



Use of antibiotics around the world

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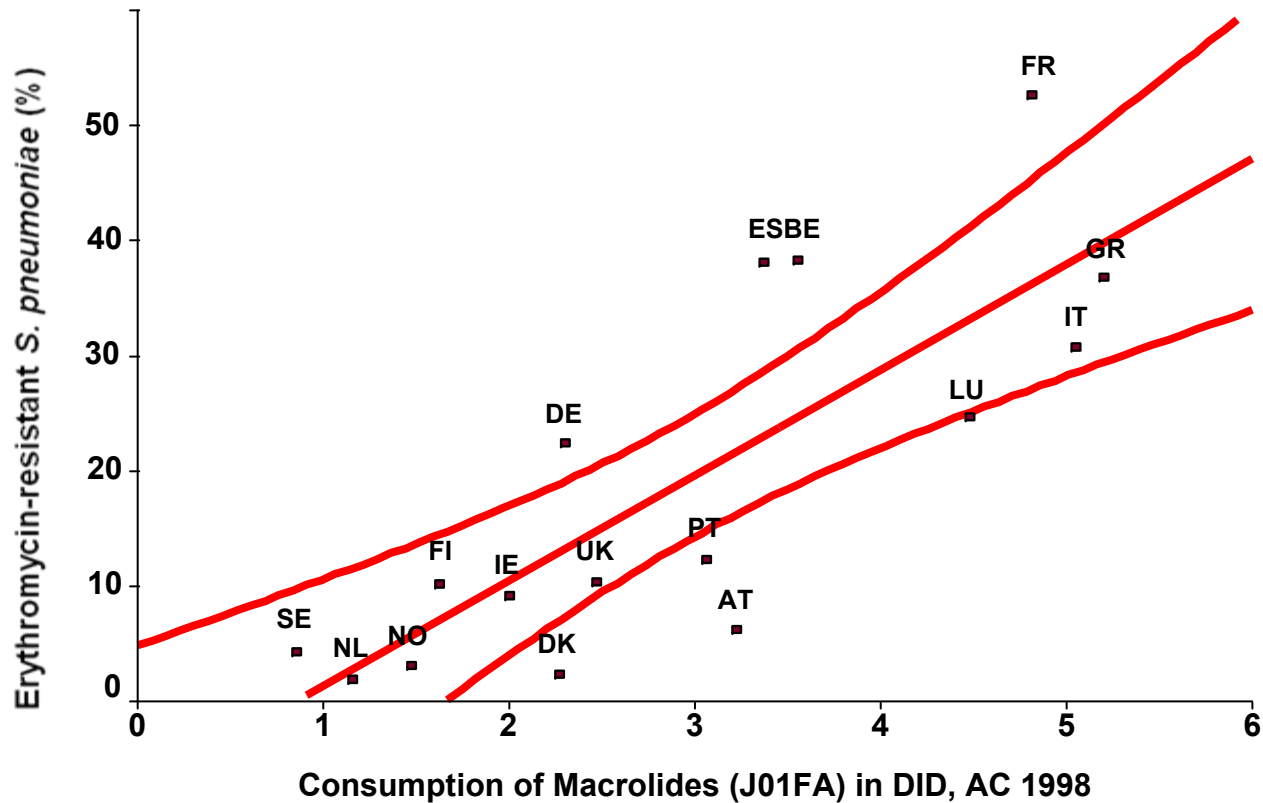
**Bệnh viện Việt Nam-Thụy Điển
(Uong Bi Hospital)**

With the support of *Wallonie-Bruxelles-International*



Why to study consumption ?

Correlation between antibiotic use and resistance



How to evaluate consumption?



- **DDD: Defined Daily Dose**
(as per WHO recommendation)

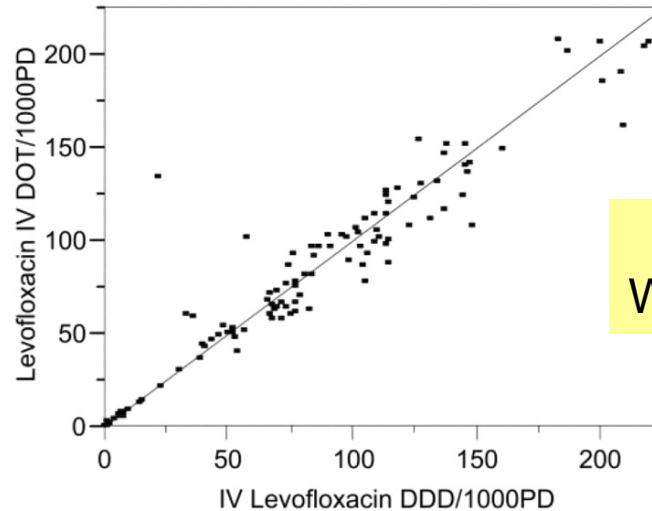
average maintenance dose per day for a drug used for its main indication in adults.

The DDD is a unit of measurement and does not necessarily reflect the recommended or prescribed daily dose.

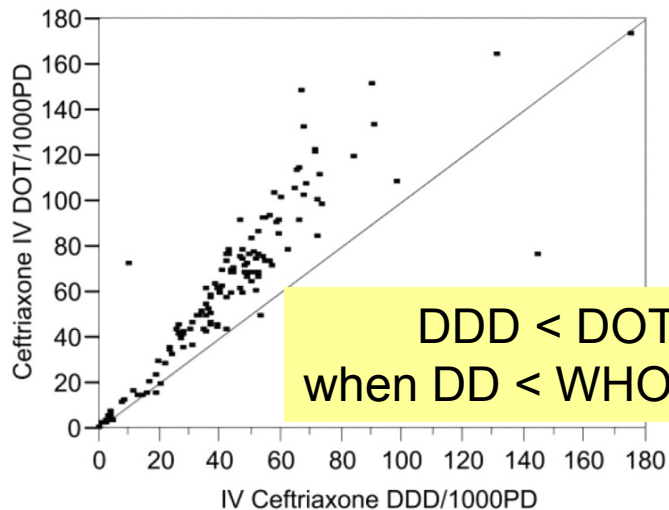
→ Packages of different brands with the same active ingredient but with different strength and pack size can be aggregated.

- **DOT: Days Of Treatment**

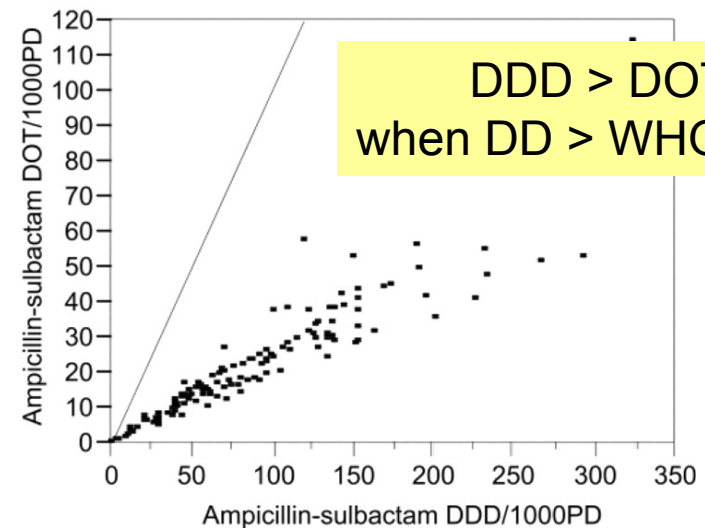
DDD vs DOT



DDD = DOT
When DD = WHO dose

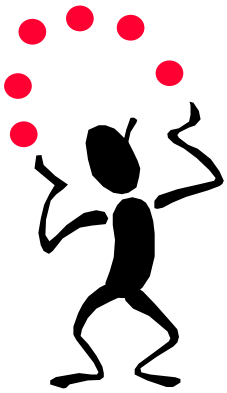


DDD < DOT
when DD < WHO dose



DDD > DOT
when DD > WHO dose

Polk et al. Clin Infect Dis. 2007;44:664-670



DDD vs DOT

Measurement method	Advantages	Disadvantages
Defined Daily Dose	(1) Allows standardized comparisons of aggregate antibiotic use between hospitals in different locations and countries; (2) allows for an estimate of use in countries with limited access to computerized pharmacy data; (3) will change the estimate of drug use if the recommended daily dose is altered and the approved DDD does not change	(1) Will not accurately estimate DOT when the administered daily dose is not equal to the DDD and, therefore, cannot be used to compare relative use between different antibiotic classes; (2) cannot be used in children; (3) will underestimate use for drugs that require reduced dosage when excretory function is impaired, such as with renal impairment; (4) approved DDDs may change as new dosages are approved for existing drugs, which can create confusion when comparing use over time
Days of Therapy	(1) Can be used to measure antimicrobial use in children; (2) not influenced by changes in the recommended DDD; (3) not influenced by discrepancies between the DDD and the preferred daily dose	(1) Will overestimate use for drugs that are given in multiple doses per day; (2) more difficult to measure without computerized pharmacy records



European data

Surveillance of antimicrobial consumption in Europe

2010

← www.ecdc.europa.eu/en/healthtopics/antimicrobial_resistance/esac-net-database/Pages/database.aspx ☆ esac ecdc report

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Antimicrobial resistance

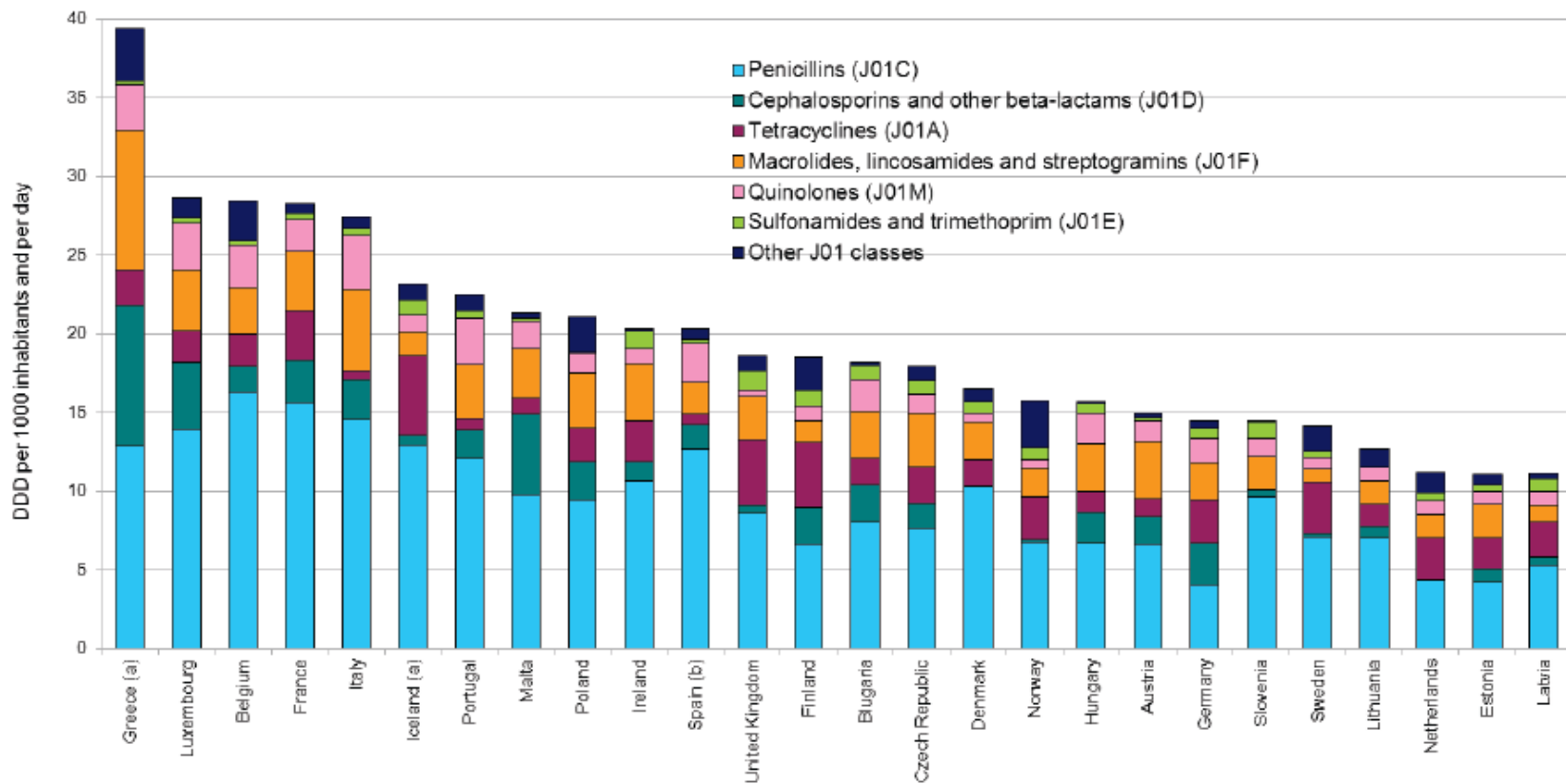
Antimicrobial consumption interactive database
(ESAC-Net)



