Global Antibiotic Resistance Partnership

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

Antimicrobial resistance surveillance and control programs

What can we learn?

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Surveillance programs

- Antimicrobial resistance surveillance

  EARSS, ANSORP, BSAC, Alexander, MYSTIC, SENTRY, NARMS

- Antimicrobial consumption surveillance

  ESAC, …

  - Hospital / Community based
  - Local/regional/national/international
  - Driven by public health, professional, commercial stakes

Surveillance programs

- Indicator microorganisms
- Indicator antimicrobial agents
- Standardized and validated methods for testing, data collection, data collation (web based), analysis and reporting
- Routinely generated data
- Quality assurance

European Antimicrobial Resistance Surveillance System (EARSS)

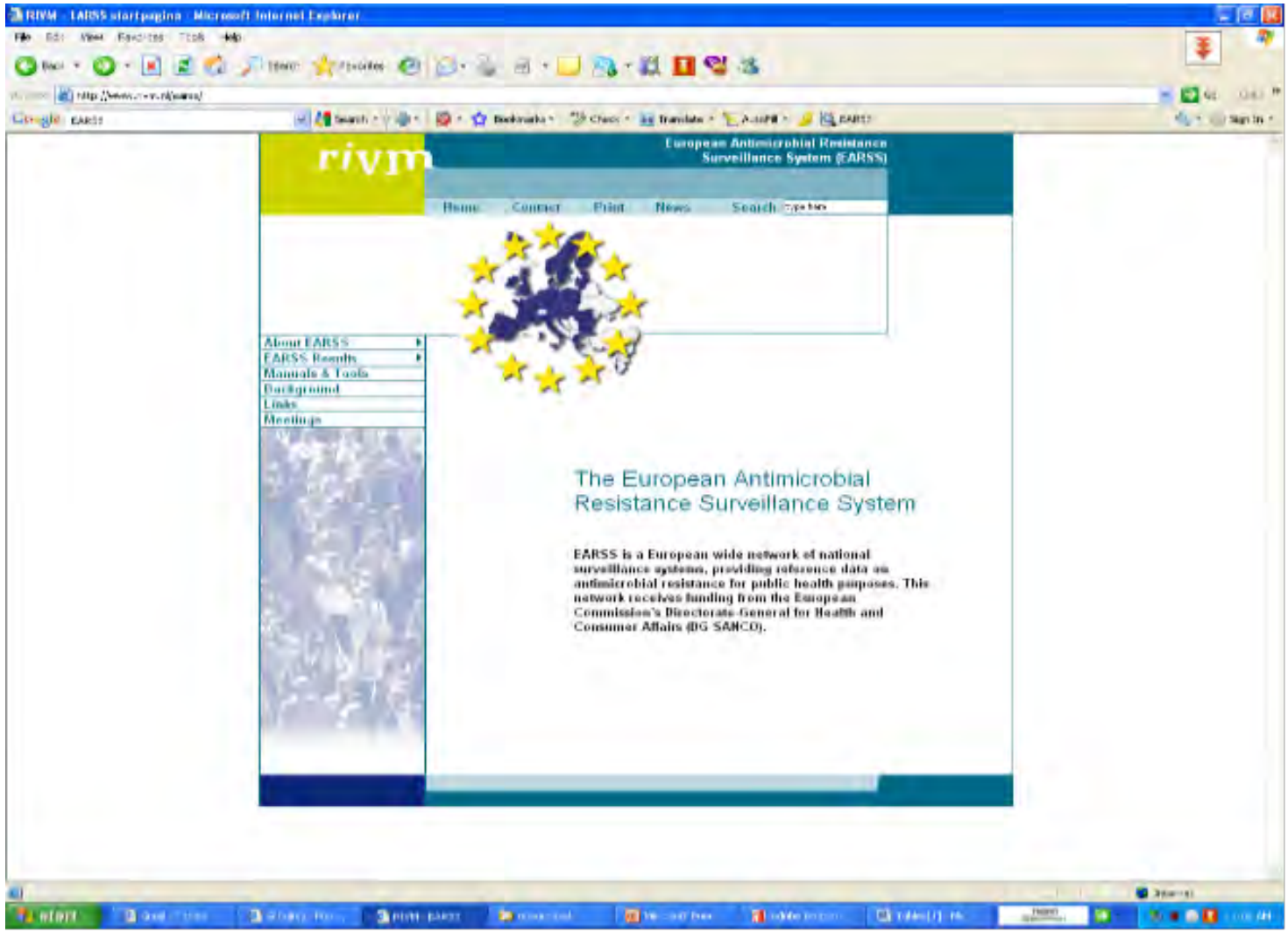
- collect comparable and validated AMR data;
- analyse trends in time and place;
- provide timely AMR data that constitute a basis for policy decisions;
- provide feedback to 'those who need to know';
- encourage the implementation, maintenance and improvement of national AMR surveillance programmes;
- supports national systems in their efforts to improve diagnostic accuracy at every level of the surveillance chain;
- link AMR data to factors influencing the emergence and spread of AMR, such as antibiotic use data; and
- initiate, foster and complement scientific research in Europe in the field of AMR.

