



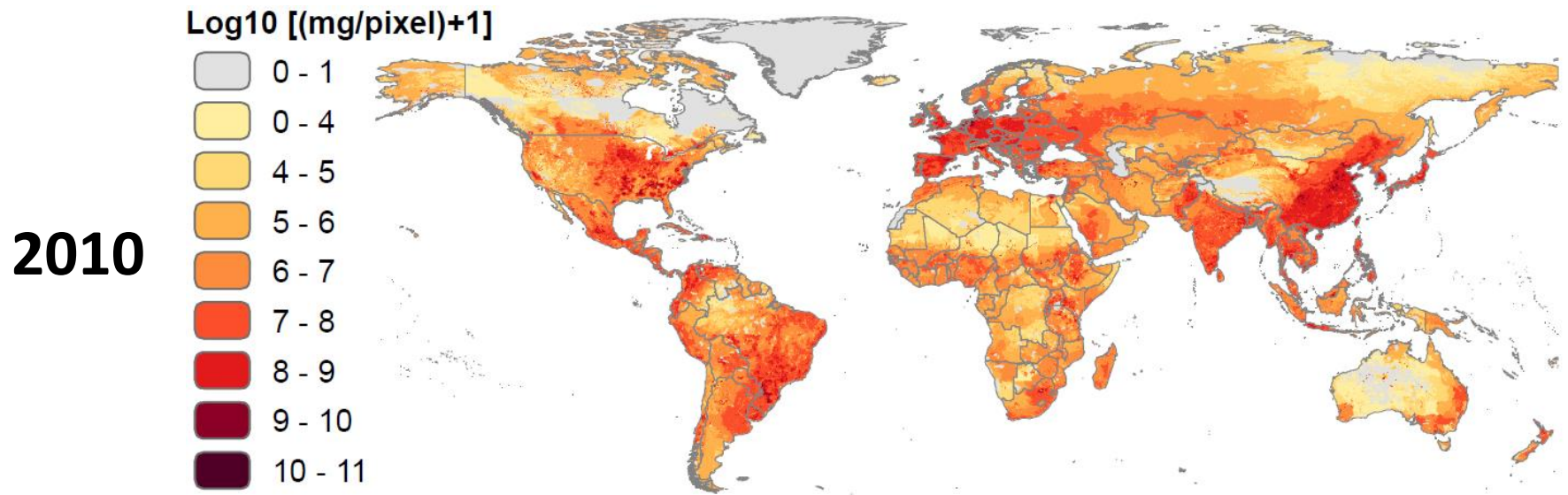
GLOBAL TRENDS IN ANTIMICROBIAL RESISTANCE IN FOOD ANIMALS,
an update.