www.ecdc.europa.eu

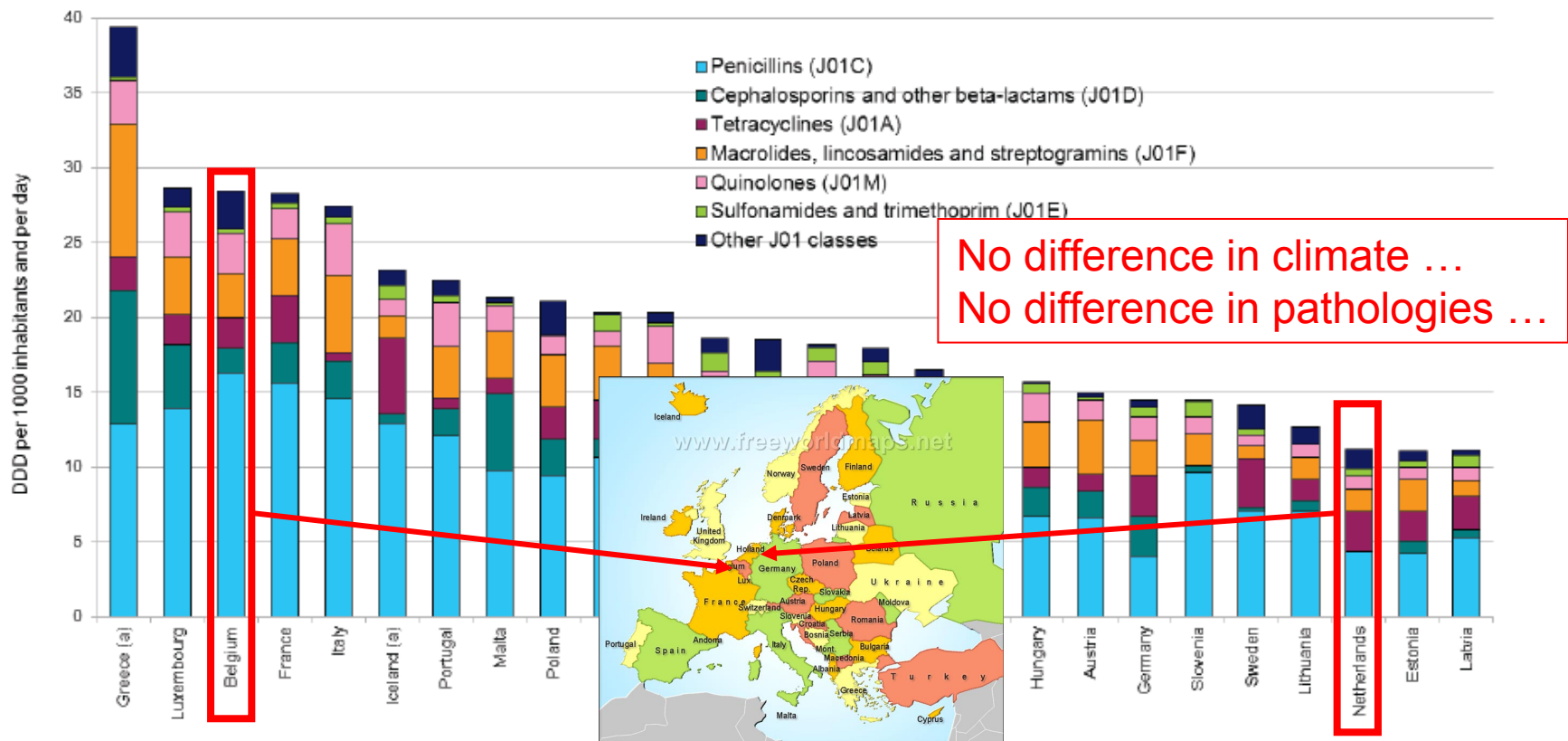
Antibiotic consumption in the community

Consumption of antibacterials for systemic use (ATC group J01) at ATC group level 3 in the community, EU/EEA countries, 2010, expressed as DDD per 1 000 inhabitants and per day



Antibiotic consumption in the community

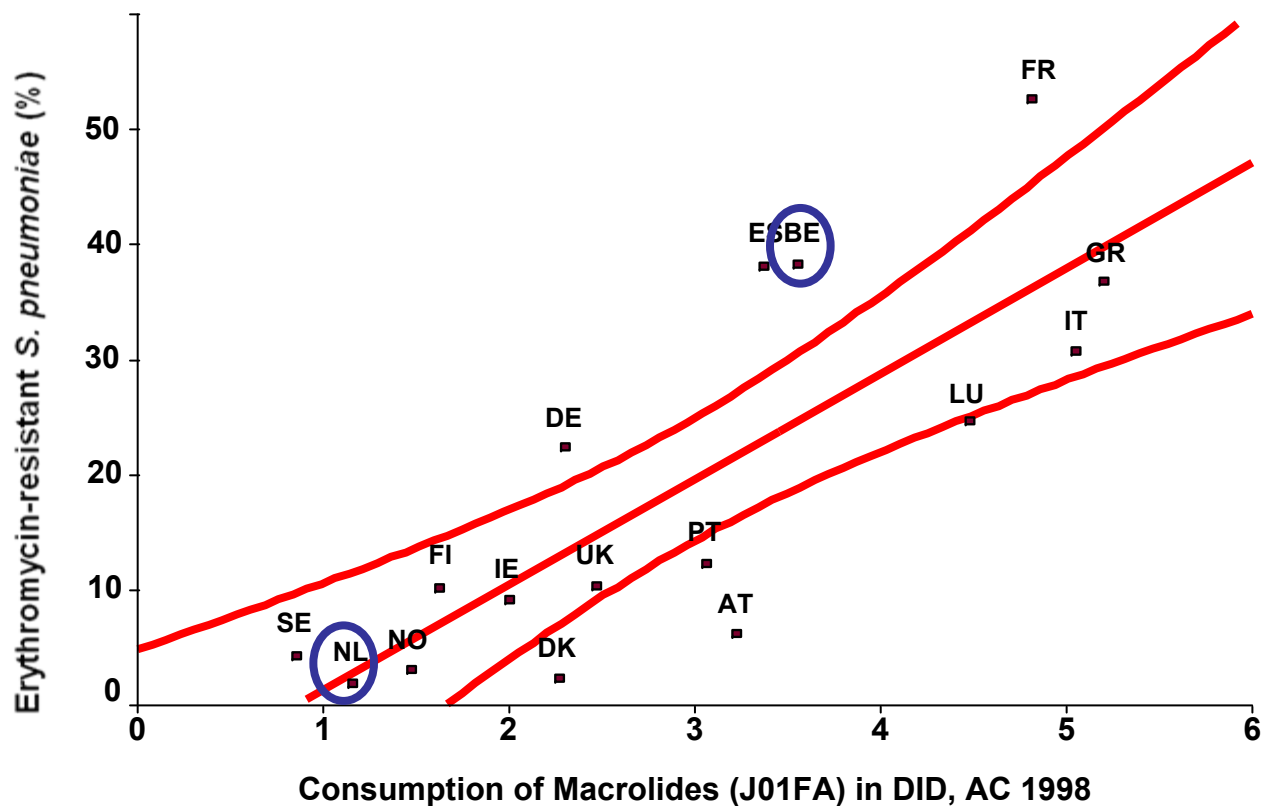
Consumption of antibacterials for systemic use (ATC group J01) at ATC group level 3 in the community, EU/EEA countries, 2010, expressed as DDD per 1 000 inhabitants and per day



This is mainly a question of antibiotic policy ...

