Antimicrobial Resistance Surveillance Systems and bias!

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AMR Surveillance

- **International official programmes**
  - none
- **European official programmes**
  - EARSS / EARS-NET
- **National official programmes**
  - Many initiatives
- **Many commercial intiatives**
  - Alexander project
  - SENTRY
  - MYSTIC
  - ECO-SENS
  - …

Links to national and international programmes:
http://www.ecdc.europa.eu/en/activities/surveillance/EARS-Net/external_sites/Pages/external_sites.aspx

Systems

- Commercial systems
  - often pointed toward a specific microorganism and/or class of drugs (Alexander project (URTI), ECO-SENS (E.coli))
  - Isolates sent to central laboratory (cash per isolate)
- Voluntary manual reporting of certain microorganisms, drugs and infections (EARS-NET)
- Voluntary computer-supported or fully automatic reporting of some/all microrganisms (NL, SE)
- Mandatory reporting systems for
  - defined bacteria (M.tb)
  - defined resistance geno/phenotypes (MRSA, VRE, NDM1, etc)

AMR surveillance is biased because it is based on routine ”consecutive” isolates

- Bias
  - The Sick – ”we do not culture the healthy”
  - The Failures – ”we only culture when therapy fails”

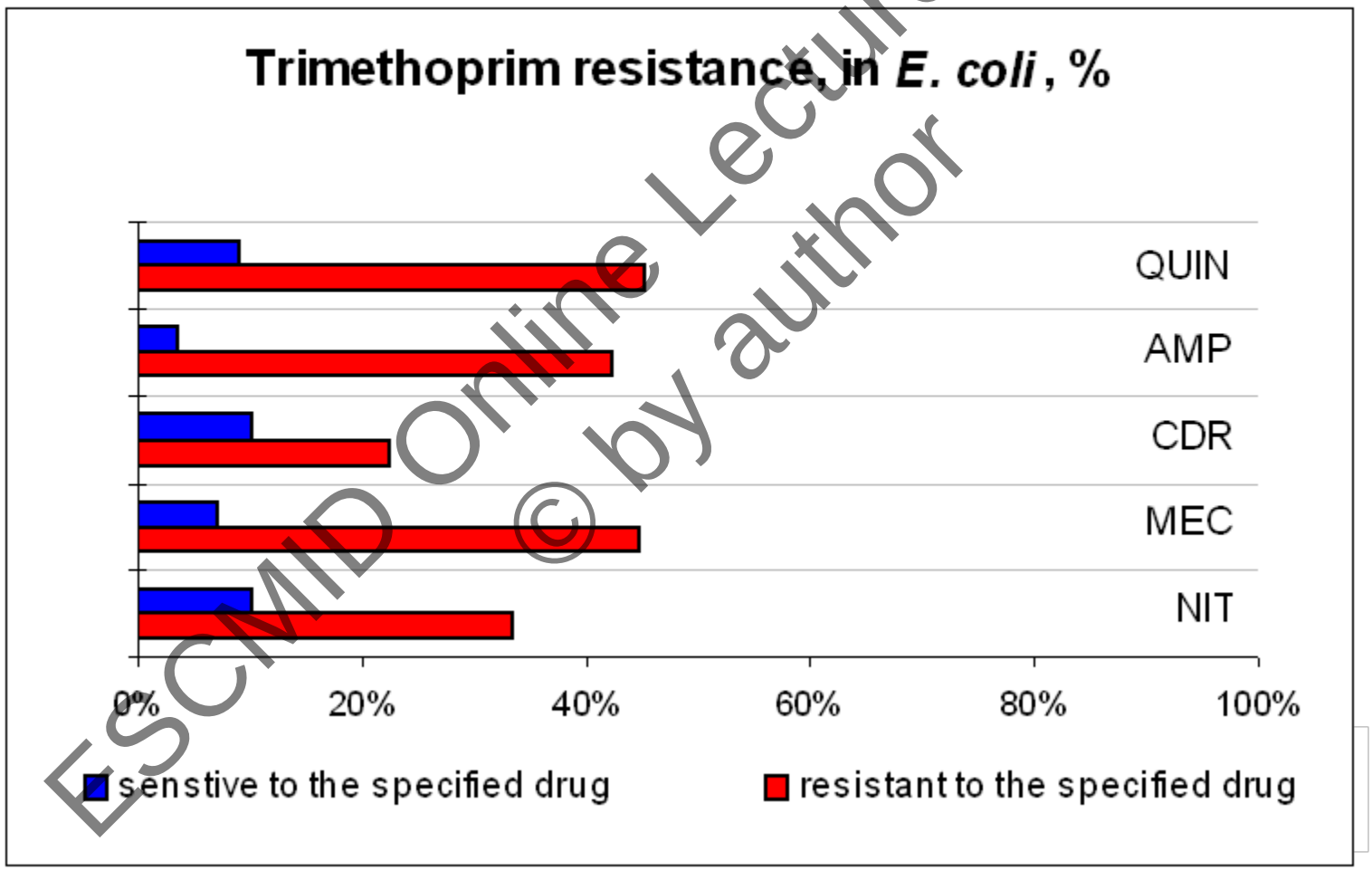
How and where we collect our data will affect resistance levels

1. Breakpoints
2. Associated resistance
3. ”Repeat isolates from a single patient” – rare resistance
4. ”Repeat isolates from several patients” – clonal outbreak
5. Frequency of sampling
6. Origin of patients
   i. International influence/local strains
   ii. suburban/countryside,
   iii. ICU/hospital/primary care
7. Age
8. Gender

Examples of bias:

Associerad resistens

E. coli



Associated resistance: Resistance rates resulting from independant susceptibility tests are lower than those obtained through an algorithm (see cefotaxime; all tests 8.8%, independant tests 5.3%).