EARSS: international network of national surveillance systems

- Funded by European Centre for Disease Prevention and control (ECDC) and Dutch Ministry of Health

- Ongoing system monitoring resistance in
  - *S. pneumoniae, S. aureus, enterococci*
  - *E. coli, K. pneumoniae, P. aeruginosa*

Austria	AT	Italy	IT
Belgium	BE	Latvia	LV
Bosnia and Herzegovina*	BA	Lithuania	LT
Bulgaria	BG	Luxembourg	LU
Croatia	HR	Malta	MT
Cyprus	CY	Netherlands	NL
Czech Republic	CZ	Norway	NO
Denmark	DK	Poland	PL
Estonia	EE	Portugal	PT
Finland	FI	Romania	RO
France	FR	Slovenia	SI
Germany	DE	Spain	ES
Greece	GR	Sweden	SE
Hungary	HU	Switzerland*	CH
Iceland	IS	Turkey	TR
Ireland	IE	United Kingdom	UK
Israel	IL		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European Antimicrobial Resistance Surveillance System (EARSS)
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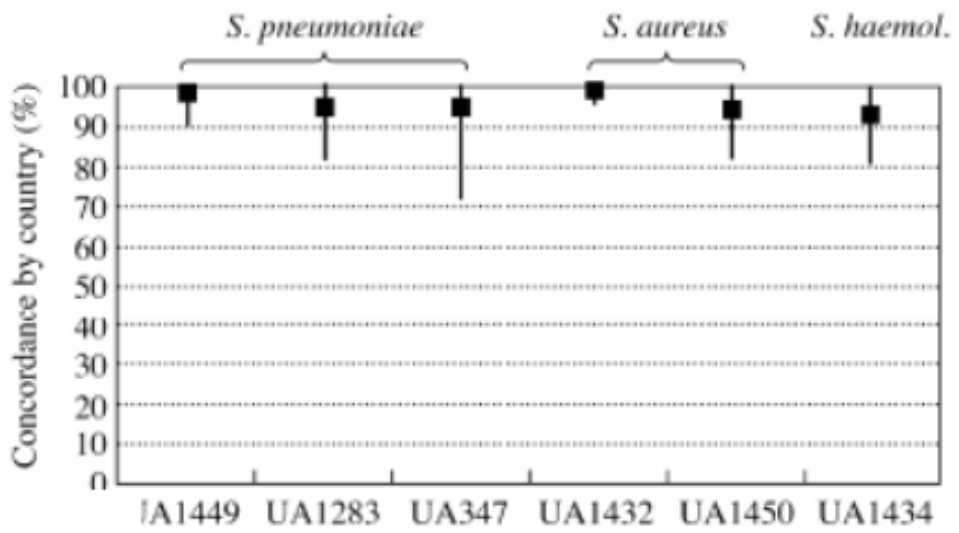
The European Antimicrobial Resistance Surveillance System
EARSS is a European wide network of national surveillance systems, providing reference data on antimicrobial resistance for public health purposes. This network receives funding from the European Commission's Directorate-General for Health and Consumer Affairs (DG SANCO).

Lack of European agreement on breakpoint criteria: QA of AST in EARSS network

Concordance of antimicrobial test results for 433 laboratories in 23 countries



The average and the range across countries of the concordance of antimicrobial test results, specified for every control strain. *S. haemol.* = *S. haemolyticus*.

European Surveillance of Antimicrobial Consumption (ESAC)

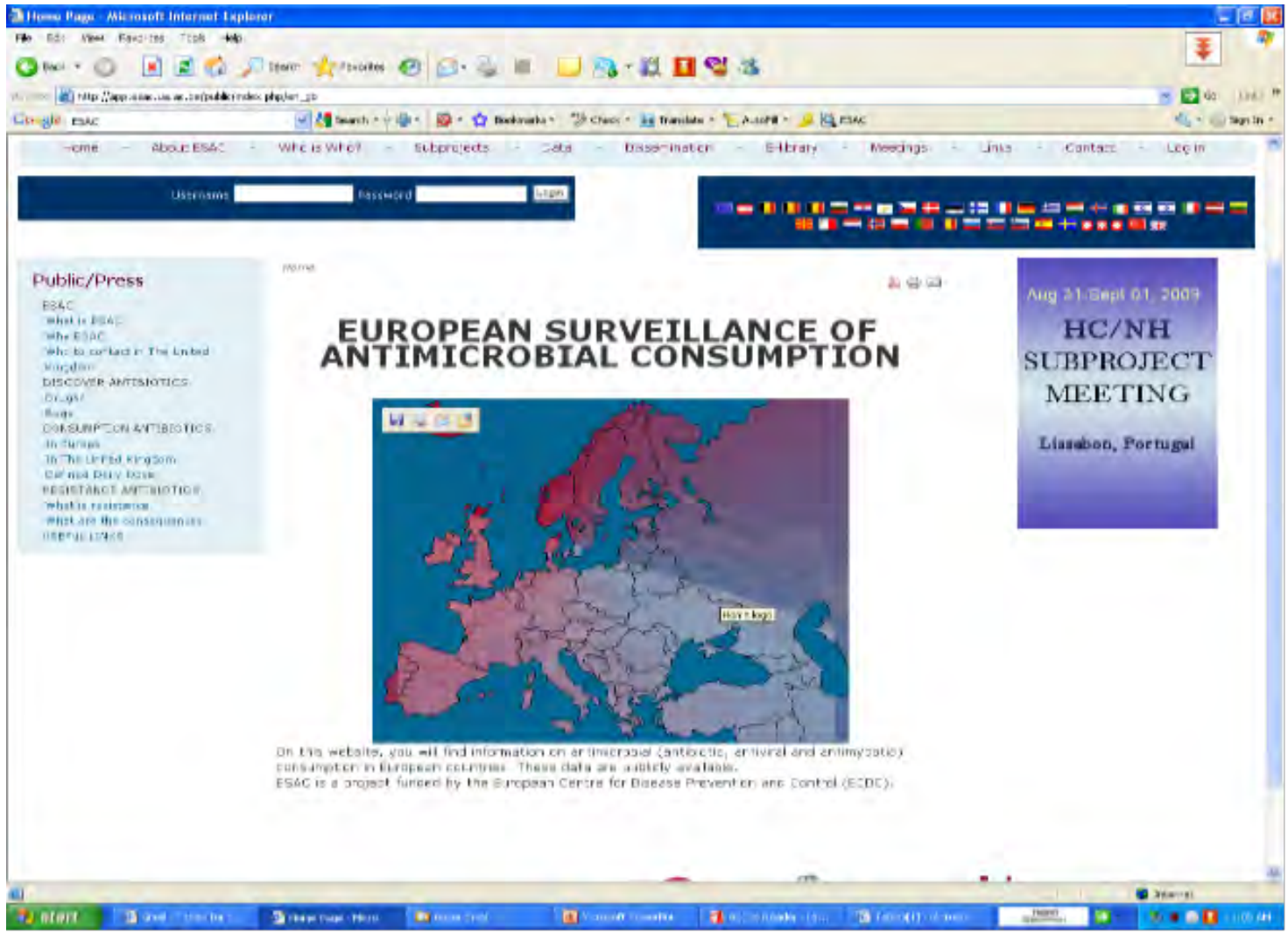
- To ensure the continuous collection of comprehensive antimicrobial consumption data from ambulatory and hospital care
- Develop health indicators for ab use
- Provide evidence based guidelines and education tools to manage risk of infections and ab resistance