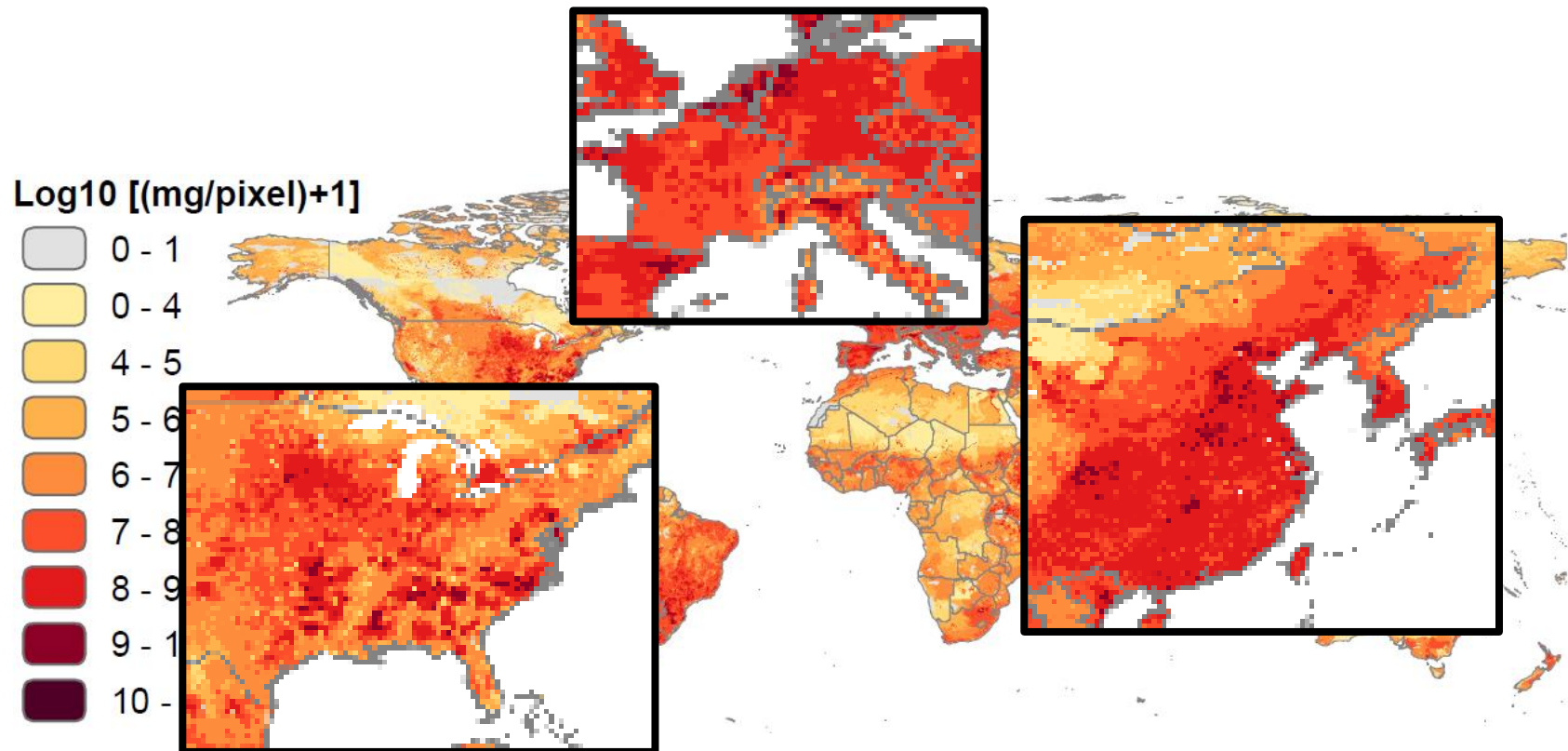
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ETH zürich