Registreringar

Översikt

Grunddata

Laboratorier
Antibiotikum
Arter
Personliga filter
Ursprung
Provtyp
Analys
EW-filter
Synonym antibiotika
Synonym art
Synonym provtyp
Synonym analys
Ignorerade arter
Ignorerade antibiotika
Ignorerade provtyper
Ignorerade analyser

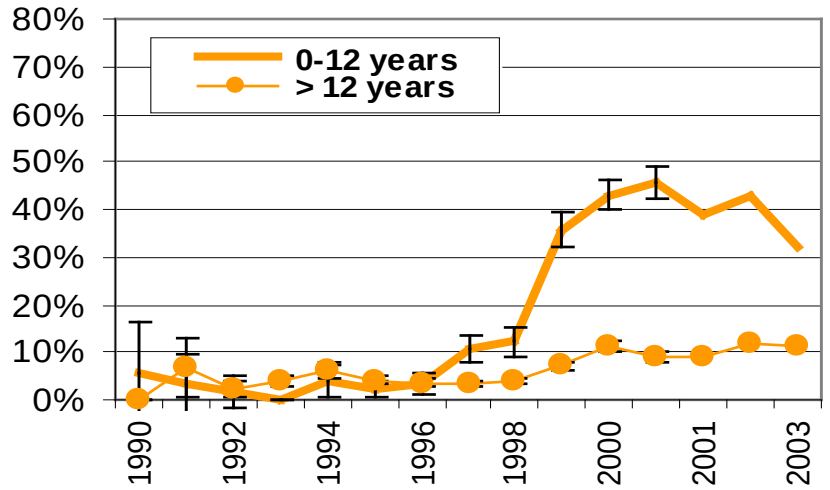
Administration

Summering

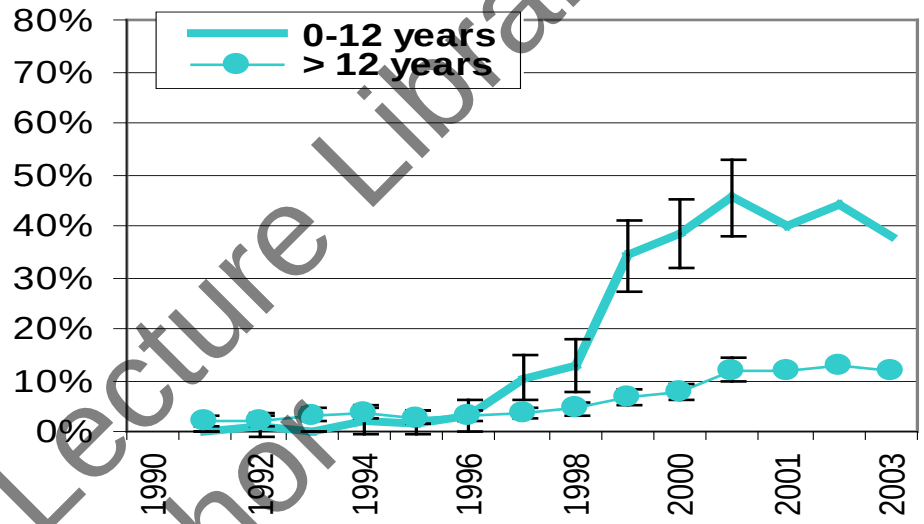
Art	ESCHERICHIA COLI		
Lab	N/A	**Regår Fr.o.m.**	2001
Kön	N/A	**Regår T.o.m**	2011
		Födår Fr.o.m.	N/A
Antal	20542	**Födår T.o.m.**	N/A

Antibiotikum	Totalt	S %	I %	R %	Prim=1	S %	I %	R %
AMIKACIN	5	100	0	0	0	?	?	?
AMOXICILLIN	8	25	0	75	0	?	?	?
AMOXICILLINCLAVULANSYRA	1	100	0	0	0	?	?	?
AMPICILLIN	7 473	44,8	26,7	28,5	5 837	45,3	27,2	27,5
AZTREONAM	206	19,4	4,9	75,7	93	17,2	5,4	77,4
CEFADROXIL	20 688	66,7	29,9	3,4	13 882	70,3	26,8	2,9
CEFEPIM	206	36,4	2,4	61,2	93	33,3	1,1	65,6
CEFOTAXIM	7 055	90,6	0,6	8,8	5 119	94,5	0,3	5,3
CEFOXITIN	117	35,9	0	64,1	0	?	?	?
CEFPODOXIM	137	7,3	0	92,7	8	12,5	0	87,5
CEFTAZIDIM	8 628	92,3	1,6	6,2	5 847	94,9	1	4,1
CEFTIBUTEN	12 547	98,5	0,1	1,4	9 449	98,7	0,1	1,2
CEFUROXIM	159	79,9	0	20,1	21	95,2	0	4,8
CIPROFLOXACIN	20 138	90	0,1	9,9	13 719	90,6	0,1	9,4
COLISTIN	1	100	0	0	0	?	?	?
DOXYCYKLIN	1	0	0	100	0	?	?	?
ERTAPENEM	108	98,1	0	1,9	3	100	0	0
FOSFOMYCIN	140	95	0	5	3	66,7	0	33,3
FUSIDINSYRA	1	0	0	100	0	?	?	?
GENTAMICIN	1 854	91,2	0,4	8,5	179	91,6	1,1	7,3
IMIPENEM	587	99,8	0	0,2	57	100	0	0

