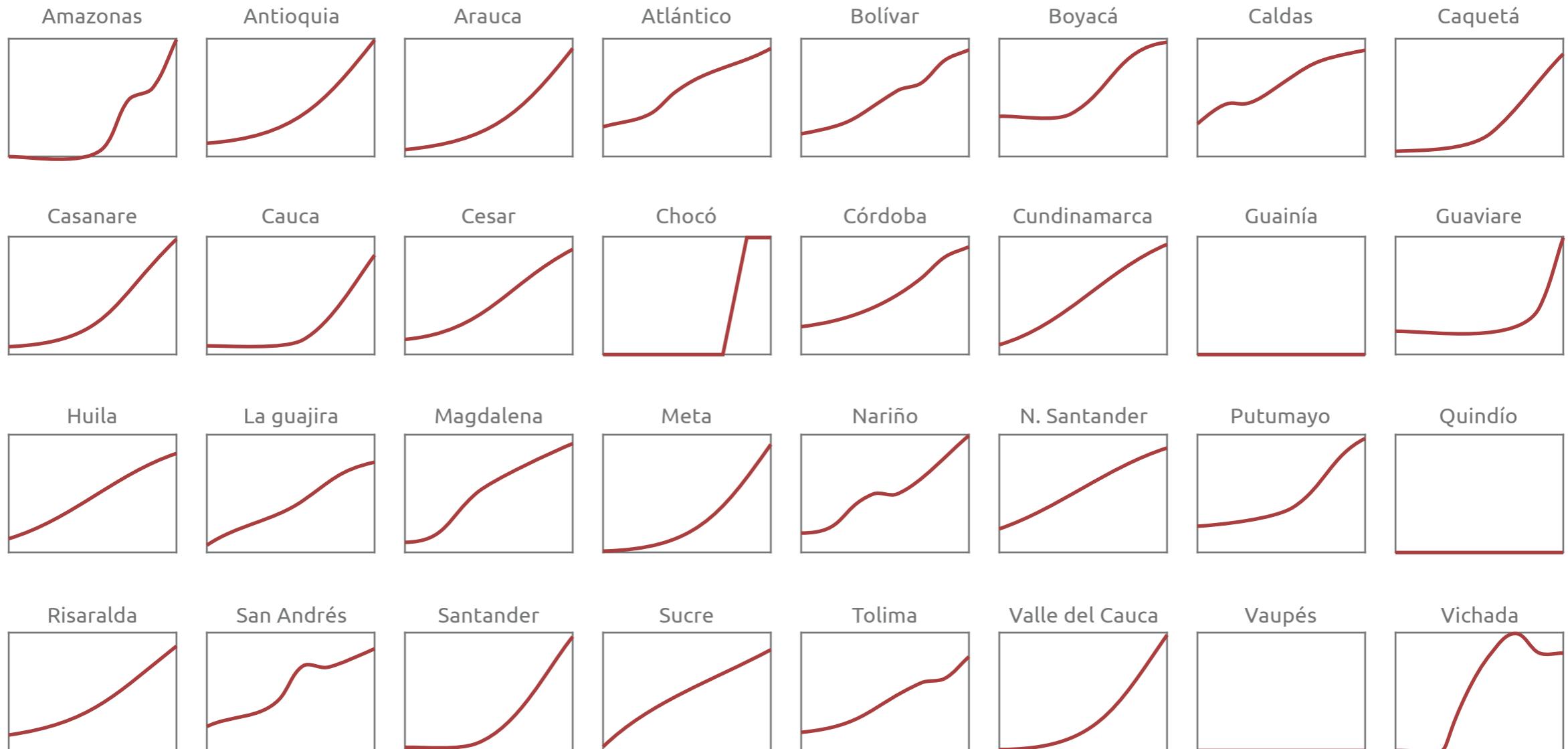
<http://www.ins.gov.co/Noticias/ZIKA/Forms/AllItems.aspx>

<https://github.com/cdcepi/zika>