Network of national representatives

Data providers

Data collected at level of active substance using taxonomy of ATC classification system, expressed as defined daily doses (DDD)

Funded by ECDC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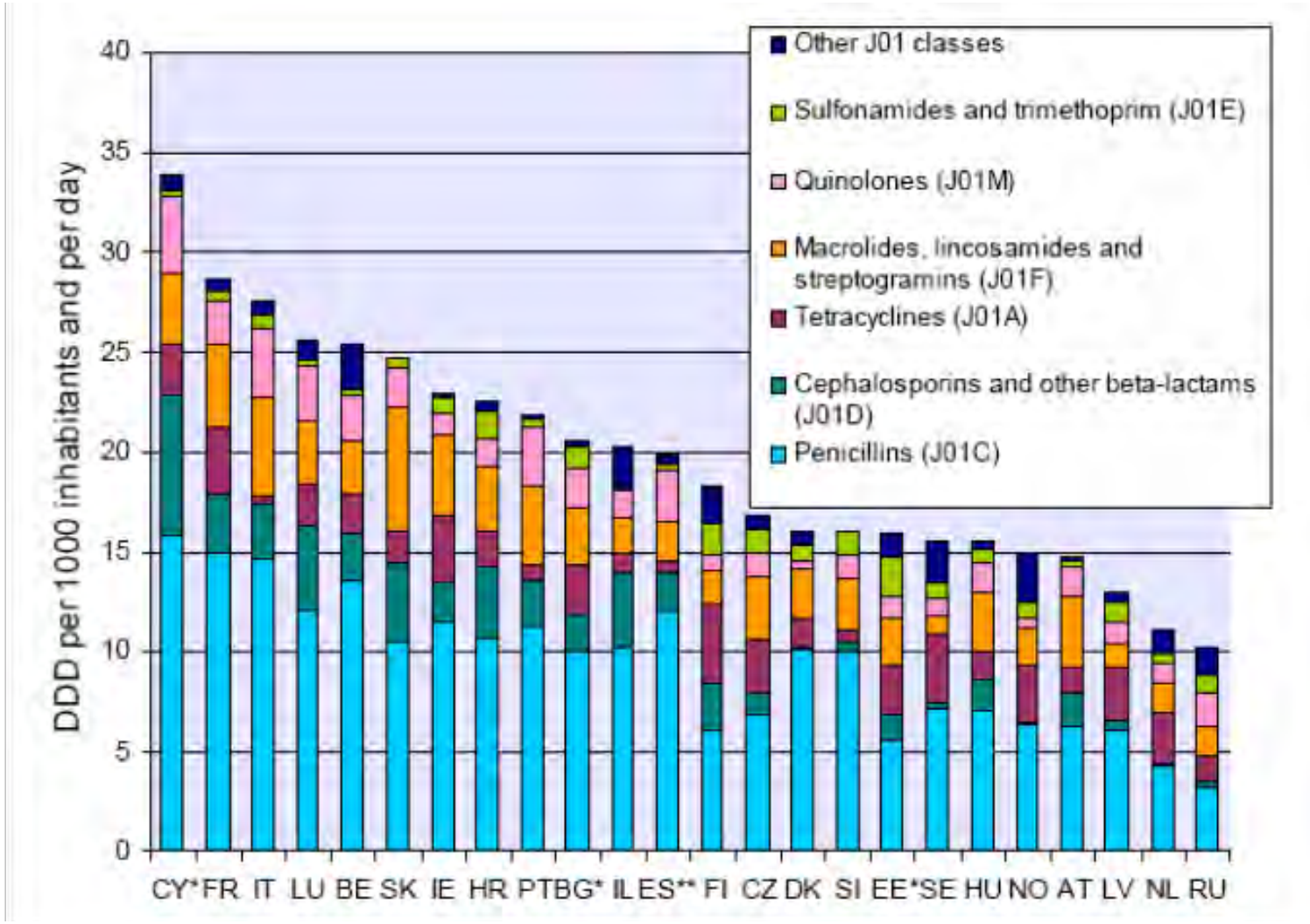
What is resistance
What are the consequences
Useful Links
EUROPEAN SURVEILLANCE OF ANTIMICROBIAL CONSUMPTION
Aug 31-Sept 01, 2009
HC/NH SUBPROJECT MEETING
Lisbon, Portugal
On this website, you will find information on antimicrobial (antibiotic, antiviral and antimycotic) consumption in European countries. These data are publicly available.
ESAC is a project funded by the European Centre for Disease Prevention and Control (ECDC).
start