Skåne county, Sweden

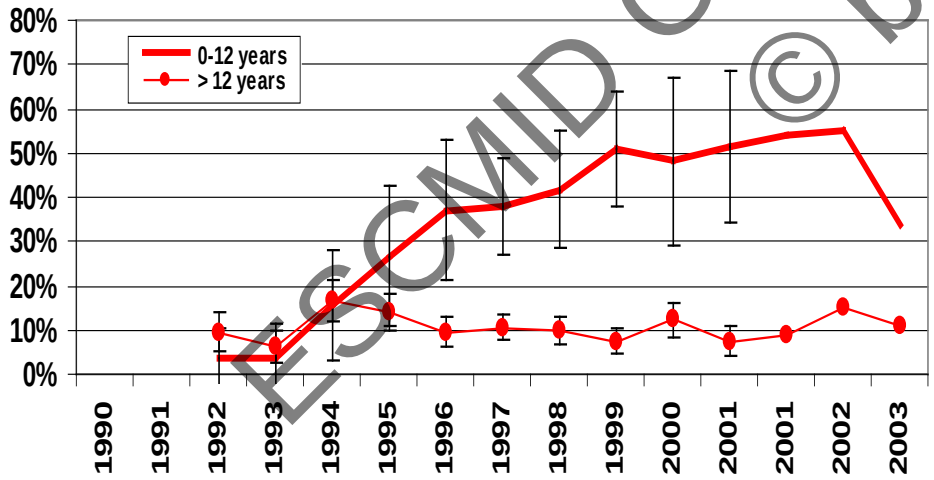


Västra Götaland county, Sweden

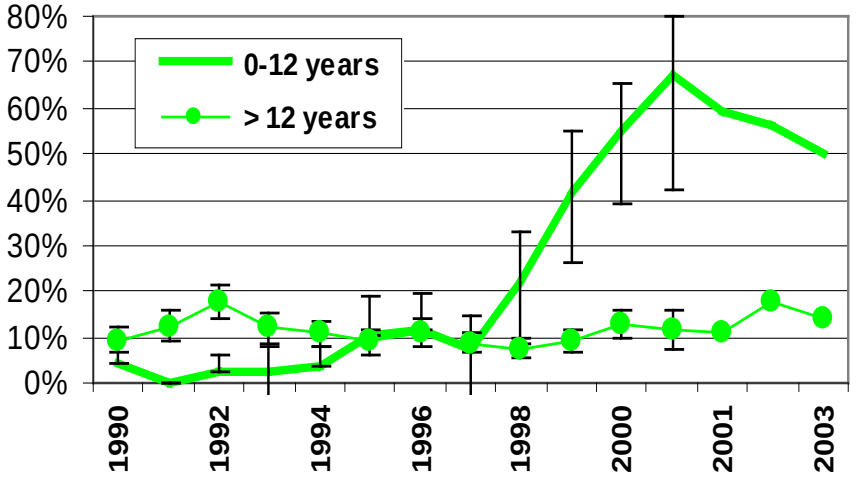


Fusidic acid resistance in S.aureus in children (0 – 12 yrs) and in adults (>12 yrs)