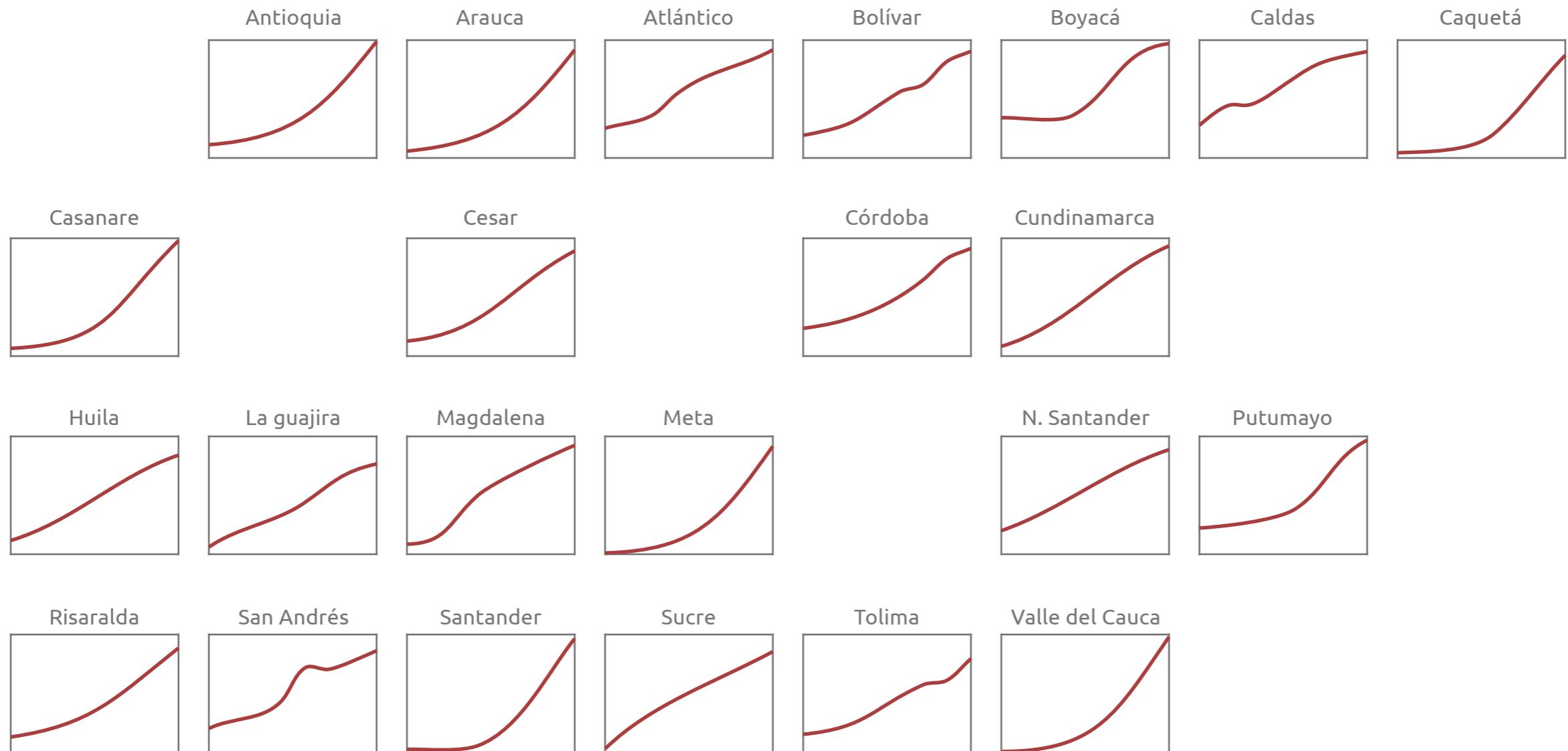
VALIDATING THE DATA USING AGGREGATE CASES



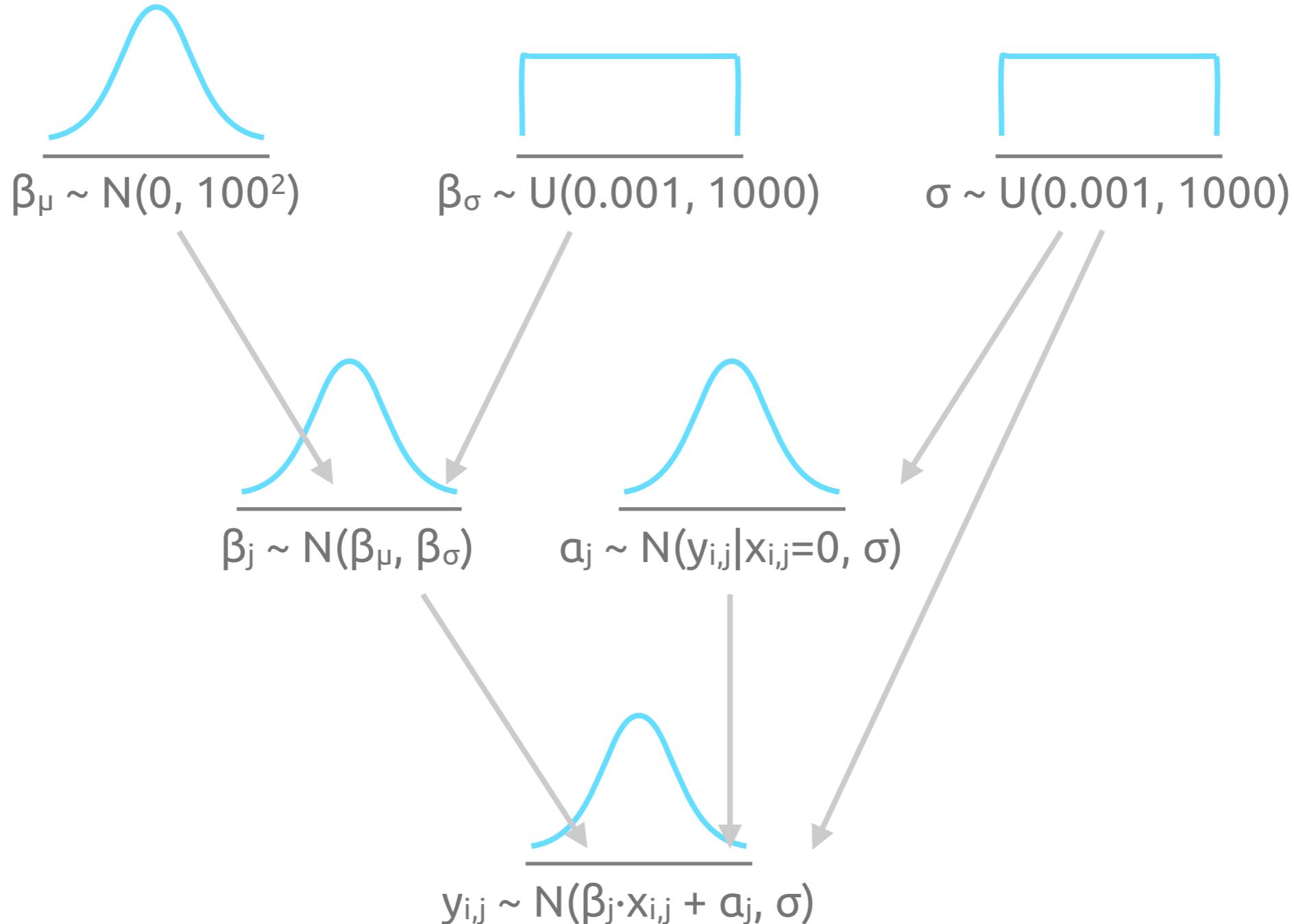
CONFIRMED CASES BY DEPARTMENT