Outpatient antibiotic usage in Europe

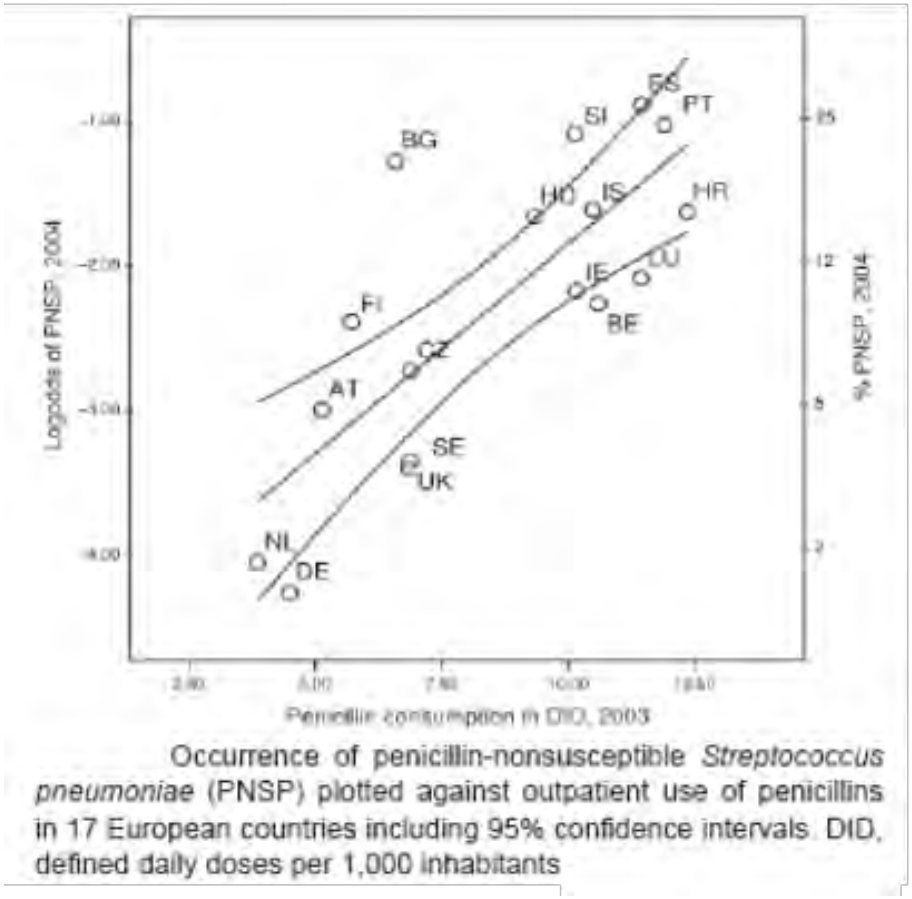


Outpatient antibiotic (J01) use in 2007 subdivided into the major antibiotic classes according to ATC classification

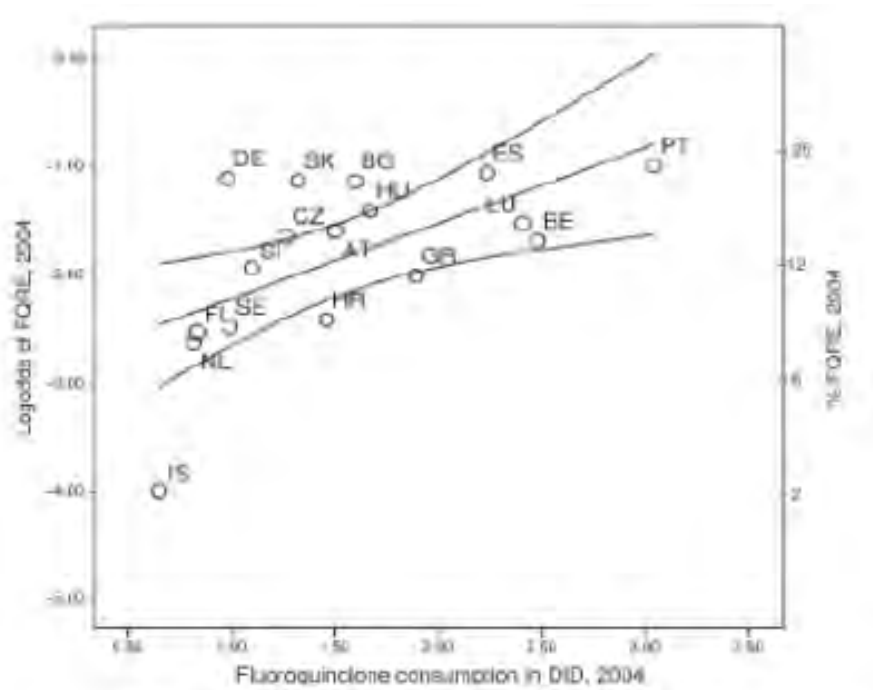
ESAC year book 2007

Occurrence of antimicrobial resistance is associated with antimicrobial usage

Data for primary blood culture isolates of *S. pneumoniae* and *E. coli*



Occurrence of penicillin-nonsusceptible *Streptococcus pneumoniae* (PNSP) plotted against outpatient use of penicillins in 17 European countries including 95% confidence intervals. DID, defined daily doses per 1,000 inhabitants



Occurrence of fluoroquinolone-resistant *Escherichia coli* (FQRE) plotted against outpatient use of fluoroquinolone antimicrobial agents in 17 European countries including 95% confidence intervals. DID, defined daily doses/1,000 inhabitants.