Blekinge county, Sweden



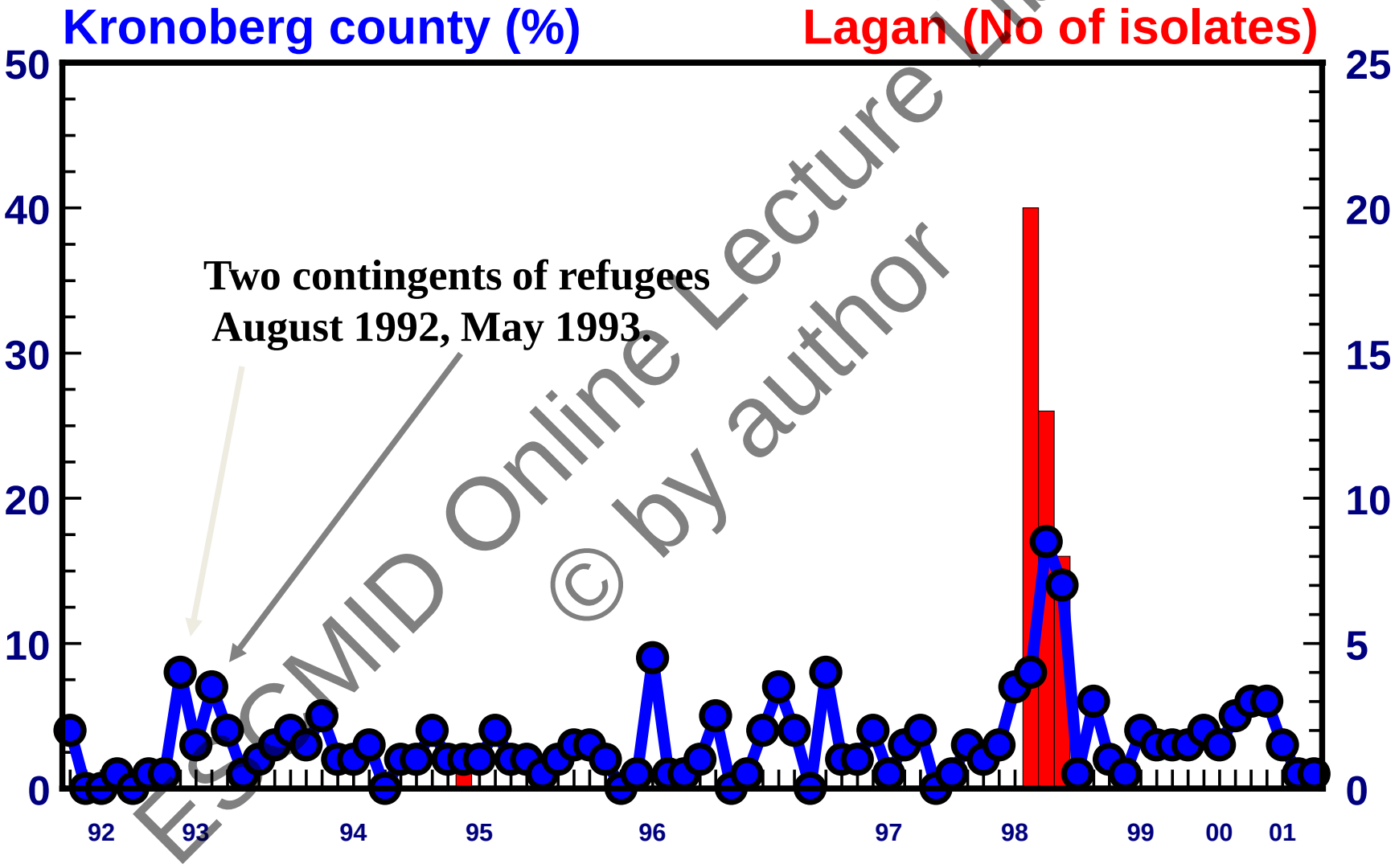
Kronoberg county, Sweden



Penicillin non-susceptibility over time in a county in Sweden

Streptococcus pneumoniae

Penicillin MIC >0.125 mg/L



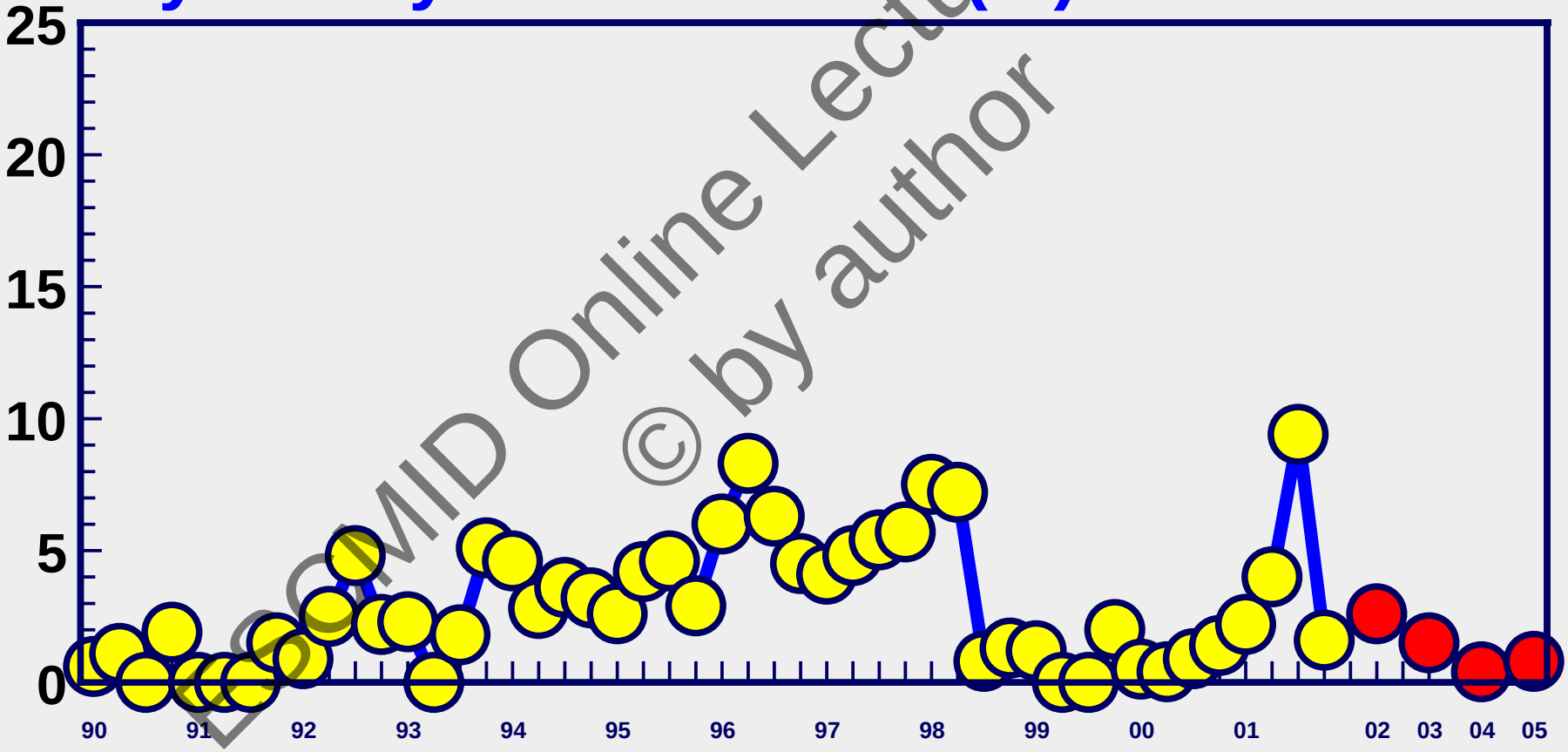