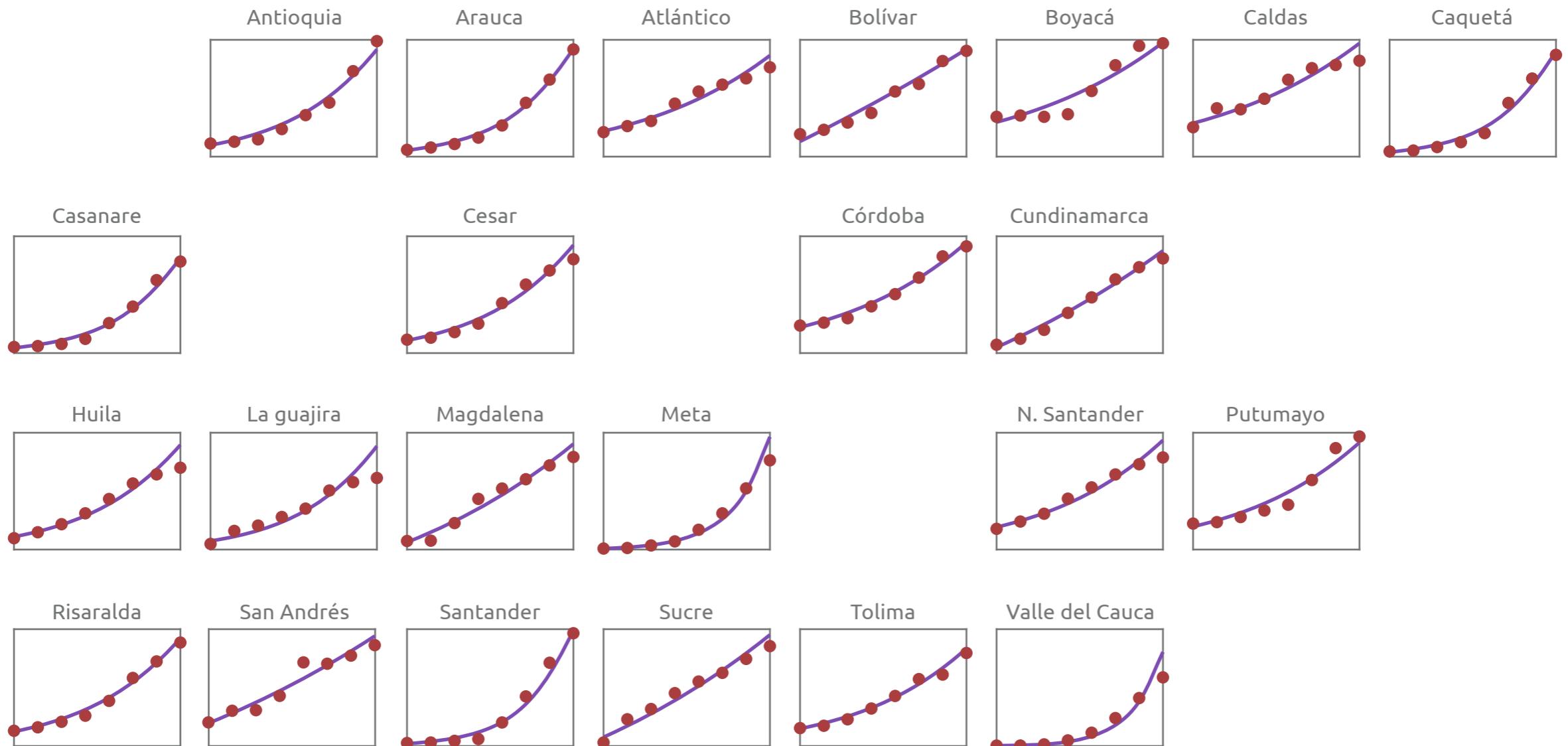
CONFIRMED CASES BY DEPARTMENT (> 50 CASES)



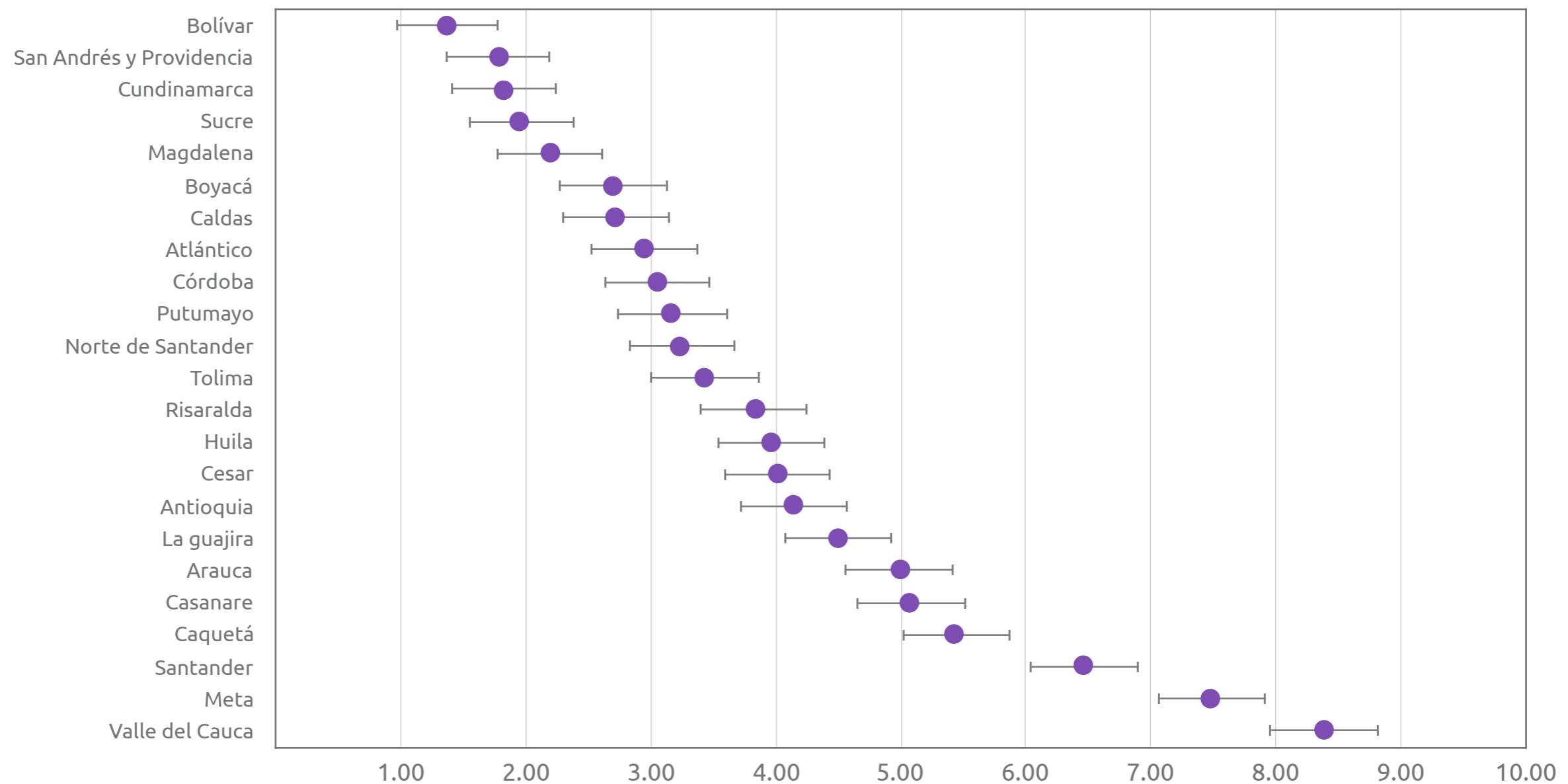
HIERARCHICAL REGRESSION MODEL (LOG TRANSFORM)