Seasonal variation of total outpatient antibiotic usage Europe

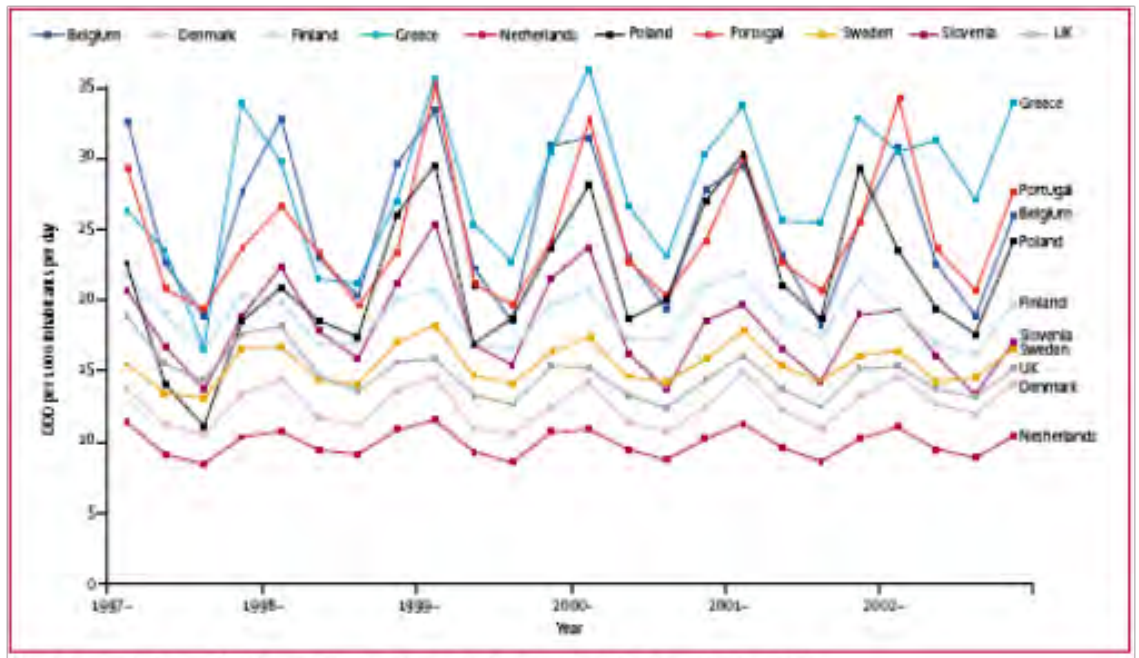


Figure 2: Seasonal variation of total outpatient antibiotic use in ten European countries between 1997 and 2002

Lancet 2005; 365: 579–87

Design of prevention strategies
Grounding studies in France

- Intensive education programs to optimize antibiotic usage can effect PNSP colonization
- Limited knowledge results in poor antibiotic prescription and treatment practice in physicians and patients

“Antibiotics aren’t automatic!”

- Aim: to increase awareness amongst physicians and public on good antibiotic practice
- Method: humoristic televised messages targeted at population likely to ask for antibiotics (young mothers, young workers, elderly), radio, newspaper, web site etc.
- Education campaign for health care workers
- Free rapid tests for diagnosing *S. pyogenes* tonsillitis
- Repeated every winter since 2002