Streptococcus pyogenes

Quarterly and yearly (red) rates

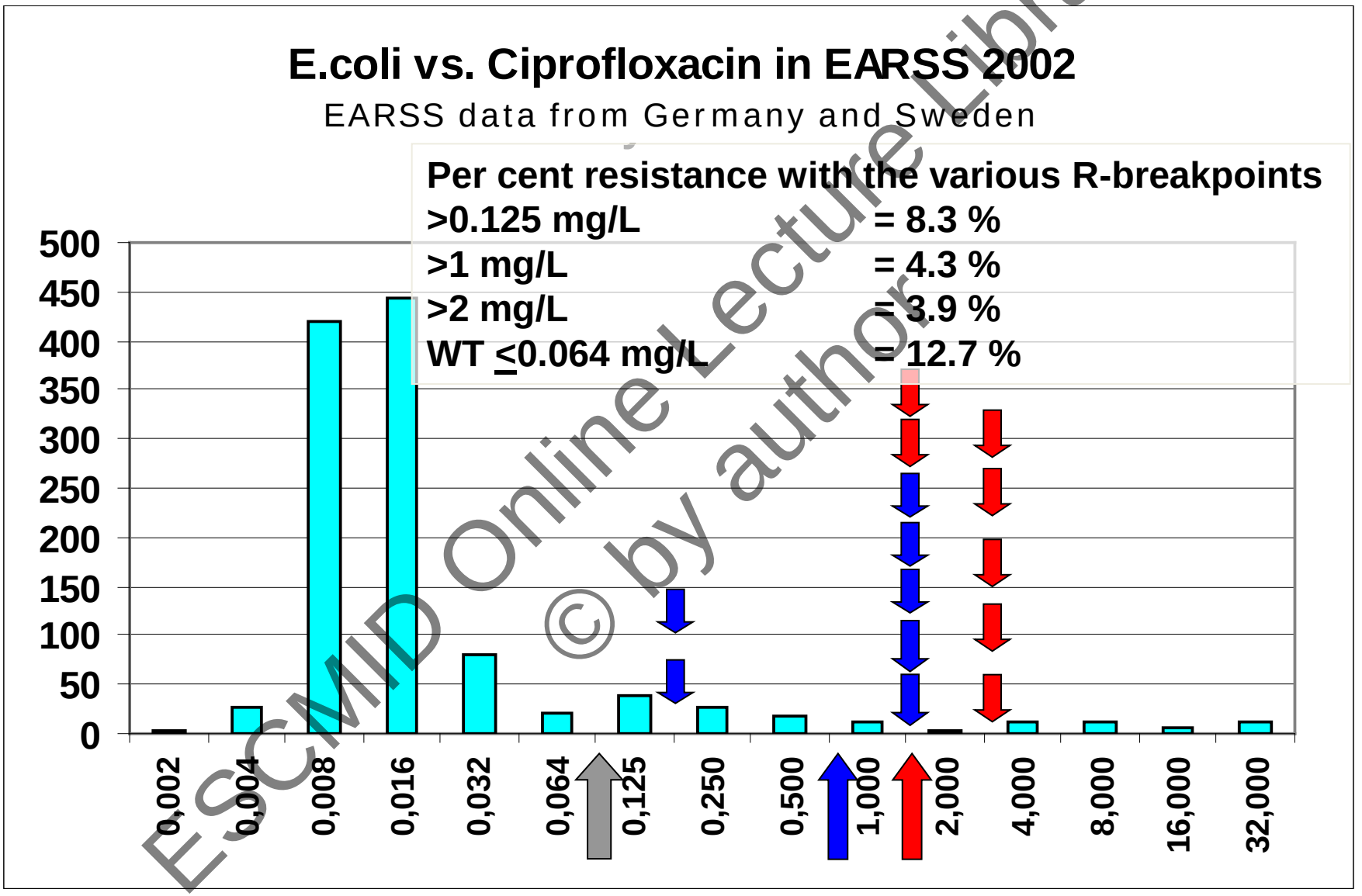
Kronoberg county, Sweden

Events (unrelated to the use of the drug) may affect resistance

Erythromycin resistance (%)