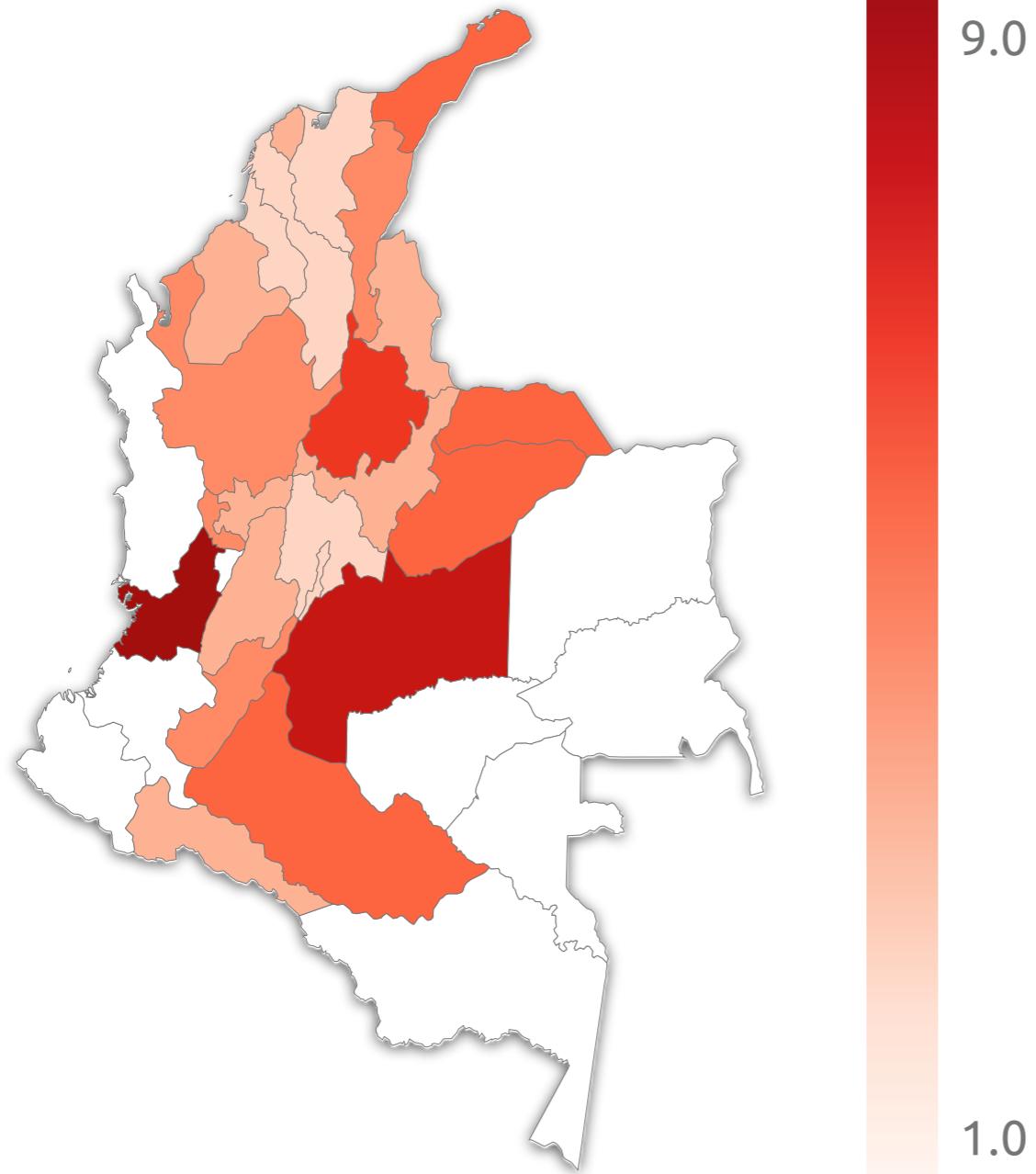
REGRESSION RESULTS (BAYESIAN P-VALUE: 0.4988)



95% CREDIBLE INTERVALS FOR R_0 BY DEPARTMENT



GEO-SPATIAL VARIATION IN R_0



Compare with projected R_0 from Perkins, et al, "Model-based projections of Zika virus infections in childbearing women in the Americas" based on discrete model parameters, e.g. daily temperature, mosquito mortality, transmission probabilities, mosquito biting rate, etc.