Changes in antibiotic prescriptions

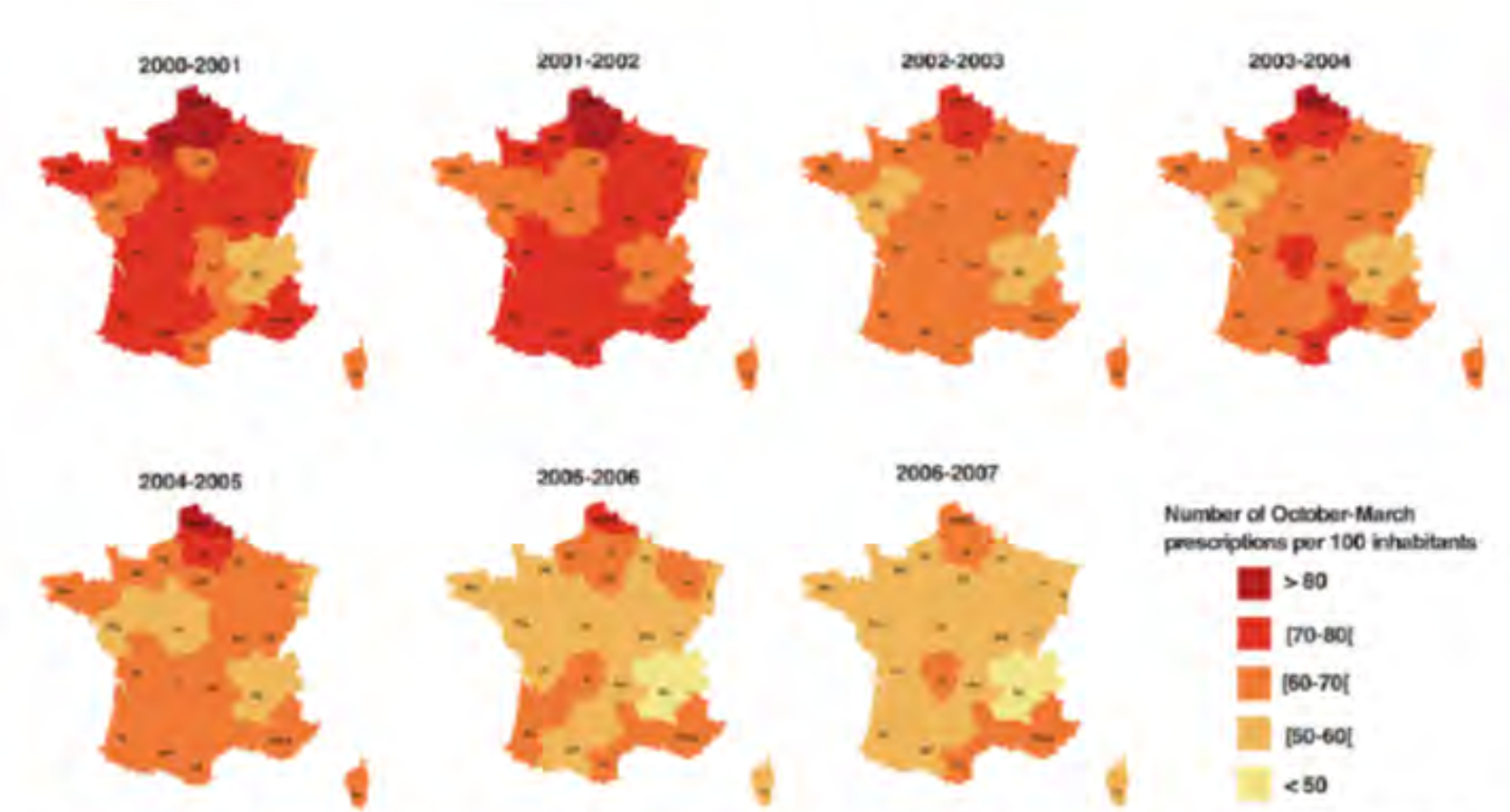
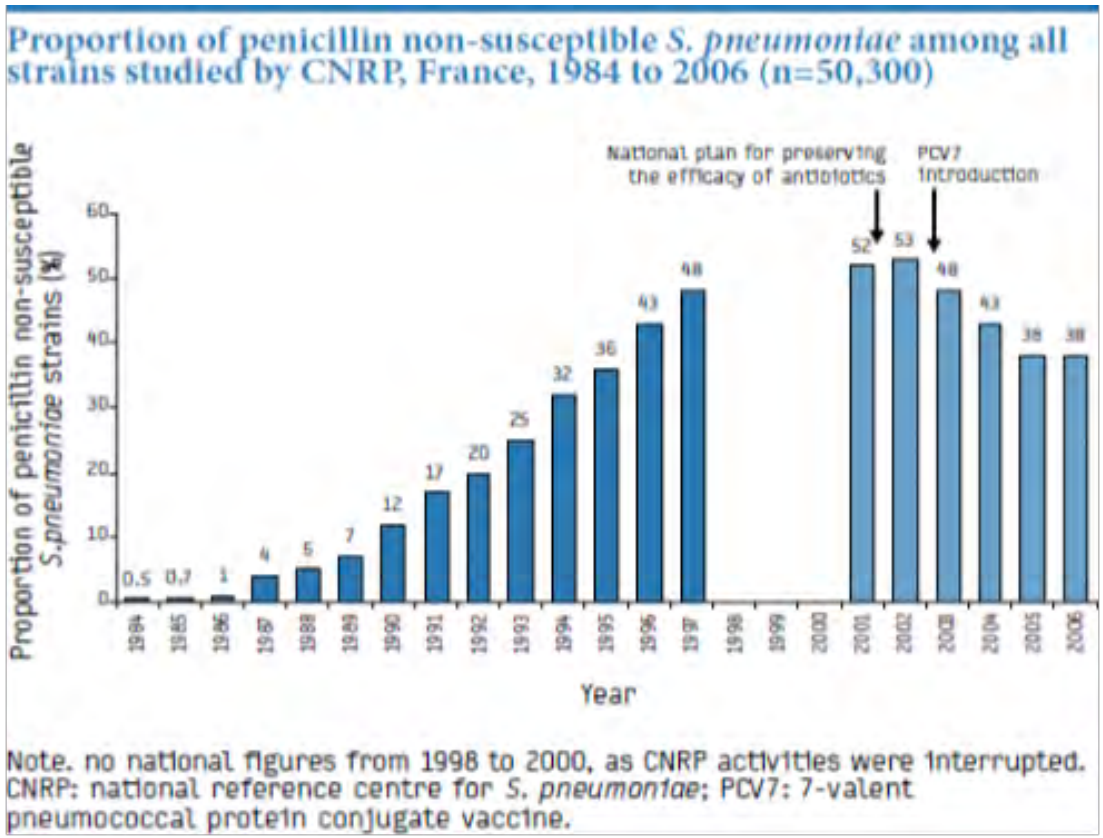


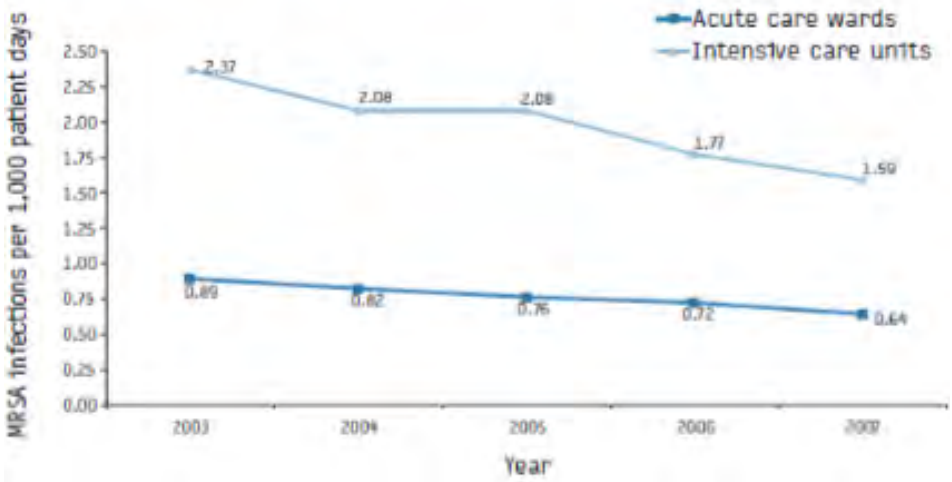
Figure 2. Winter antibiotic prescriptions in France by region, from October 2000 to March 2007. The number of October-March prescriptions is divided by the number of regional inhabitants for the respective year in each of 22 France's regions: Al (Alsace), Aq (Aquitaine), Auv (Auvergne), BN (Basse Normandie), Bou (Bourgogne), Br (Bretagne), CA (Champagne-Ardenne), Ce (Centre), Co (Corse), HN (Haute Normandie), Li (Limousin), Lo (Lorraine), LR (Languedoc-Roussillon), IDF (Ile de France), FC (Franche-Conté), MP (Midi-Pyrénées), NPDC (Nord-Pas de Calais), PACA (Provence-Alpes-Cote d'Azur), PDL (Pays de Loire), PC (Poitou-Charente), Pi (Picardie), RA (Rhones Alpes).
doi:10.1371/journal.pmed.1000084.g002