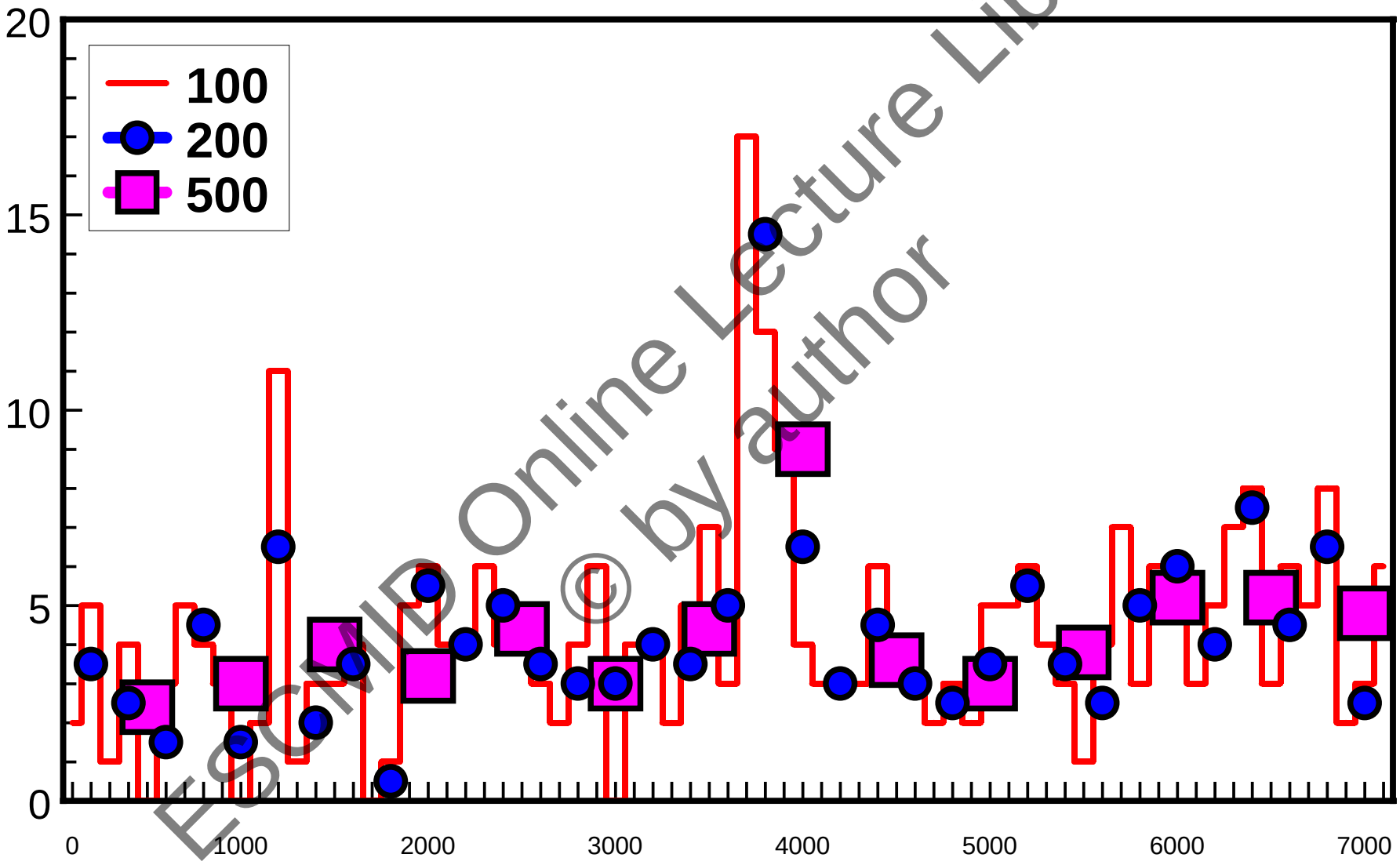


Breakpoints obviously afect resistance levels

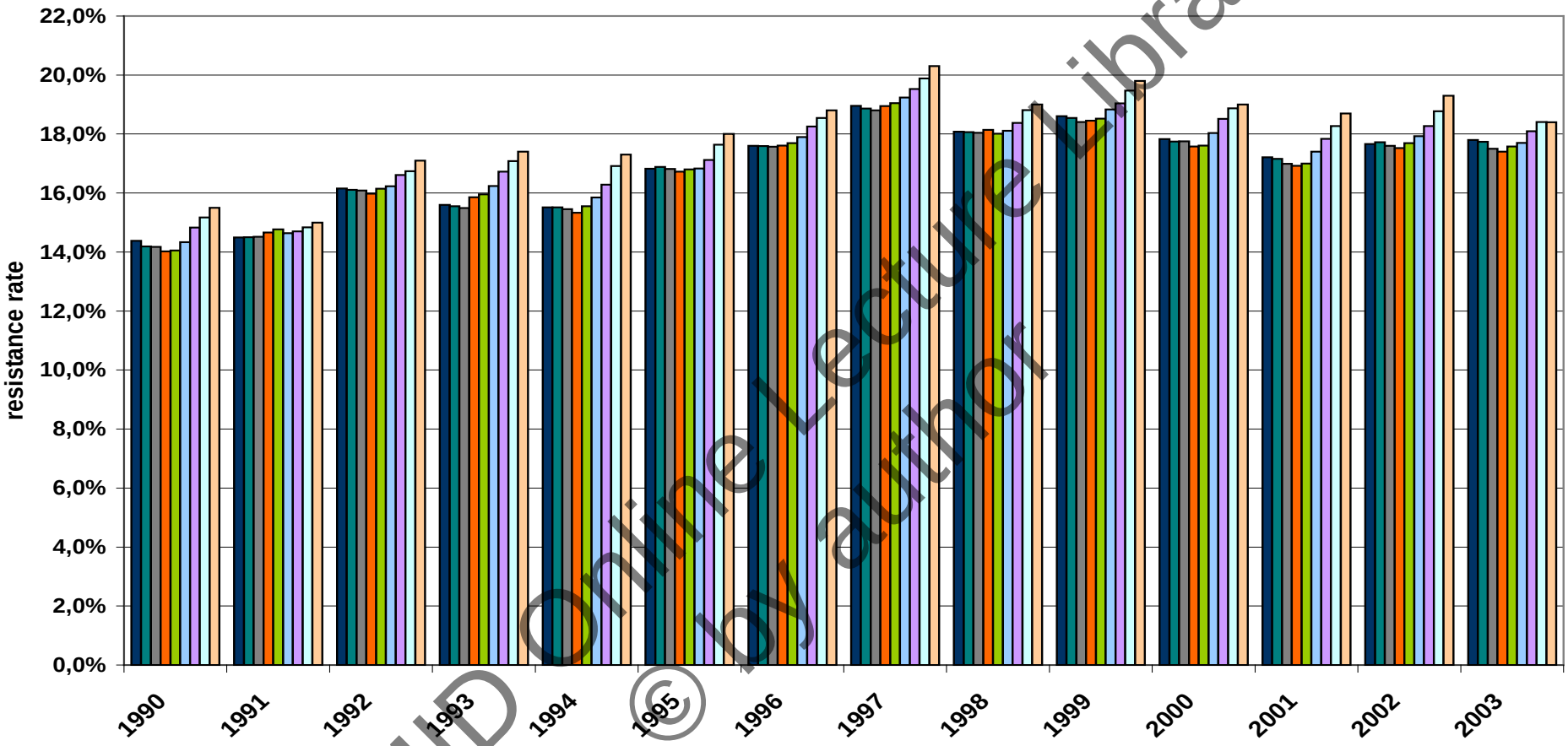


S.pneumoniae vs. penicillin 1995 - 2006

Resistance rates based on 100, 200 and 500 consecutive clinical isolates.