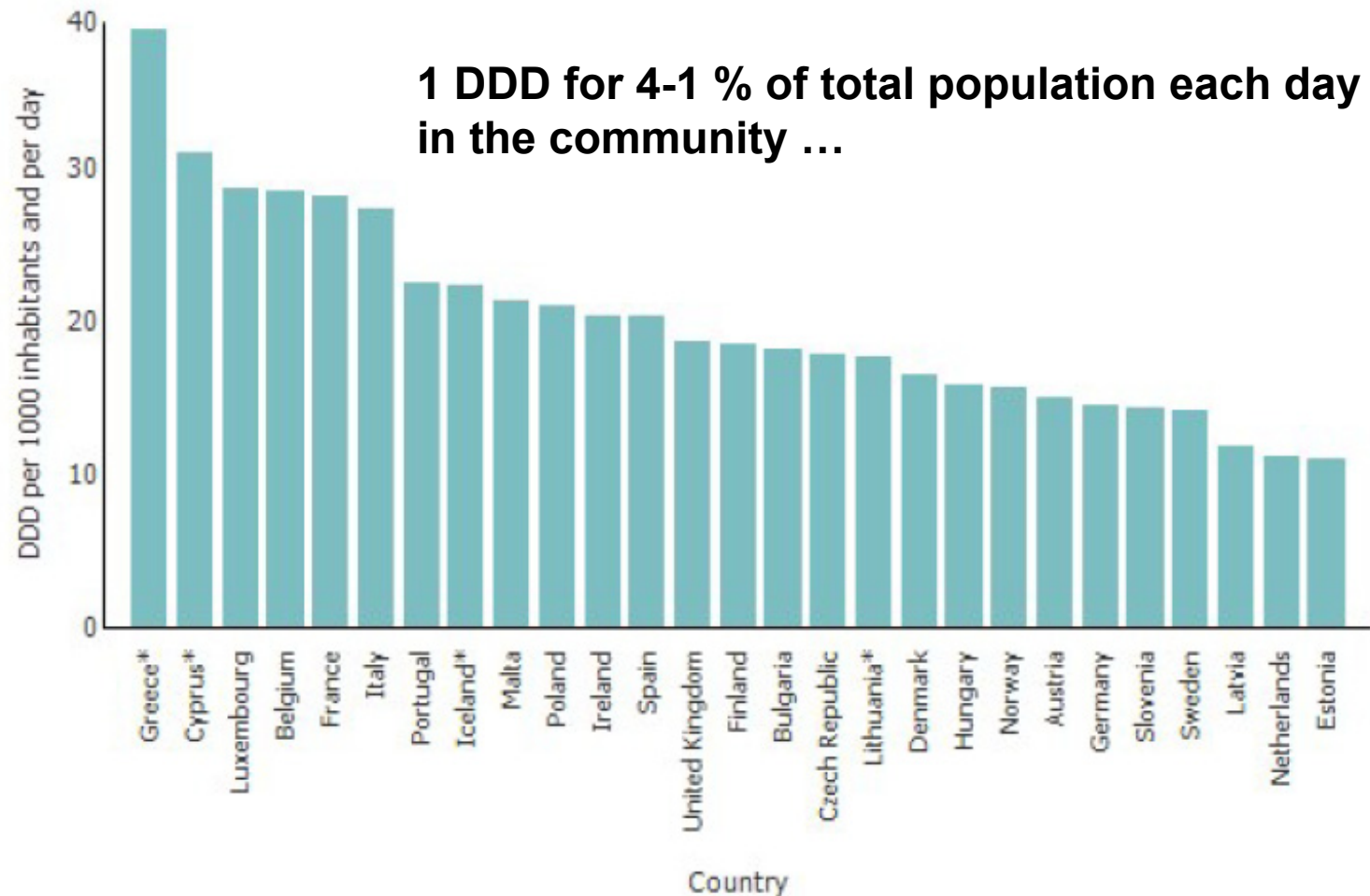
Does this translate in differences of resistance ?

Correlation between antibiotic use and resistance



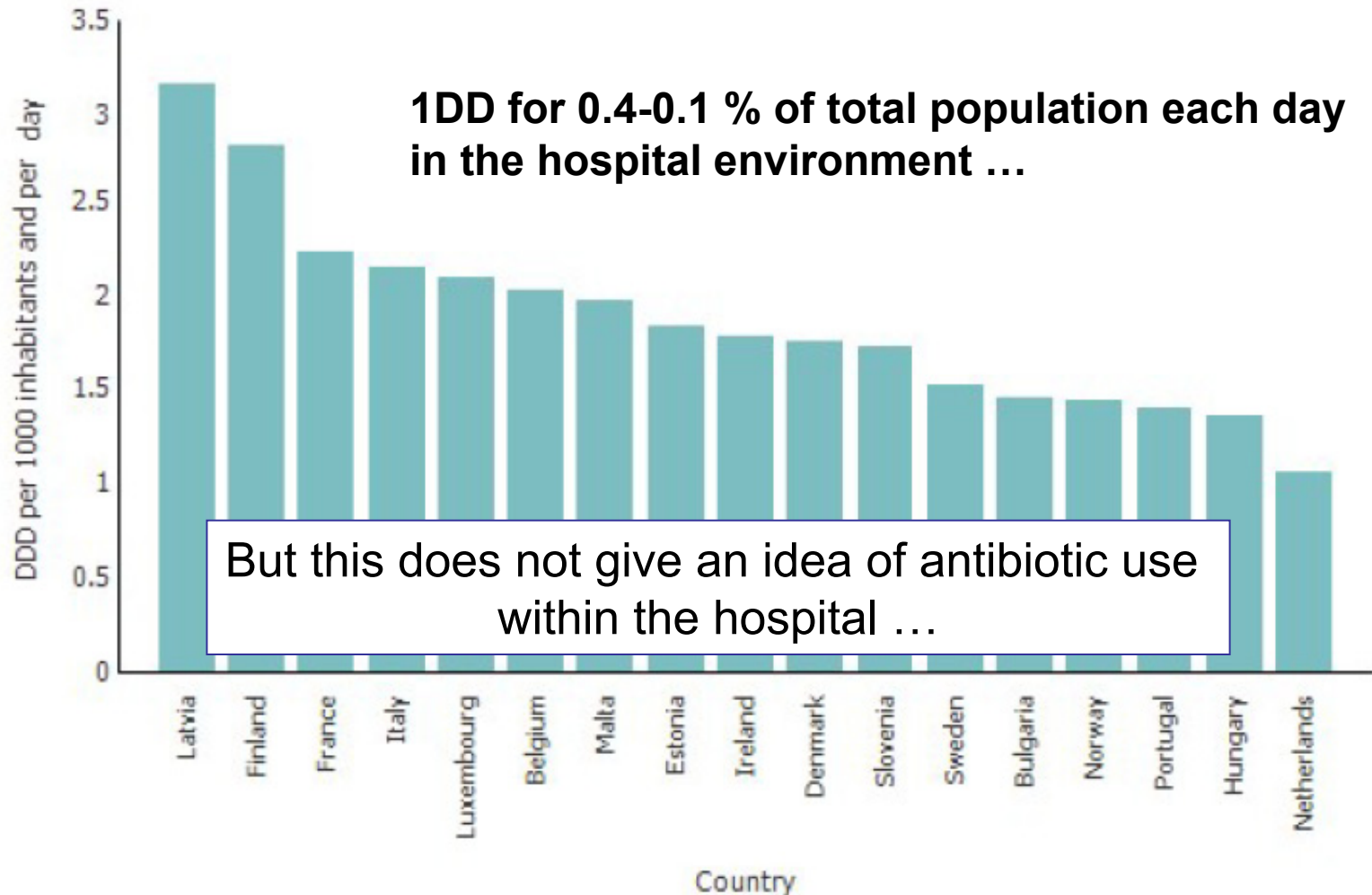
Antibiotic consumption in the community

Consumption of antimicrobials in ATC group J01 (antibacterials for systemic use) in the community (primary care sector) in Europe, reporting year 2010



Antibiotic consumption in the hospital

Consumption of antimicrobials in ATC group J01 (antibacterials for systemic use) in the hospital sector in Europe, reporting year 2010



Antibiotic consumption in the hospital

Patterns of Antibiotic Use In European Hospitals

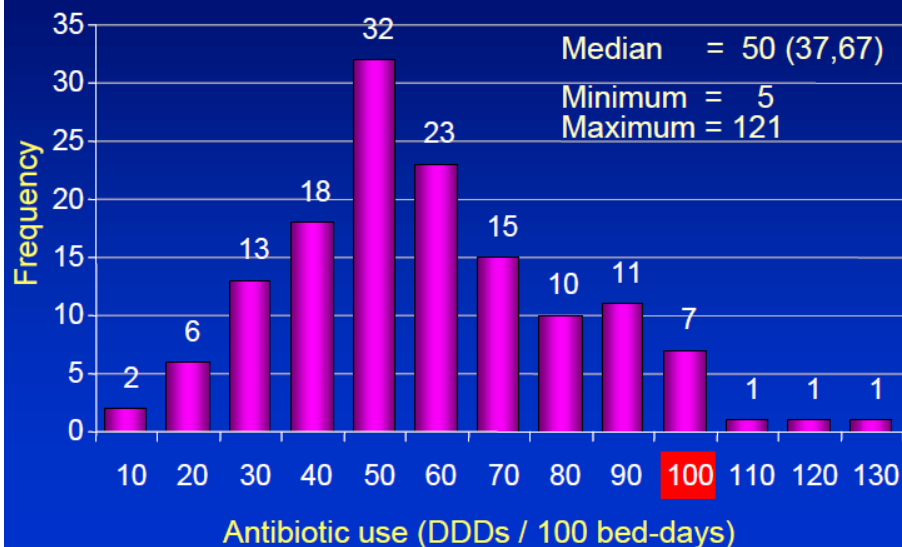


Fiona M. MacKenzie

Aberdeen Royal Infirmary, Scotland

Antibiotic consumption in the hospital

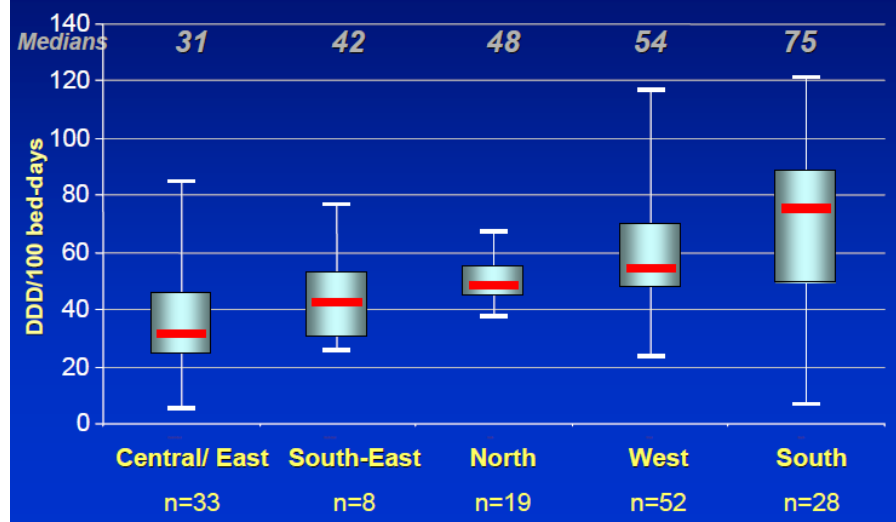
Antibiotic use data: Distribution (n = 140) 2005