CENTER FOR
**Disease Dynamics,
Economics & Policy**

WASHINGTON DC • NEW DELHI

Global maps of antimicrobial use in food animals

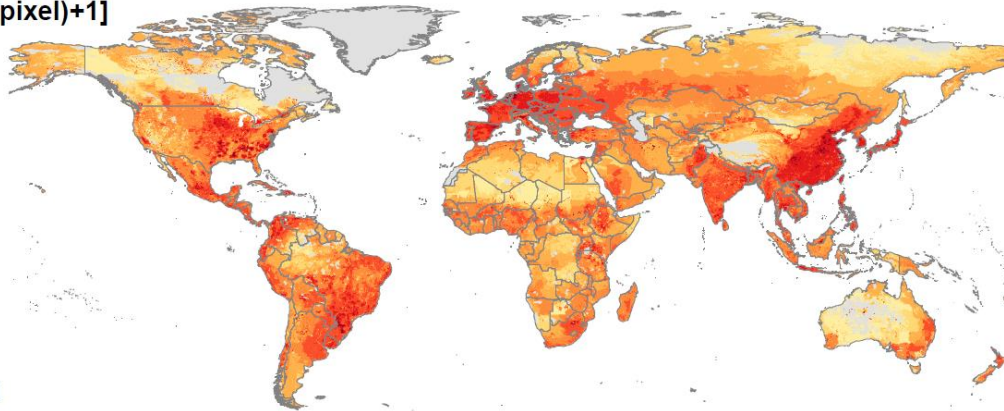




Global maps of antimicrobial use in food animals

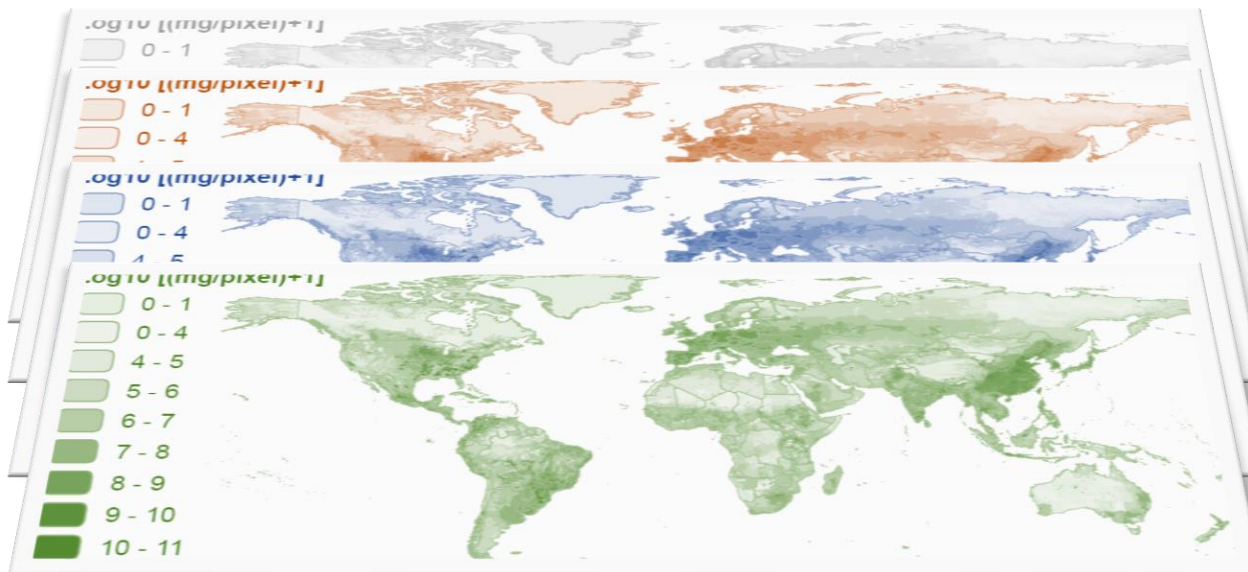
2010

$\text{Log}_{10} [(mg/pixel)+1]$



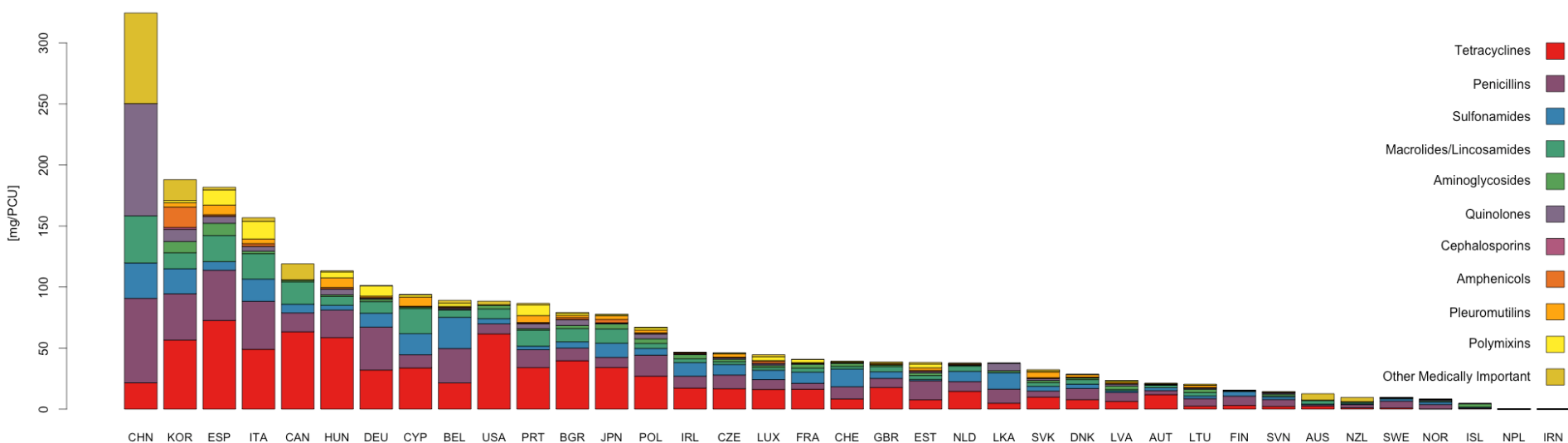
mg/PCU

2013



Fluoroquinolones
Aminoglycosides
Tetracycline
Penicillin
...
10 classes.

Input Data

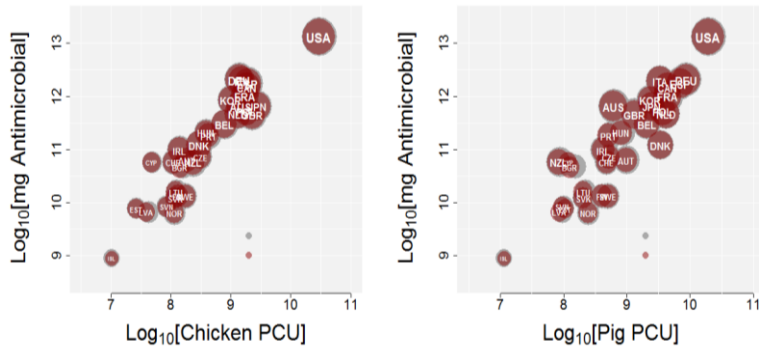


High-income countries
ESVAC, Korea, USA,...

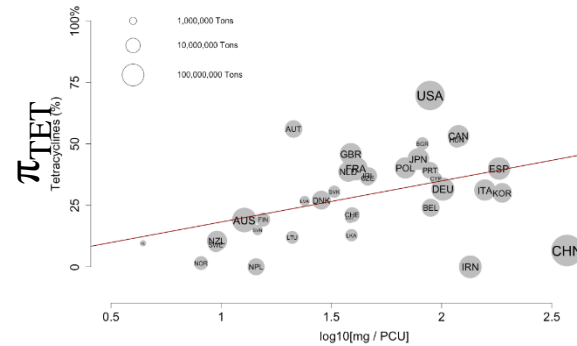
Low- and Middle-income countries
Iran, Sri Lanka, **China**, Nepal...

Methodology

Step 1. Country Consumption



Step 2. Proportion of Tetracycline (%)



Step 3. Species-specific coefficients



A diagram illustrating the components of the notation $\alpha_{c,i,k,s}$. The notation is at the top, with four lines connecting it to the following labels: "country" (for c), "drug class" (for i), "species" (for k), and "extensive/intensive" (for s).