E. coli vs ampicillin



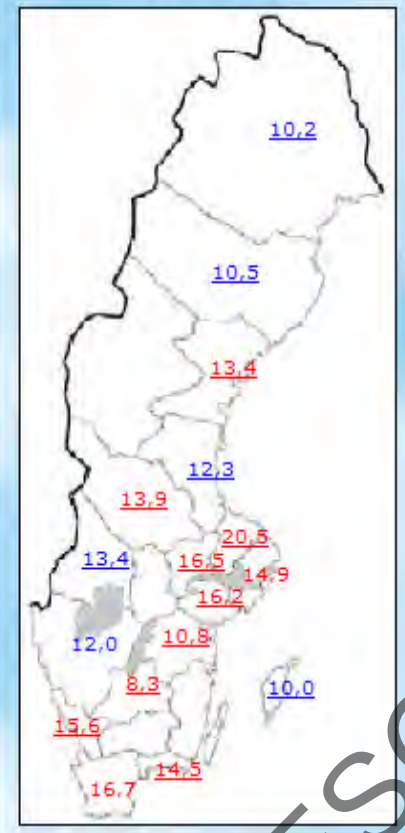
Effect on ampicillin resistance rate in community isolates of *E. coli* of different time cut-offs for the exclusion of duplicate isolates. Bars in the following order: No exclusion, Exclusion algorithm 7, 14, 30, 45, 90, 180, 270 and 365 days.

ResNet 2009; E.coli, Nalidixinsyra (090504)