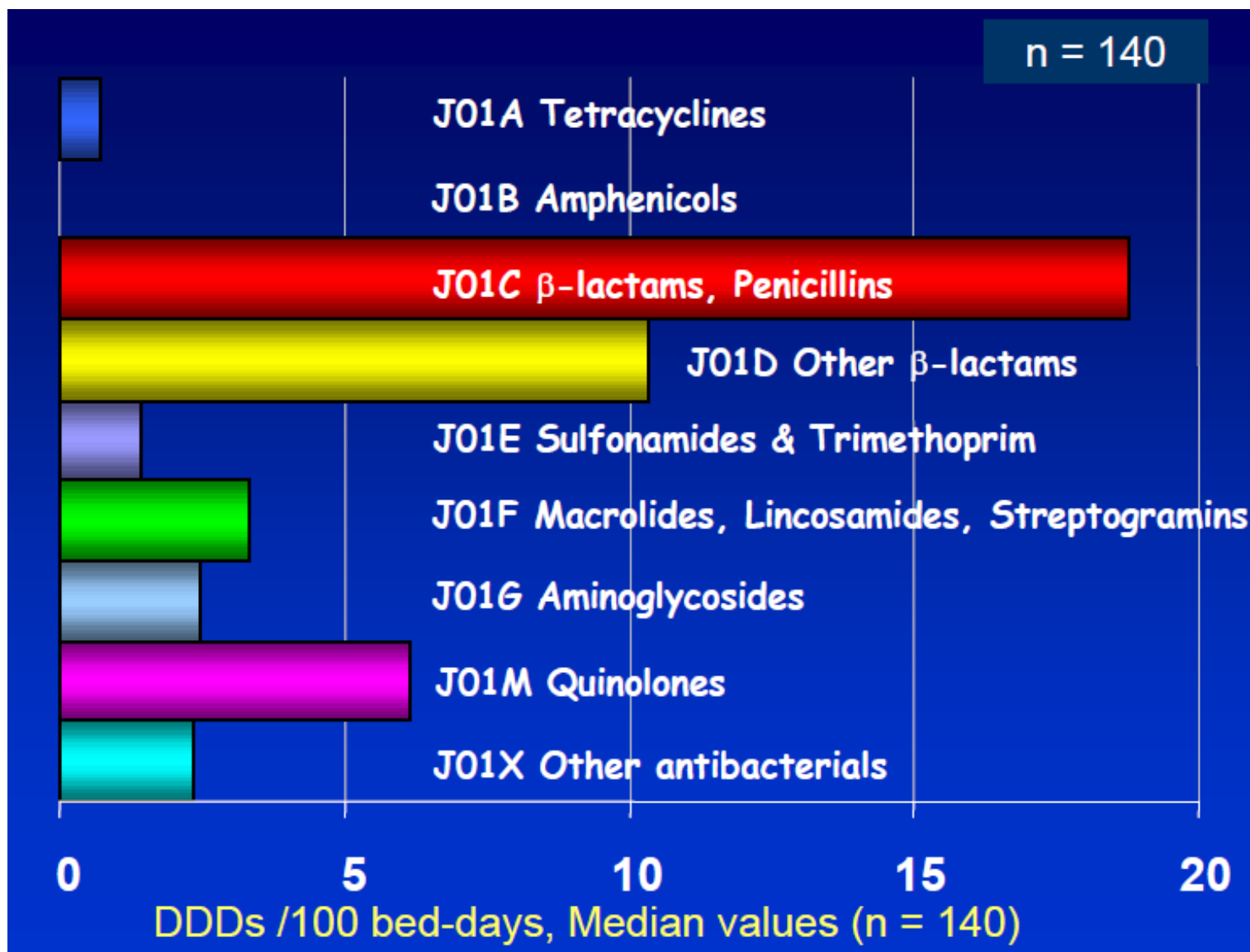
Median total antibiotic use: 2001

By Geographical Region, n = 140

$p < 0.001$

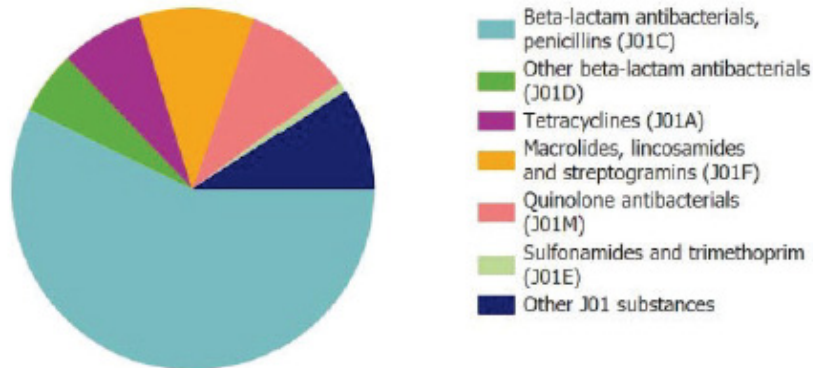


Antibiotic consumption in the hospital

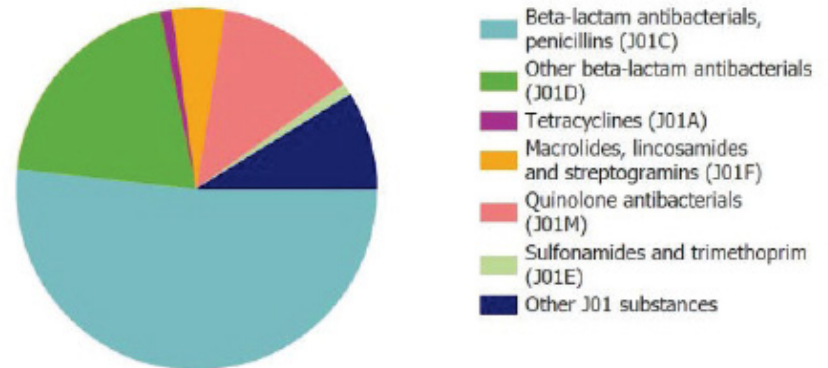


Distribution of antibiotic use

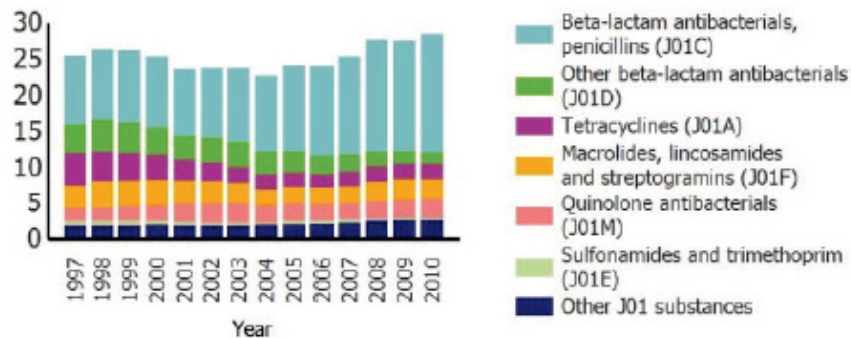
Distribution of the consumption in the community (primary care sector) of ATC group J01



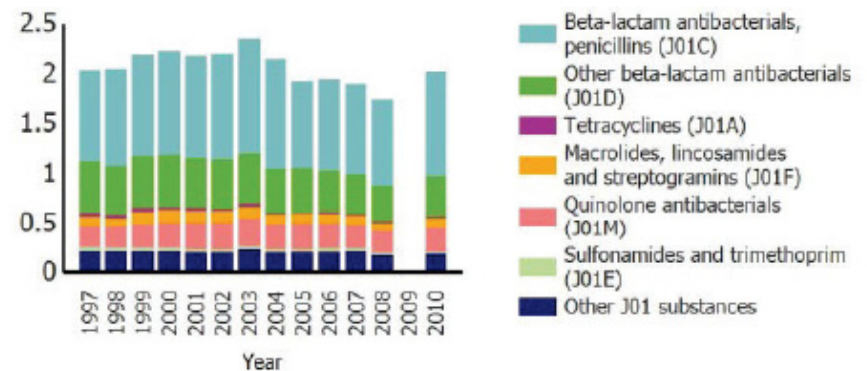
Distribution of the consumption in the hospital sector of ATC group J01



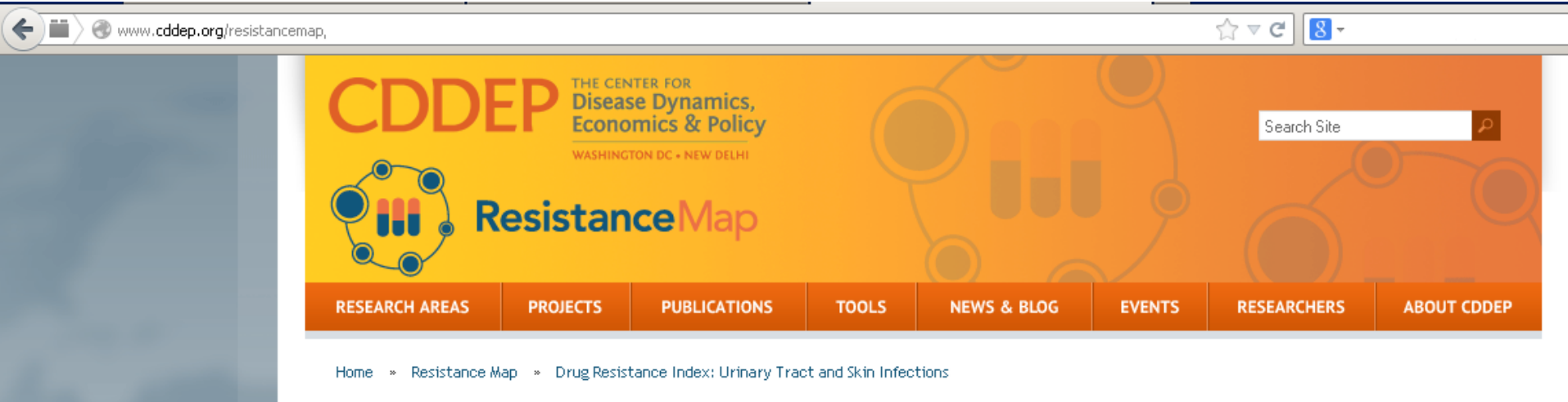
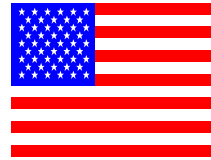
Trend of the consumption in the community (primary care sector) of ATC group J01 expressed in DDD per 1000 inhabitants and per day



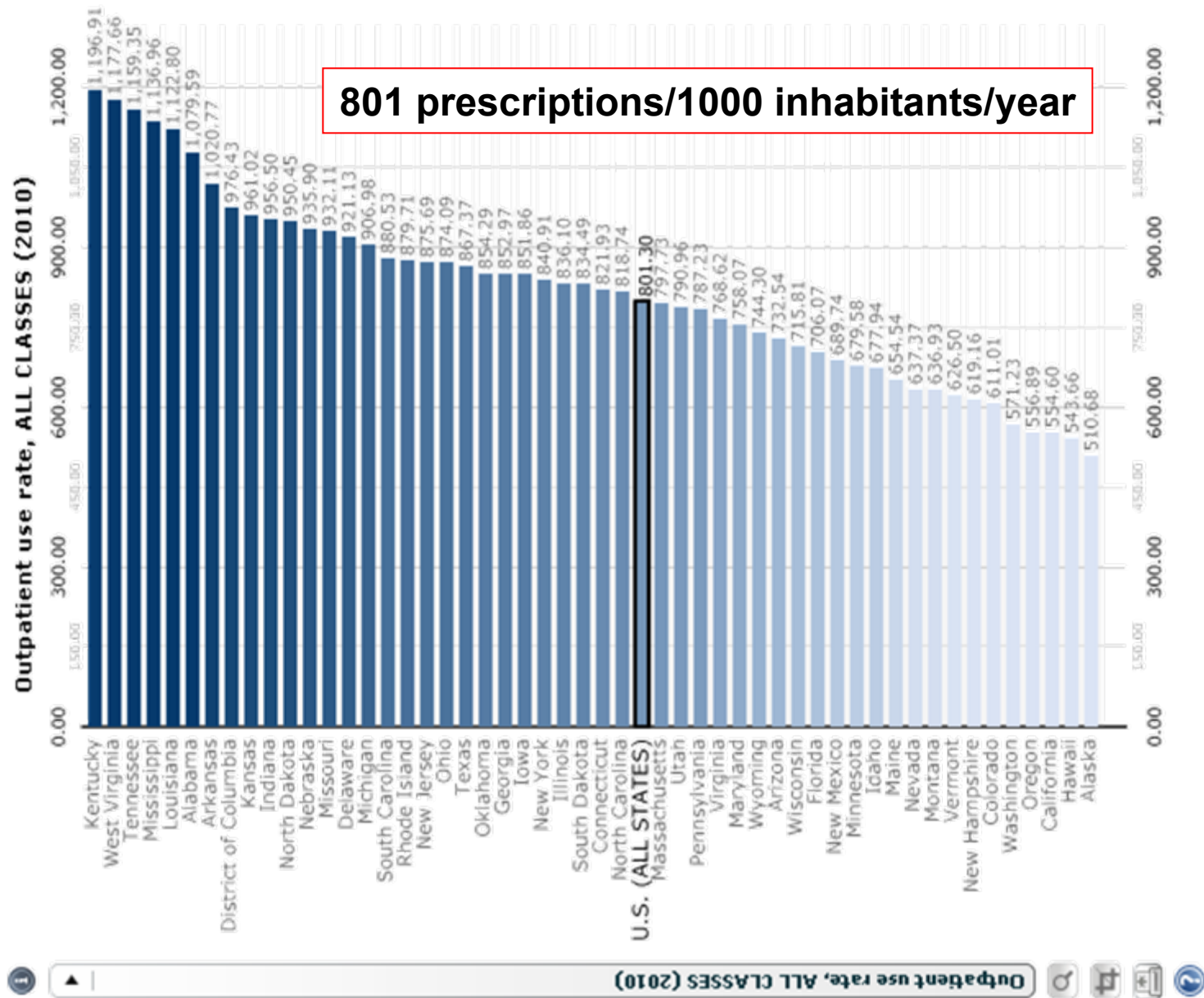
Trend of the consumption in the hospital sector of ATC group J01 expressed in DDD per 1000 inhabitants and per day