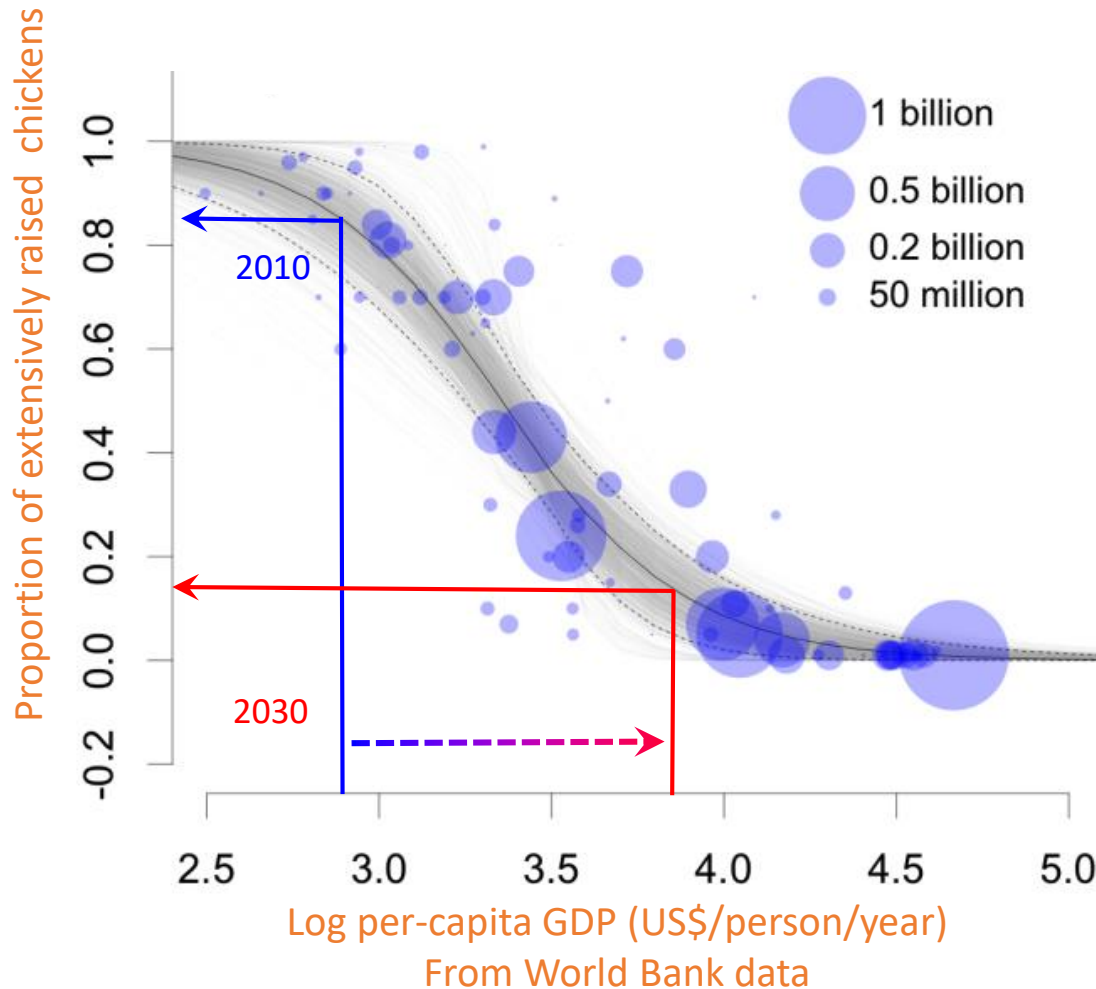
Step 4. Uncertainty & Standardization

Country Total

$$\sum_j^{228} \sum_c^{10} \sum_k^4 \sum_s^2 (\alpha_{c,j,k,s} \pm 1.96 \cdot sd(\alpha_{c,j,k,s})) \cdot PCU_{2013,c,j,k,s}$$

Projections intensive production (2013-2030)

In each country, the proportion of **animals raised extensively** is correlated with **GDP per capita**.