Changes in incidence of invasive PNSP in France

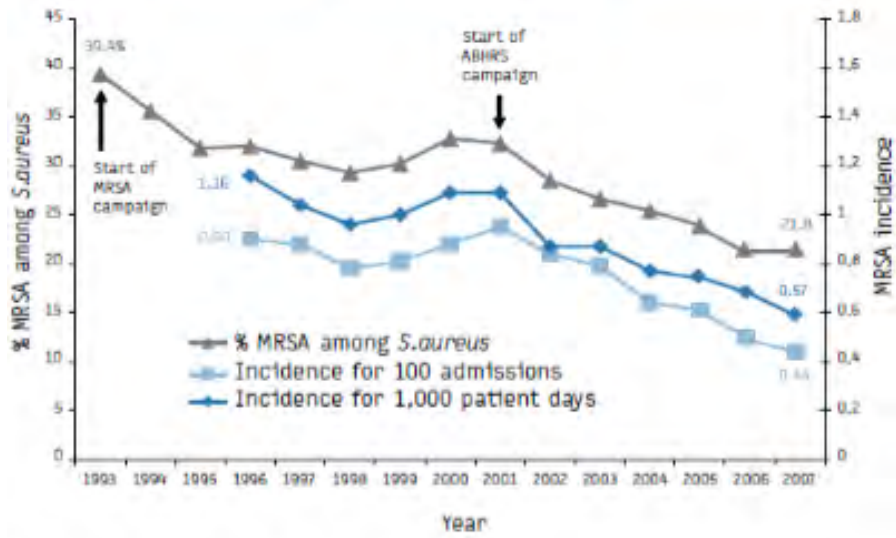


Changes in MRSA incidence in France

Methicillin-resistant *S. aureus* incidence density in healthcare facilities that have participated since 2003 in the BMR-Raisin Network, by type of unit, France, 2003 to 2007 (n=227)



MRSA proportion among *S. aureus*, and MRSA incidence, 39 teaching hospitals of the Paris area, 1993 to 2007



Source: Assistance publique - Hôpitaux de Paris
MRSA: methicillin-resistant *S. aureus*. ABHRS: alcohol-based hand rub solutions

The tetanus ICU at the Hospital for Tropical Diseases

Intervention study to reduce spread of drug-resistant microorganisms

Target resistant microorganisms on tetanus ICU

- MRSA
- ESBL-positive *Enterobacteriaceae*
- Gentamicin resistant *Klebsiella pneumoniae*
- Amikacin resistant *Acinetobacter spp* .
- *Pseudomonas aeruginosa*

Interventions on tetanus ICU

After one year baseline surveillance

Target	Infection control measures
Exogenous acquisition of microorganisms	–Reinforcement of hand hygiene –Limit exchange of equipment, materials, staff between patients –Revise washing procedures: allocate wash bowls to individual patients –Measure compliance by direct observations
Exogenous acquisition of MRSA	–Reporting of results of surveillance cultures –Sign indicating positivity at the bedside
Endogenous acquisition of ESBL[b]-positive *Enterobacteriaceae*	–Change in empirical antimicrobial therapy resulting in three regimens applied simultaneously ("antibiotic mixing")

Empirical antimicrobial therapy on tetanusward

- Year 1: ceftazidime/amikacin
- Year 2: alternating between individual patients:
  - ceftazidime; ciprofloxacine; piperacillin/tazobactam;
  - all with amikacin
- Imipenem as second line therapy in both years

Use of antimicrobial agents on tetanus ward

	Defined daily dosages per 1000 patient days		Rate (yr 2 vs yr 1)	95% CI
Agent	*Year 1*	*Year 2*		
Ceftazidime	173	81	0.47	0.40–0.55
All 3rd generation cephalosporines	179	85	0.48	0.41–0.55
Ciprofloxacine	13	59	4.46	3.10–6.59
All fluoroquinolones	81	99	1.22	1.02–1.46
Piperacillin/tazobactam	8	59	7.2	4.63–11.76
Amikacin	207	205	0.99	0.88–1.11
→ Imipenem	80	48	0.60	0.48–0.74
Penicillin	261	167	0.64	0.57–0.71
Metronidazole	165	217	1.31	1.17–1.48

Surveillance culture results

admission, twice weekly
nose, axilla, sputum, anus

	Patients with a positive culture No./total no. (%)		**Patients with a positive culture on admission No./total no. (%)**	
	Year 1 N=190	**Year 2** N= 167	**Year 1** N=190	**Year 2** N= 167
MRSA	44/174 (25.3)	19/161 (11.8)	5/174 (2.9)	4/161 (2.5)
ESBL-positives *(excl. K. pneumoniae)*	94/174 (54.0)	90/161 (55.9)	22/174 (12.6)	10/161 (6.2)
Pseudomonas aeruginosa	66/174 (37.9)	95/161 (59)	7/174 (4.0)	9/161 (5.6)
Gentamicin R Klebsiella pneumoniae	86/174 (49.4)	92/161 (57.1)	19/174 (10.9)	15/161 (9.3)
Amikacin R Acinetobacter spp	85/174 (48.9)	89/161 (55.3)	21/174 (12.1)	7/161 (4.3)