Antibiotic consumption in the USA



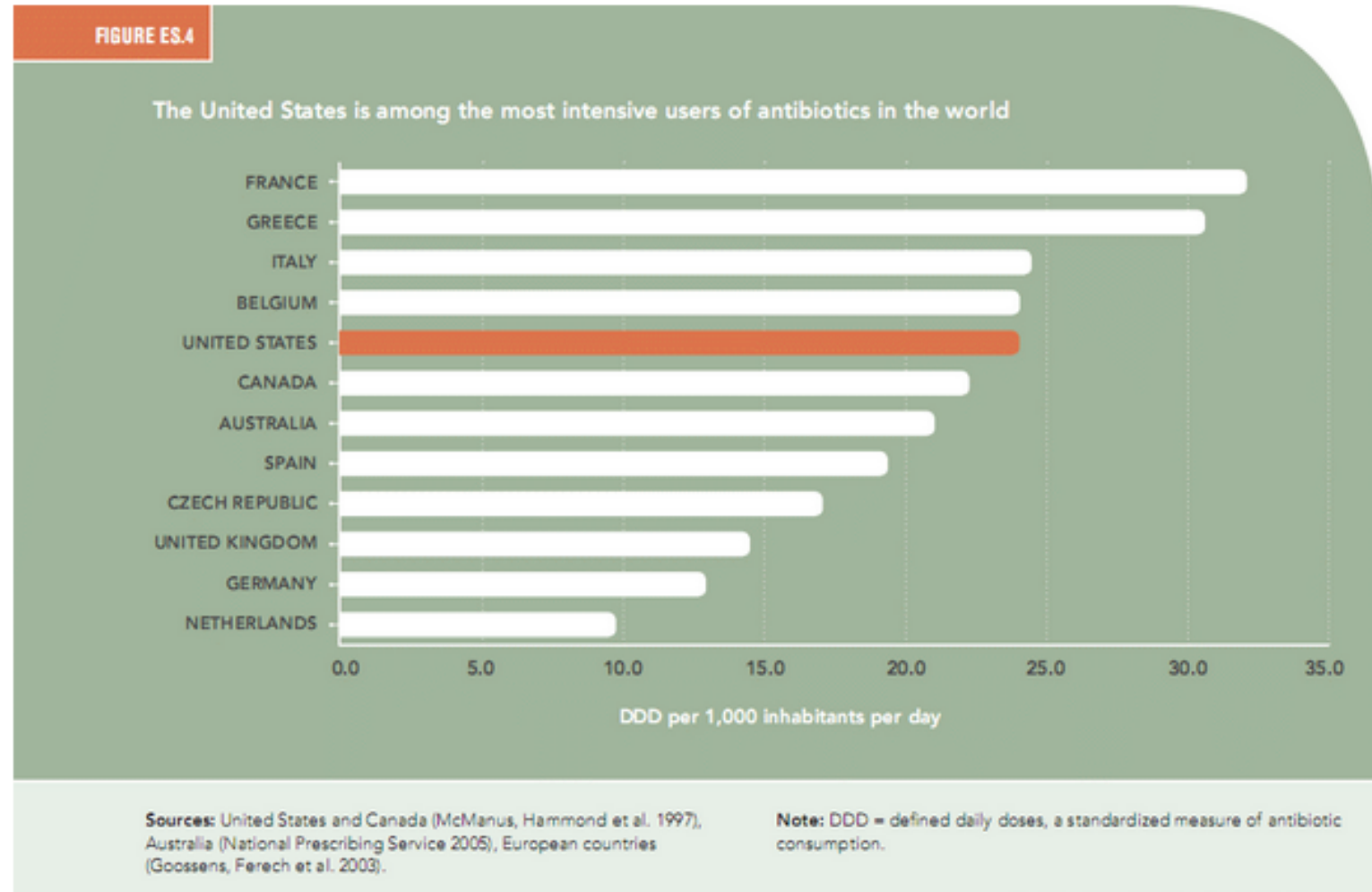
Antibiotic consumption in the community



Comparison with other countries

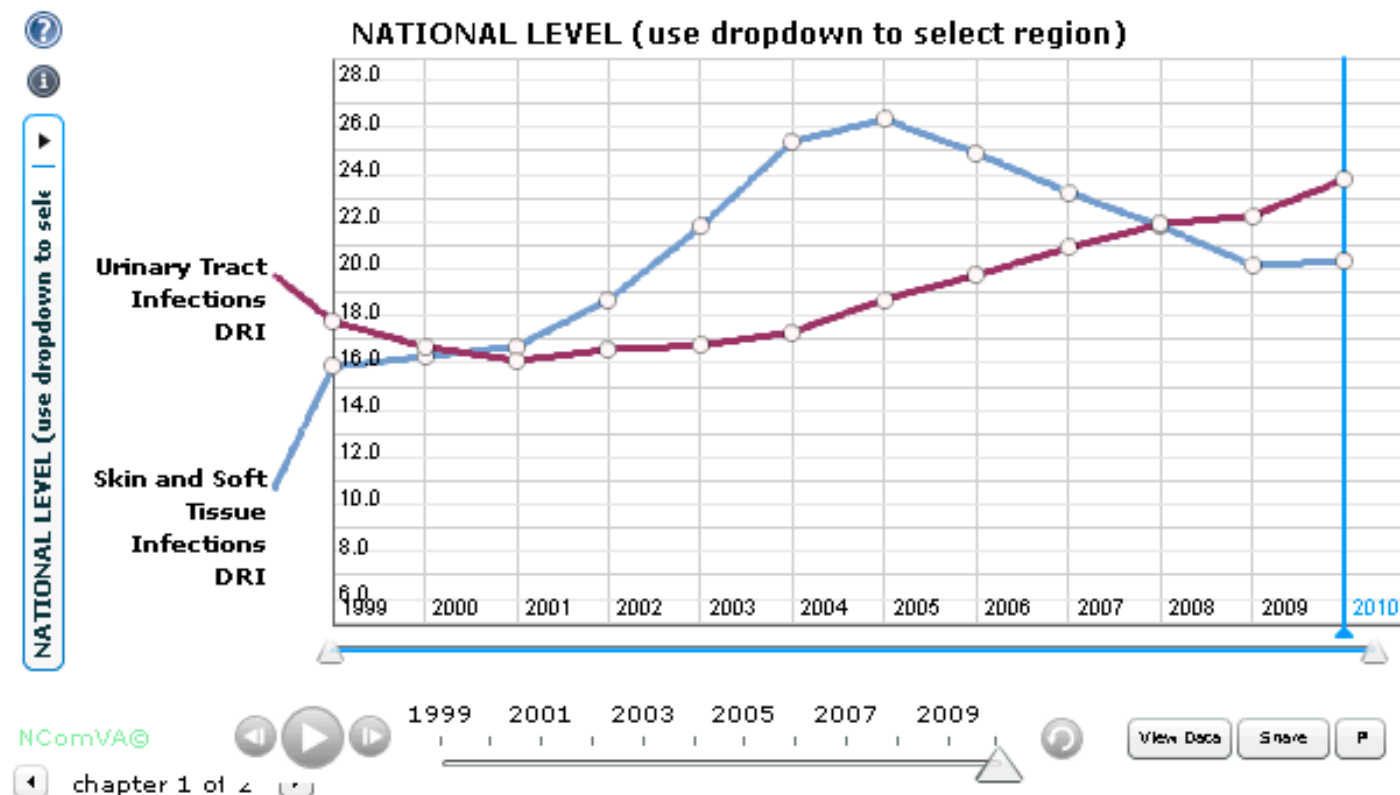
Type: Graphic

Publications: Extending the Cure: Policy Responses to the Growing Threat of Antibiotic Resistance



Index of resistance in the community

DRUG RESISTANCE INDEX FOR UTIs AND SSTIs



Between 1999 and 2010, the Urinary Tract Infection Drug Resistance Index (UTI-DRI) increased by 35%. Following an initial decline from a baseline of 16.8 in 1999 to 15.1 in 2001, the UTI-DRI increased steadily for eight years, reaching 22.8 in 2010.

In contrast, the Skin and Soft Tissue Infection DRI (SSTI-DRI) increased sharply (~70%) in the beginning of the period, but has been declining since 2005. After 2008-2009, the two indices have been diverging, with SSTI-DRI showing lower values and declining.

Antibiotic consumption in the hospital

An example for selected antibiotics...

Comparison of aggregate drug use by defined daily dose (DDDs) per 1000 patient-days and days of therapy (DOTs) per 1000 patient-days for 10 common antibacterial drugs.