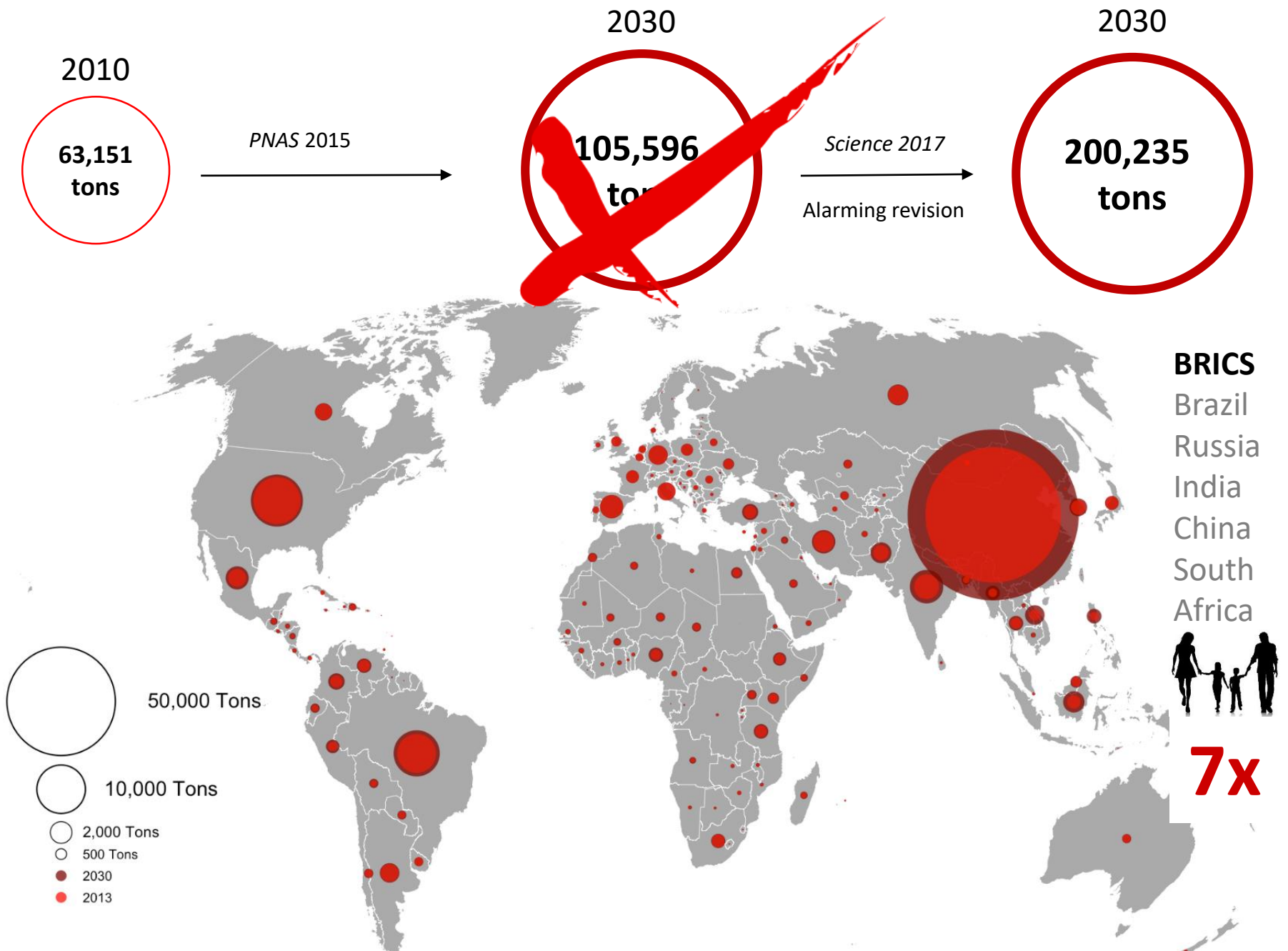


2013

log GDP per capita c. \$ 2.9
% extensive c. 83 %

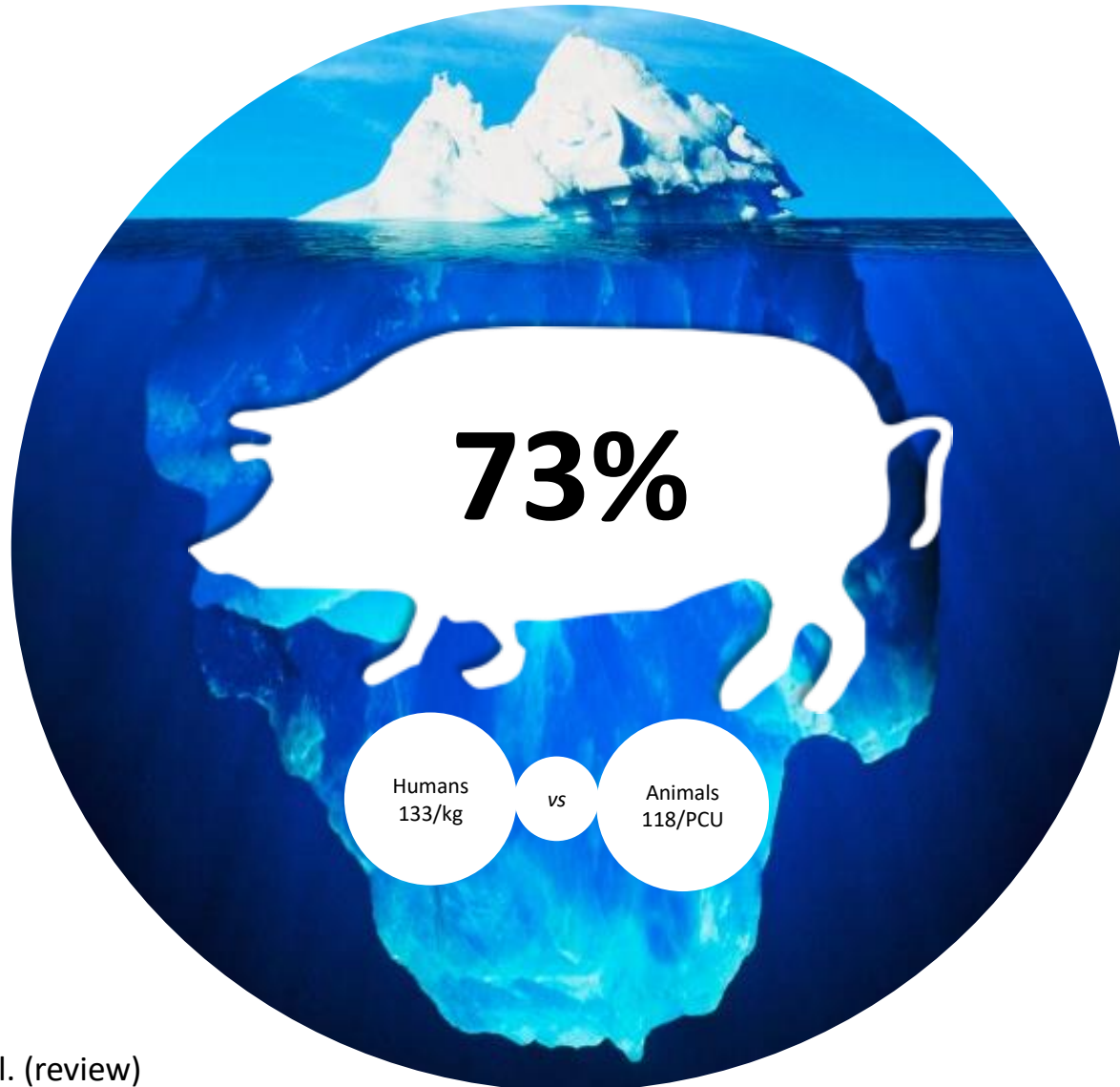
2030

log GDP per capita c. \$ 3.8
% extensive c. 18 %



Van Boeckel et al. 2017, *Science*. (including Zhang et al 2016)

Why animals ?



The perfect is the enemy of the good

Good intention

Multiple Metrics for to measure AMU
in high-income countries

Better characterize where and how
often antimicrobials are used.

Meaningful for veterinarians

Risk

Missing the bigger picture

1st Reducing AMU in Asia (and expand
efforts in USA).

2nd Reduce differences between
countries in Europe.