Community prevalence of antimicrobial drug resistance, HCMC

- 27 healthy adult volunteers; *stool samples*
- 77 healthy child volunteers; *stool samples*
- 100 consecutive healthy neonates born after uncomplicated pregnancies; *nasal and rectal swabs*

No antimicrobial treatment in previous 4 weeks

(incl. mothers from neonates)

Culture on selective agar plates containing gentamicin, ceftazidime and nalidixic acid

J Med Microbiol. 2009 Aug 20. [Epub ahead of print]

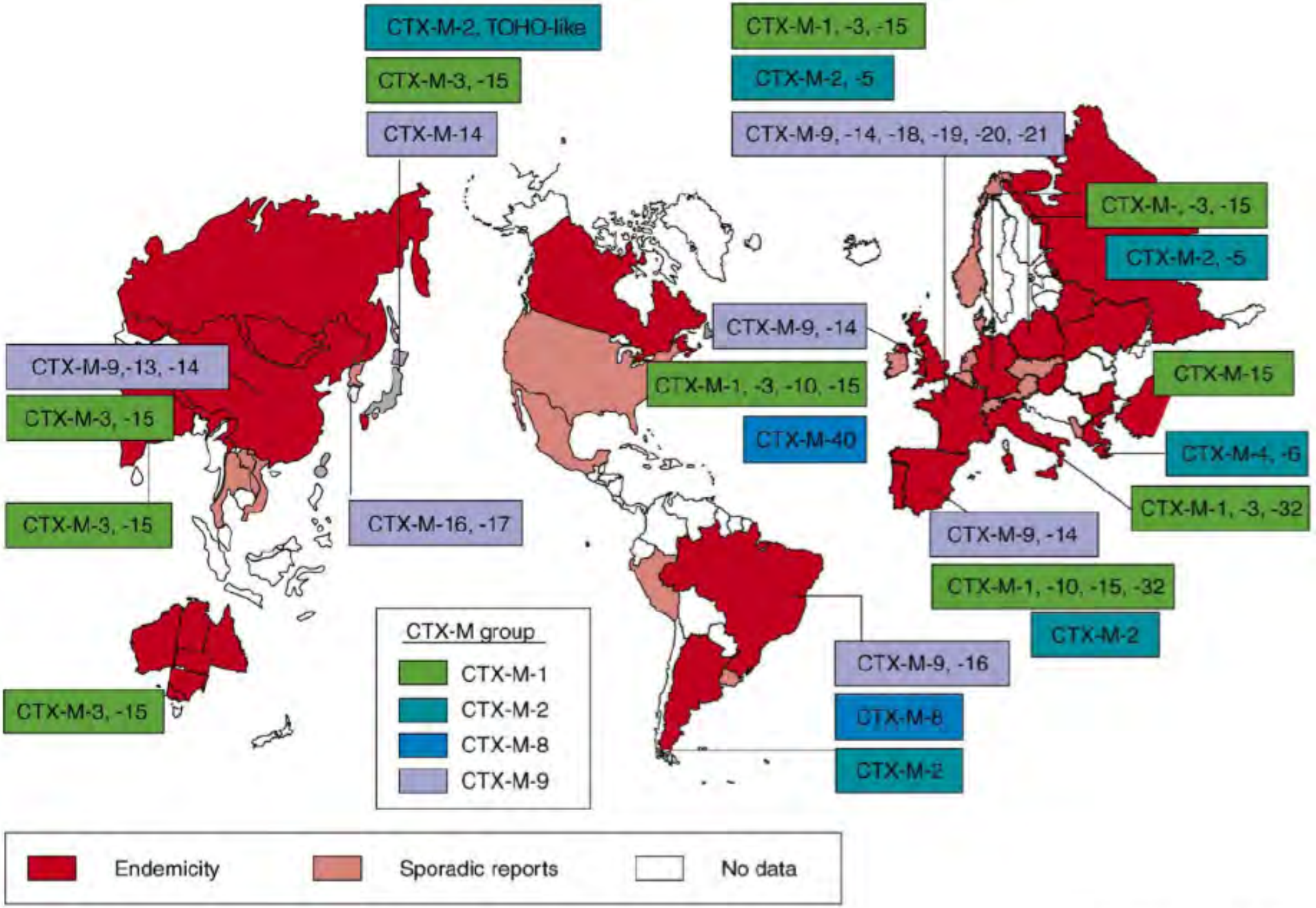
Colonization with drug-resistant Gram-negatives in healthy individuals in HCMC

Nr. of people with	Healthy volunteers (n =27)	Healthy children (n = 77)	Healthy neonates (n = 100)
Ceftazidime resistant bact.	15 (55.6)	34 (44.2)	28 (28)
Gentamicin resistant bact.	25 (92.6)	65 (84.4)	38 (38)
Nalidixic acid resistant bact.	n/a	70 (90.9)	57 (57)

J Med Microbiol. 2009 Aug 20. [Epub ahead of print]

Pandemic spread of CTX-M ESBL

- Community spread
- *E. coli*
- Spread of epidemic bacterial clones
  Spread of epidemic plasmids
- Very limited therapeutic options



Current Opinion in Microbiology

Get data!

(but only good quality data)

What is needed to develop a program

(the minimum required….)

- Awareness, willingness, sense of urgency amongst professional community and policy makers and the public
- Support from policy makers at all levels
- Essential level of regulation of health care – a health system
- Networks

What is needed to develop a program (2)

Data collection

- Access to relevant population (hospital/community)
- Knowledge, resources, and capacity to culture, identify and determine susceptibility of indicator microorganisms from appropriate sample
- Knowledge, resources, and capacity to collect, collate, store, manage (IT) and analyse data

What is needed to develop a program (3)

FUNDING!

Surveillance is a tool…

…..to achieve a change

Thank
you