Parenteral antibiotic	No. of hospitals	Mean DDDs per 1000 patient-days \pm SD	Mean DOTs per 1000 patient-days \pm SD	P	Mean difference between DDD and DOT, %	Importance of the mean difference ^a	DDD, g/day ^b	Mean administered daily dose, g/day
Cefazolin	130	80.3 \pm 35.4	94.3 \pm 27.7	<.0001	-17.4	Moderate	3	2.46
Levofloxacin	123	75.6 \pm 57.5	74.9 \pm 55.8	.3	0.7	Minor	0.5	0.51
Gatifloxacin	53	56.5 \pm 67.9	52.1 \pm 48.6	.4	7.9	Moderate	0.4	0.42
Ceftriaxone	130	44.9 \pm 28.2	62.9 \pm 35.9	<.0001	-28.6	Major	2	1.46
Vancomycin	130	46.1 \pm 39.0	52.7 \pm 26.6	.013	-6.6	Moderate	2	1.63
Piperacillin-tazobactam	127	30.3 \pm 20.3	42.7 \pm 28.5	<.0001	-40.9	Major	14	10.1
Metronidazole	126	28.1 \pm 14.3	32.8 \pm 15.4	<.0001	-7.0	Moderate	1.5	1.32
Azithromycin	130	20.8 \pm 17.1	18.0 \pm 14.8	<.0001	13.4	Moderate	0.5	0.55
Ciprofloxacin	123	18.0 \pm 22.1	13.5 \pm 16.3	<.0001	24.9	Moderate	0.5	0.72
Clindamycin	129	21.7 \pm 12.5	22.3 \pm 10.8	.23	-2.8	Minor	1.8	1.79

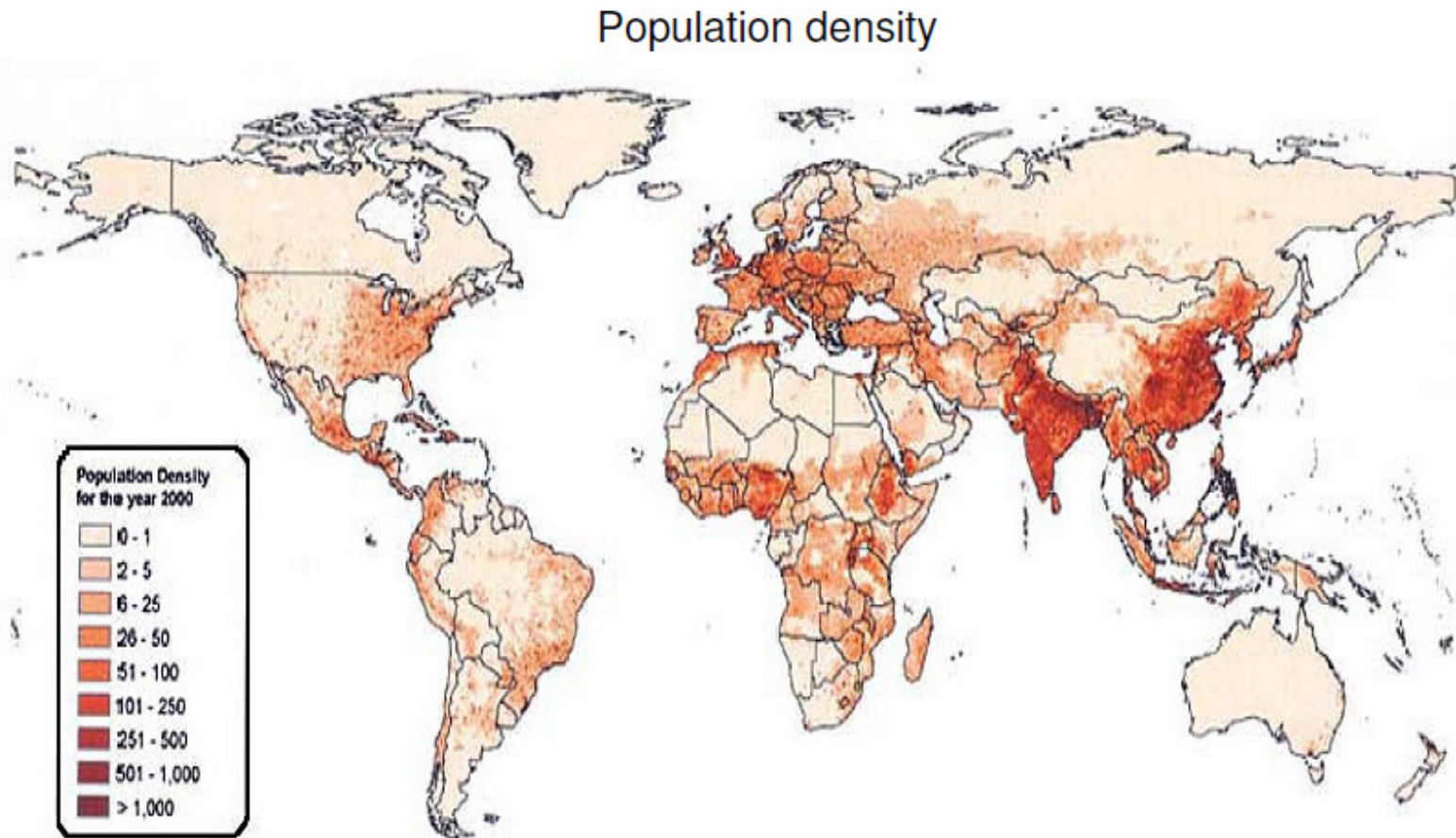
NOTE. The larger the difference between the administered daily dose and the DDD, the larger the difference in the measure of aggregate use by DDDs per 1000 patient-days and DOTs per 1000 patient-days.

^a Major (>25% difference), moderate (>5% and <25% difference), and minor (<5% difference) importance.

^b World Health Organization-defined DDD (2005 values [10]).

same order of magnitude as in Europe

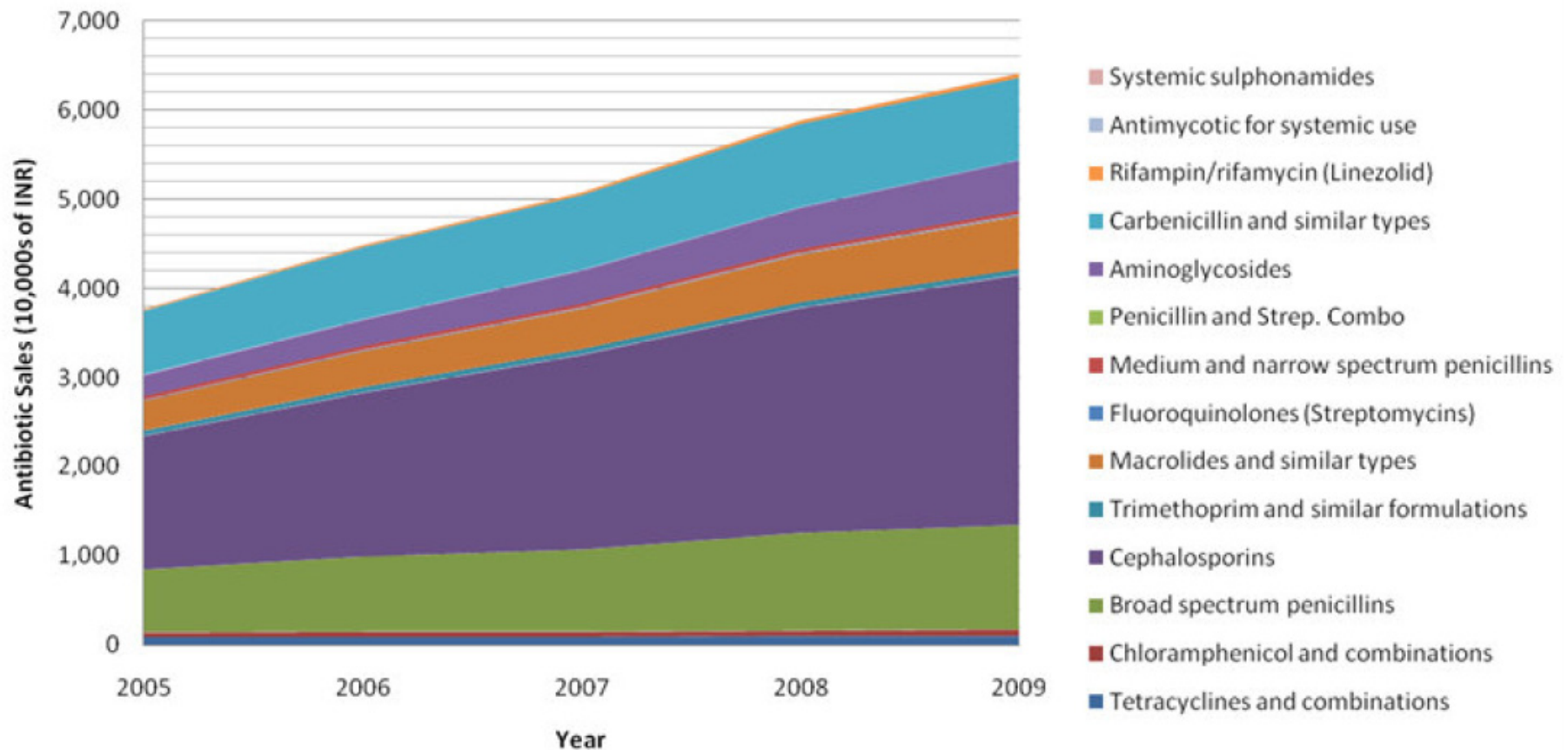
Antibiotic consumption in Asia



Large population → high pressure

Sales increase rapidly ...

Antibiotic Sales in India by Type



What about Vietnam ?

SITUATION ANALYSIS

Antibiotic Use and Resistance in Vietnam

The GARP- Vietnam National Working Group

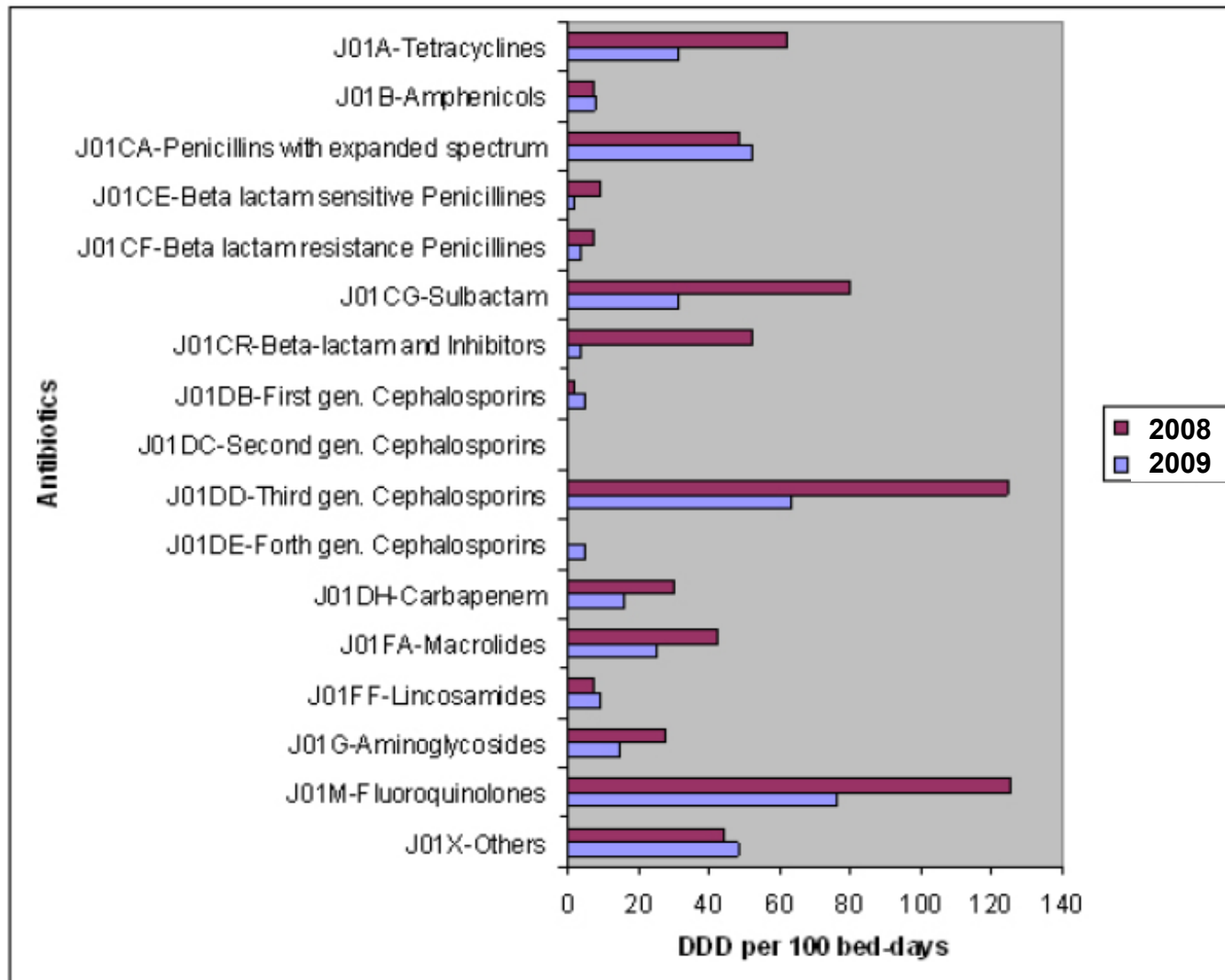
Dr. Nguyễn Văn Kính, Chairman

October 2010

CDDEP THE CENTER FOR
Disease Dynamics,
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WASHINGTON DC • NEW DELHI