Thank You

@thvanboeckel



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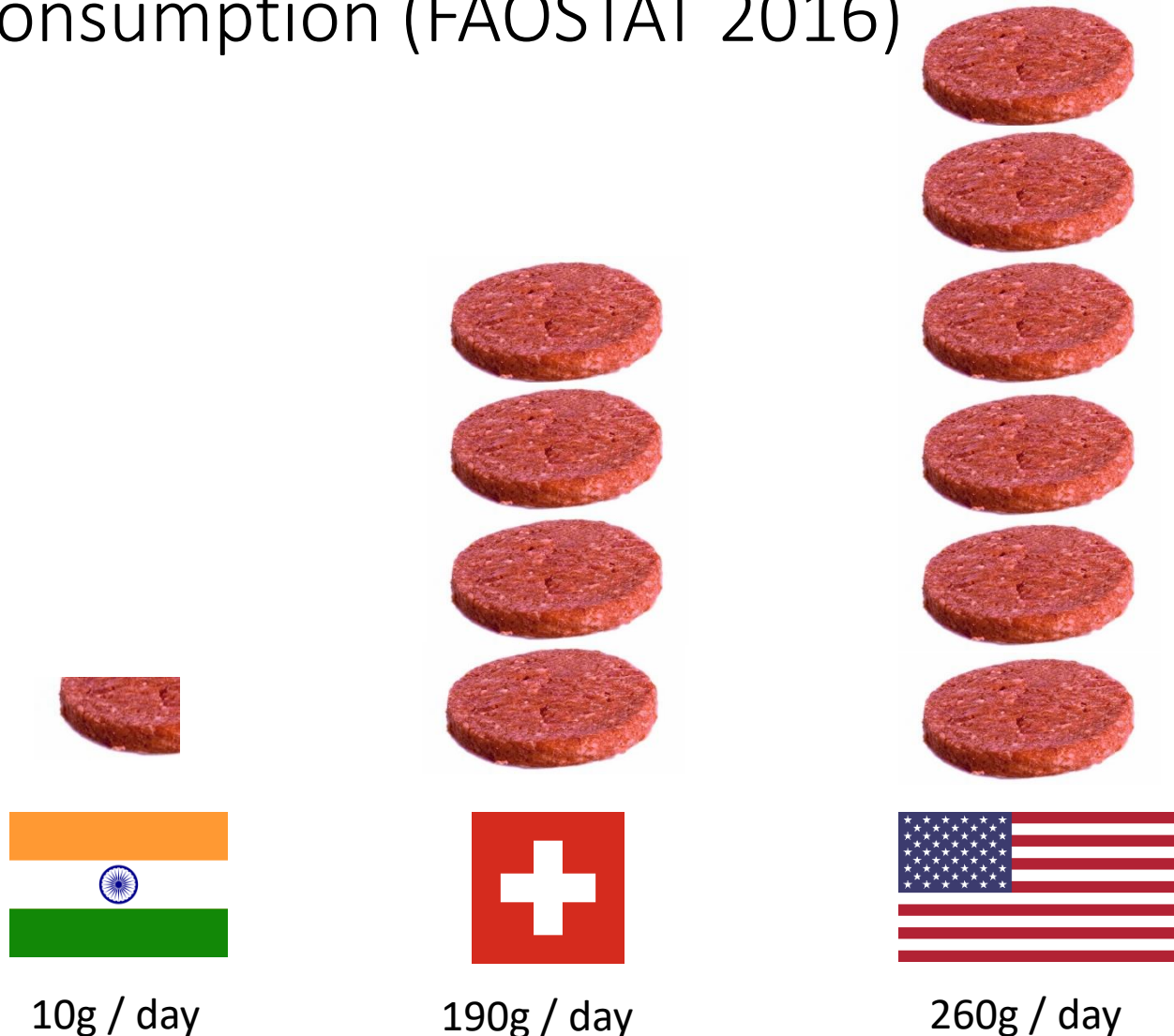
Tim Robinson



QUESTIONS

Putting things in perspective

Meat consumption (FAOSTAT 2016)



$$PCU_{k,S} = An_{k,S} \cdot (1 + n_{k,S}) \cdot \left(\frac{Y_k}{R_{\frac{CW}{LW},k}} \right)$$

where An_k is the number of living animals, $n_{k,S}$ is the number of production cycles in each production system (extensive or intensive), Y is the quantity of meat per animal (carcass weight) obtained for each country from FAOSTAT, and $R_{\frac{CW}{LW}}$ is the killing-out percentage (or dressing percentage)—that is, the ratio of carcass weight to live weight—obtained from literature estimates⁷³. The last term of this equation can be interpreted as the animal weight reconstructed from country-specific productivity figures.