Consumption in the hospital

DDD per 100 bed-days of Antibiotics in 2008-2009



Variations among hospitals

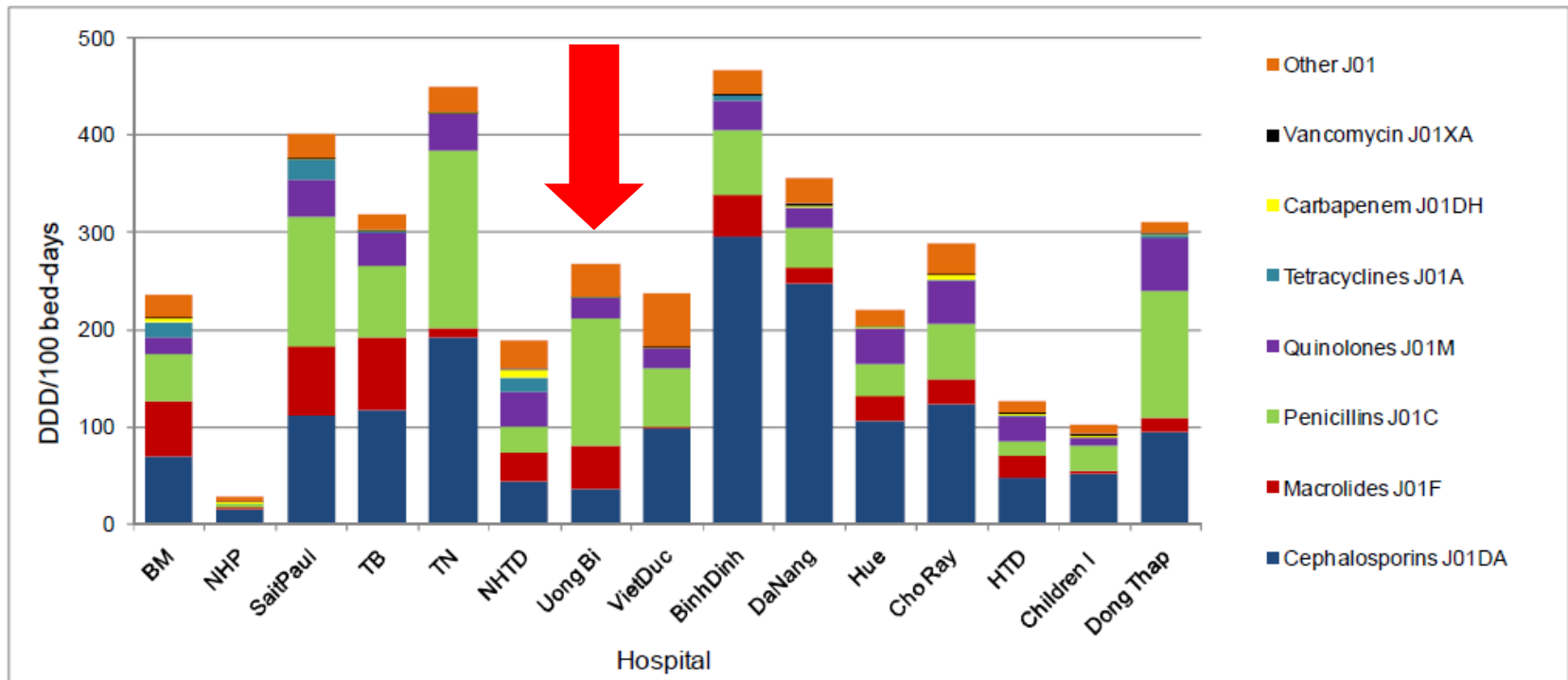
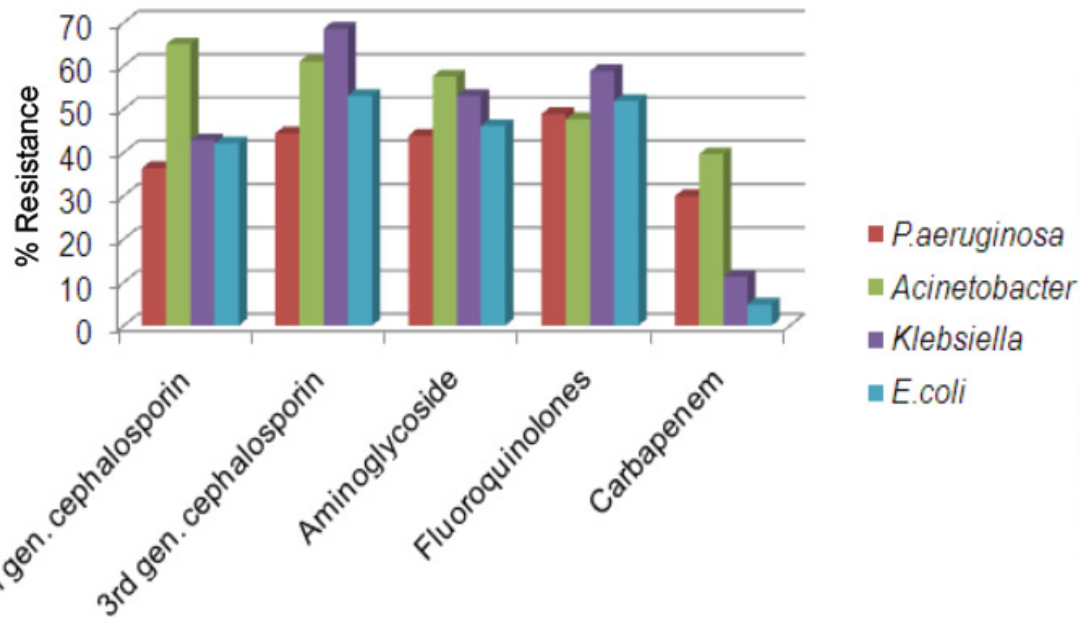


Figure 2. Total antibiotic consumption for systemic use (J01) by ATC class in 15 hospitals in Vietnam in 2008

Reminder: European median : 50 DDD/100 beds

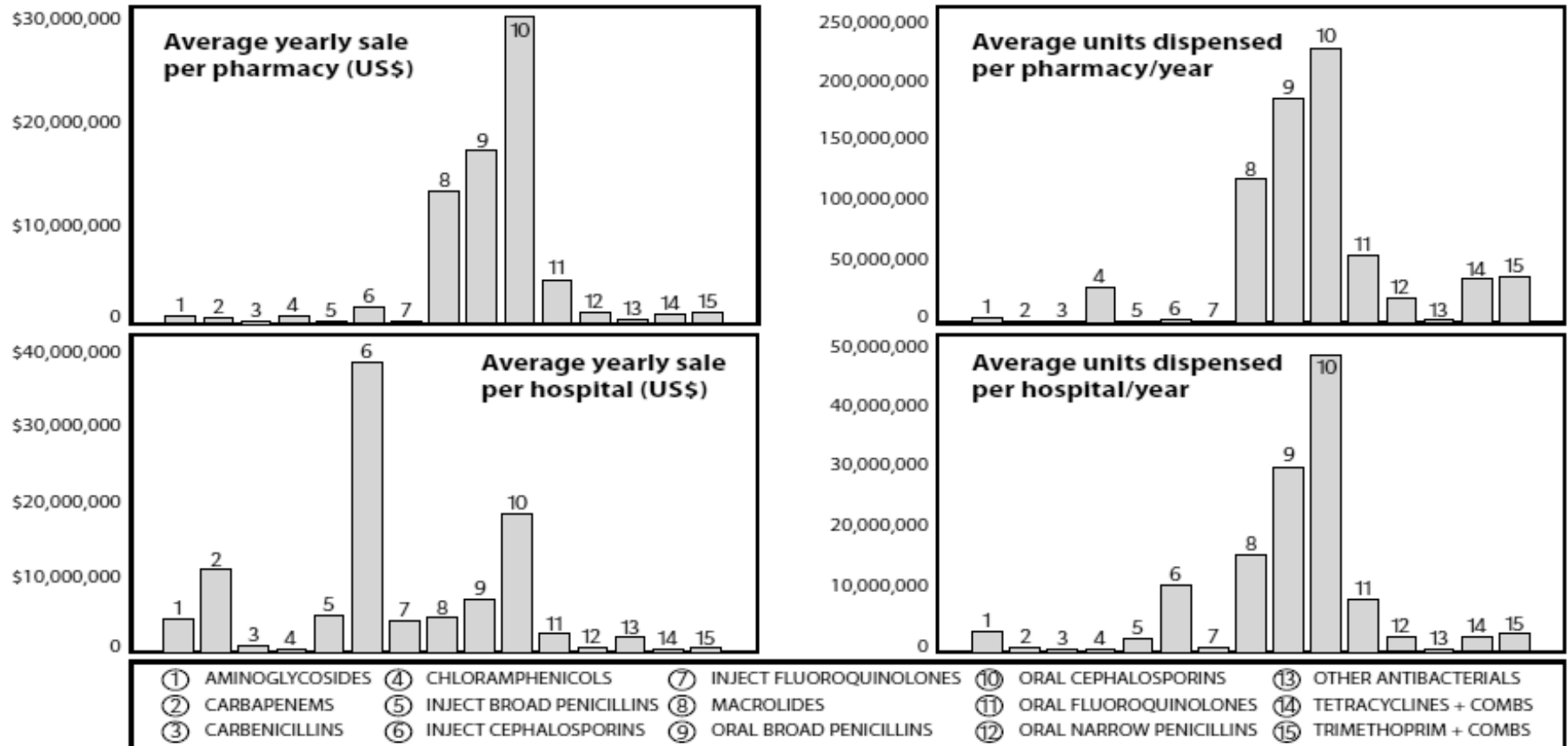
Link between consumption and resistance

Resistance to Antibiotics to 4 Common Gram-negative Bacteria



Hospital vs. community

Sales of antibiotics in Vietnam

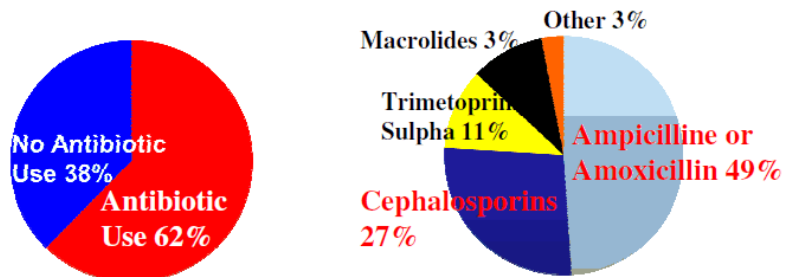


Vietnam: 90 Mio inhabitants : 2.8 units/inhab. [commun.]; 0.6 units/inhab [hosp.]
 Belgium: 11 Mio inhabitants: 0.03 DDD/inhab [commun.]; 0.003 DDD/inhab [hosp.]

Use in children in the community



AB use children during one month

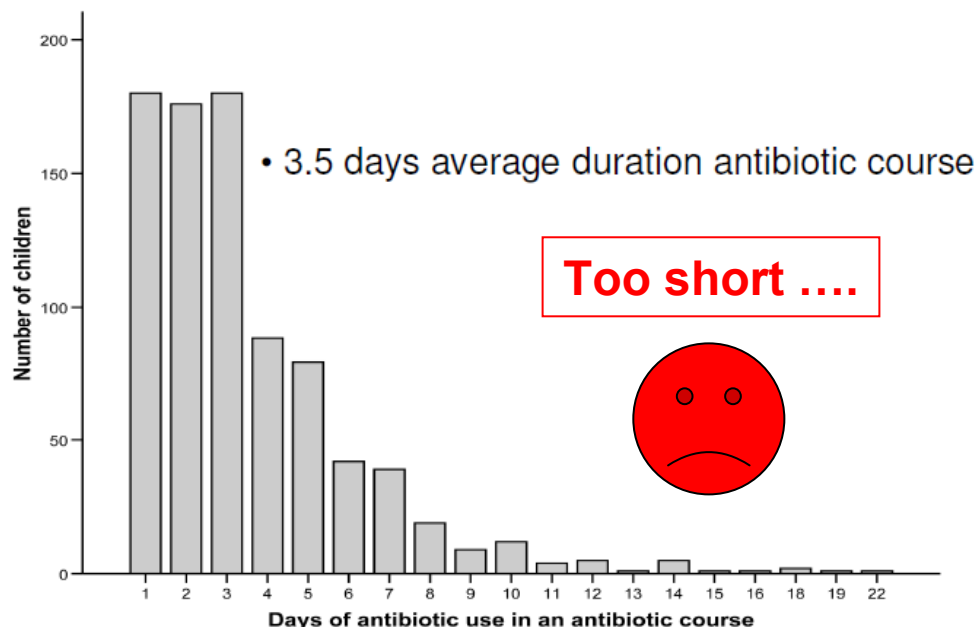


Source antibiotics:

Self treatment	16%
Drug store	30%
Private clinic	24%
Public clinic	31%

Source: QH Nguyen 2010

Too much



Too short



Antibiotics in the community

Pharmacy study



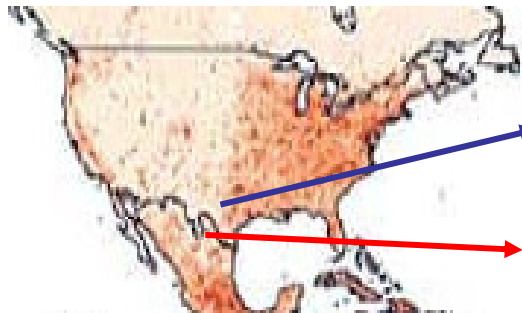
Antibiotic purchase and dispensing behaviour

Customer	<i>Urban</i>		<i>Rural</i>	
	n	%	n	%
Buy antibiotic	440	34,0	255	39,1
With prescription	41	9,3	5	2,0
- <i>Comply with prescription</i>	33	80,5	4	80,0
- <i>Dont comply with prescription</i>	8	19,5	1	20,0
Without prescription	399	90,7	250	98,0
- <i>Customer demand</i>	175	43,9	186	74,4
- <i>Drug seller advice</i>	224	56,1	64	25,6

**Not allowed in EU
or USA**

Is patient's pressure a problem ?

A study at the Mexican-American border



Prescription only

No prescription

**Americans are ready to travel
to get « free » antibiotics**

	USA resident (n=109)	Mexican resident (n=121)
Total number of products purchased	157	154
Average number of medicines purchased per client \pm SD	1.4 \pm 0.74	1.3 \pm 0.55
% products purchased with prescription	29	58
% antibiotics purchased with prescription	25	50
% antibiotics purchased without prescription that were self-prescribed	83	56
% antibiotics purchased without prescription recommended by professional	4	0
% antibiotics purchased without prescription recommended by pharmacy clerk	13	44
Characteristics of the end user of the products purchased	(n=153)	(n=157)

How to improve the situation : a European view

- in the community: { antibiotics on prescription only
education of pharmacists
education of the public on appropriate use

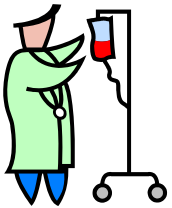


How to improve the situation : a European view

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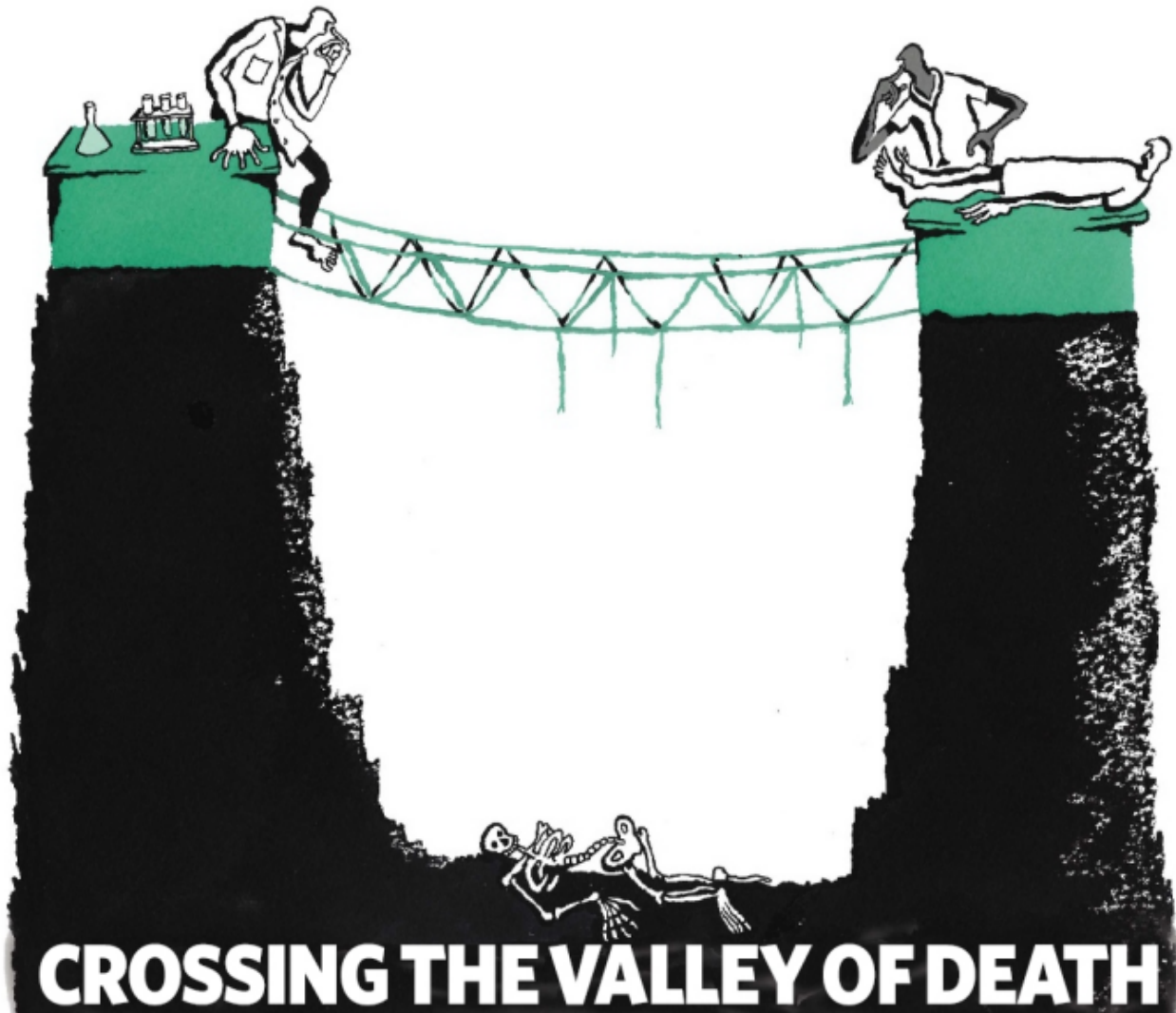


- in the hospital: antibiotic/infection control committees in hospitals



- to develop local guidelines
- to evaluate consumption
- to survey resistance
- to set up preventive measures (hygiene, isolation, prophylaxis)

Need of close collaboration between clinicians and microbiologists



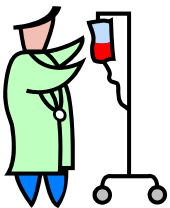
Nature (2008) 453:840-842

How to improve the situation : a European view

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- to develop local guidelines
- to evaluate consumption
- to survey resistance
- to set up preventive measures (hygiene, isolation, prophylaxis)

- at the level of the country: collect epidemiological data
collect consumption data
propose treatment guidelines taking into account
local epidemiology



Recommendations from the GRAP for improving situation in Vietnam

OPPORTUNITIES FOR CONTROLLING ANTIBIOTIC RESISTANCE

Policy option	Action
Antibiotics are prescription only drugs.	Develop national action plan for antibiotic resistance.
Make antibiotics prescription-only	Enforce current law.
Make hospitals' drug and therapeutics committee effective	Enforce requirement for committees, define their functions and standards, and develop audit mechanisms. Give committees tools and guidance on antibiotic stewardship. Provide up-to-date, accurate resistance data.
Establish infection-control committees in hospitals	Give committees sufficient resources to carry out their activities and improve infrastructure. Establish standardized indicators to monitor progress, such as hospital-acquired infection rates by department and hand-washing compliance.
Track national antibiotic resistance	Develop national testing and quality control guidelines. Fund resistance testing, quality control, training, and reporting. Issue annual national report on both antibiotic use and resistance.
Monitor antibiotic use in hospitals	Standardize antibiotic usage indicators to international units (e.g., defined daily dosage per 100 bed-days). Issue annual national report on both antibiotic use and resistance
Develop curriculum for medical and pharmacy schools	Teach and train professionals on antibiotic resistance and appropriate antibiotic use.
Develop treatment guidelines	Ensure timely and evidence-based updates of treatment guidelines for infectious diseases.
Establish pharmacovigilance center	Engage pharmacovigilance center in curbing inappropriate antibiotic prescribing.
Conduct public education campaign	Create awareness and educate Vietnamese public about appropriate and inappropriate antibiotic use.



You are in the right direction !