Meny Logga ut

13,6% R

Andel resistenta - Sverige

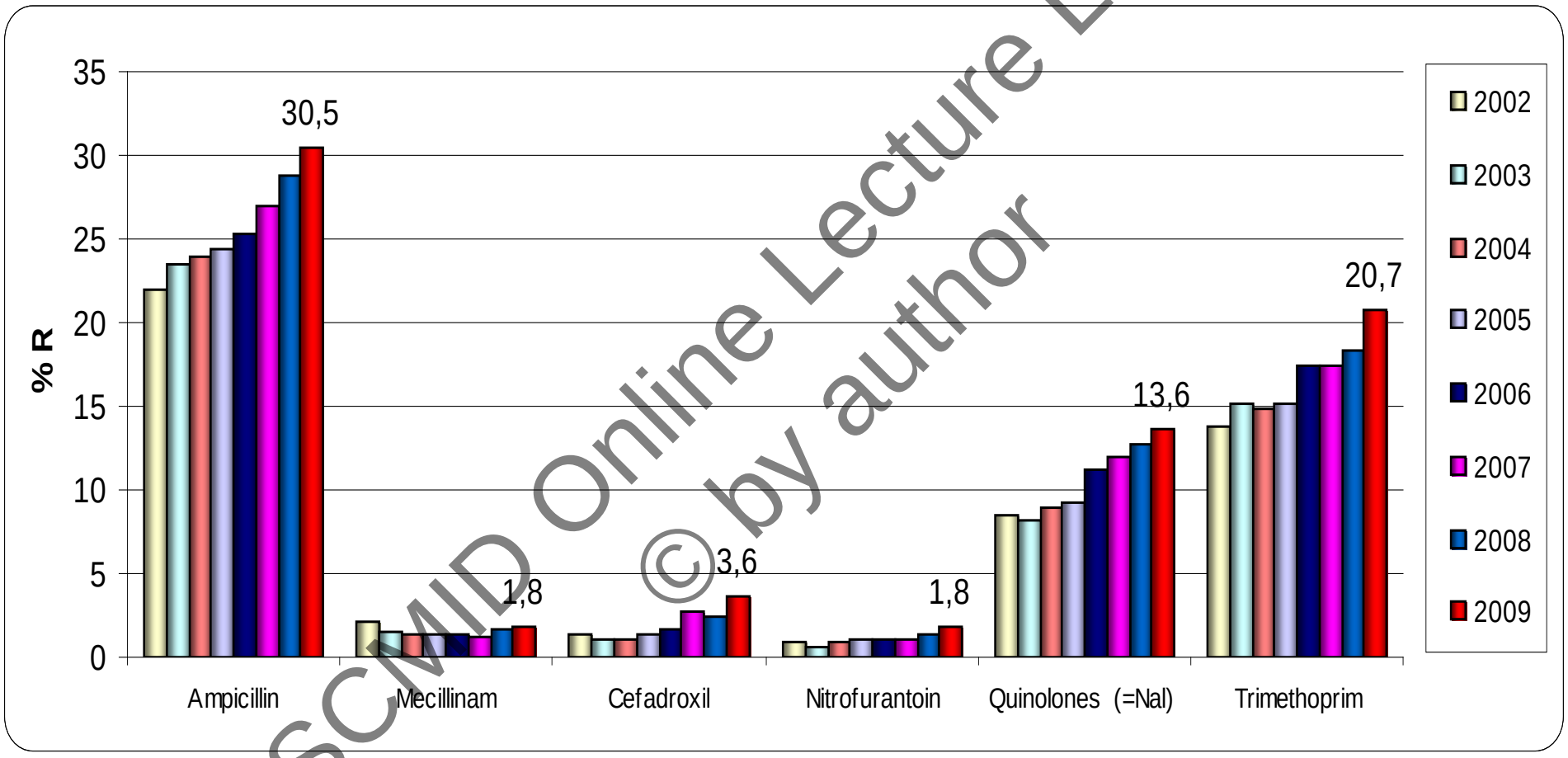


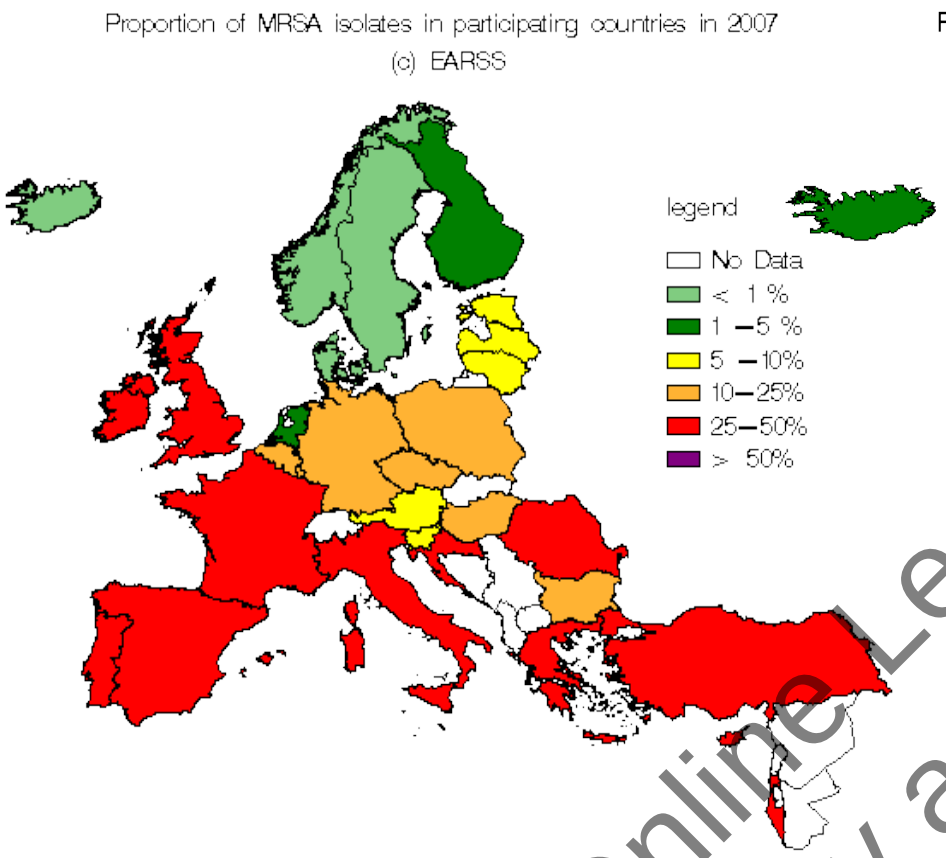
Län	Andel resistenta	Län	Andel resistenta
Blekinge	14,5 (13,6)	- Medilab	18,5 (13,6)
Dalarna	13,9 (13,6)	- St Göran Nova Medical AB	-
Gotlands	10,0 (13,6)	- Huddinge sjukhus	11,8 (13,6)
Gävleborg	12,3 (13,6)	Södermanland	16,2 (13,6)
Halland	15,6 (13,6)	Uppsala	20,5 (13,6)
Jämtland	-	Värmland	13,4 (13,6)
Jönköping	8,3 (13,6)	Västerbotten	10,5 (13,6)
Kalmar	-	Västernorrland	13,4 (13,6)
Kronoberg	-	Västmanland	16,5 (13,6)
Norrbotten	10,2 (13,6)	Västra Götaland	12,0
Skåne	16,7 (13,6)	- Borås	10,5 (13,6)
- Lund	20,1 (13,6)	- Göteborg	16,5 (13,6)
- Kristianstad	-	- Skövde	8,5 (13,6)
- Malmö	13,3 (13,6)	- Uddevalla	12,5 (13,6)
SMI	-	Örebro	-
Stockholm	14,9 (13,6)	Östergötland	10,8 (13,6)
- Karolinska sjukhuset	14,4 (13,6)		
Sverige: -			

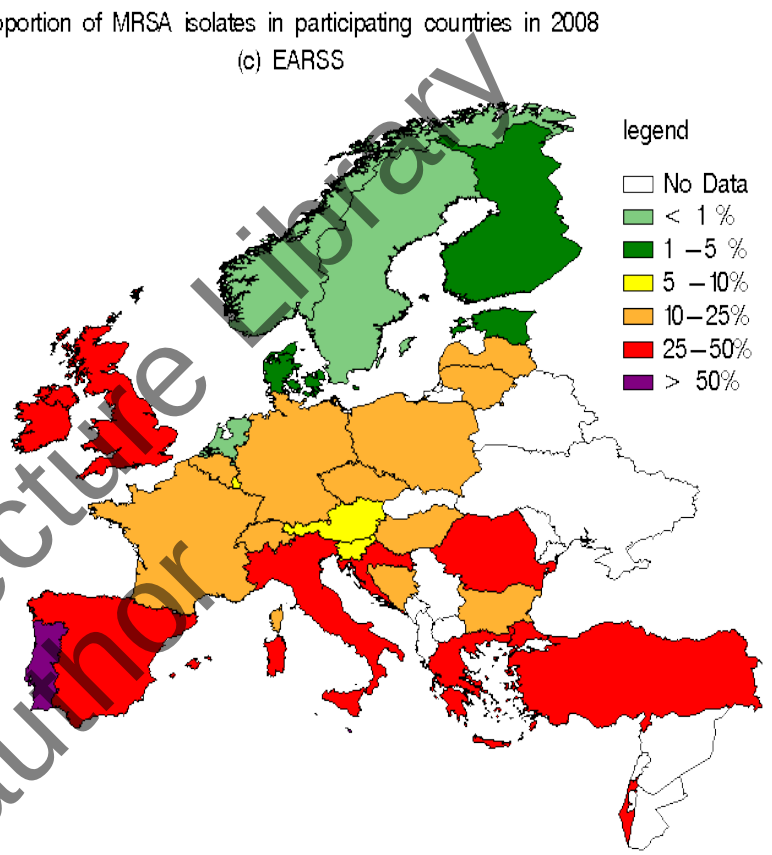
Art: Escherichia coli

Antibiotikum: Nalidixinsyra (kinolon)

ResNet 2009: E.coli från urin Sweden







MRSA 2007

MRSA 2008

Highlights of EARS-Net Annual Report 2009

Courtesy of Ole Heuer and the EARS-NET team
ECDC

Pathogens in EARS-NET

- S. aureus
- E. coli
- K. pneumoniae
- P. aeruginosa
- E. faecalis and E. fecium
- S. pneumoniae

In blood and CSF

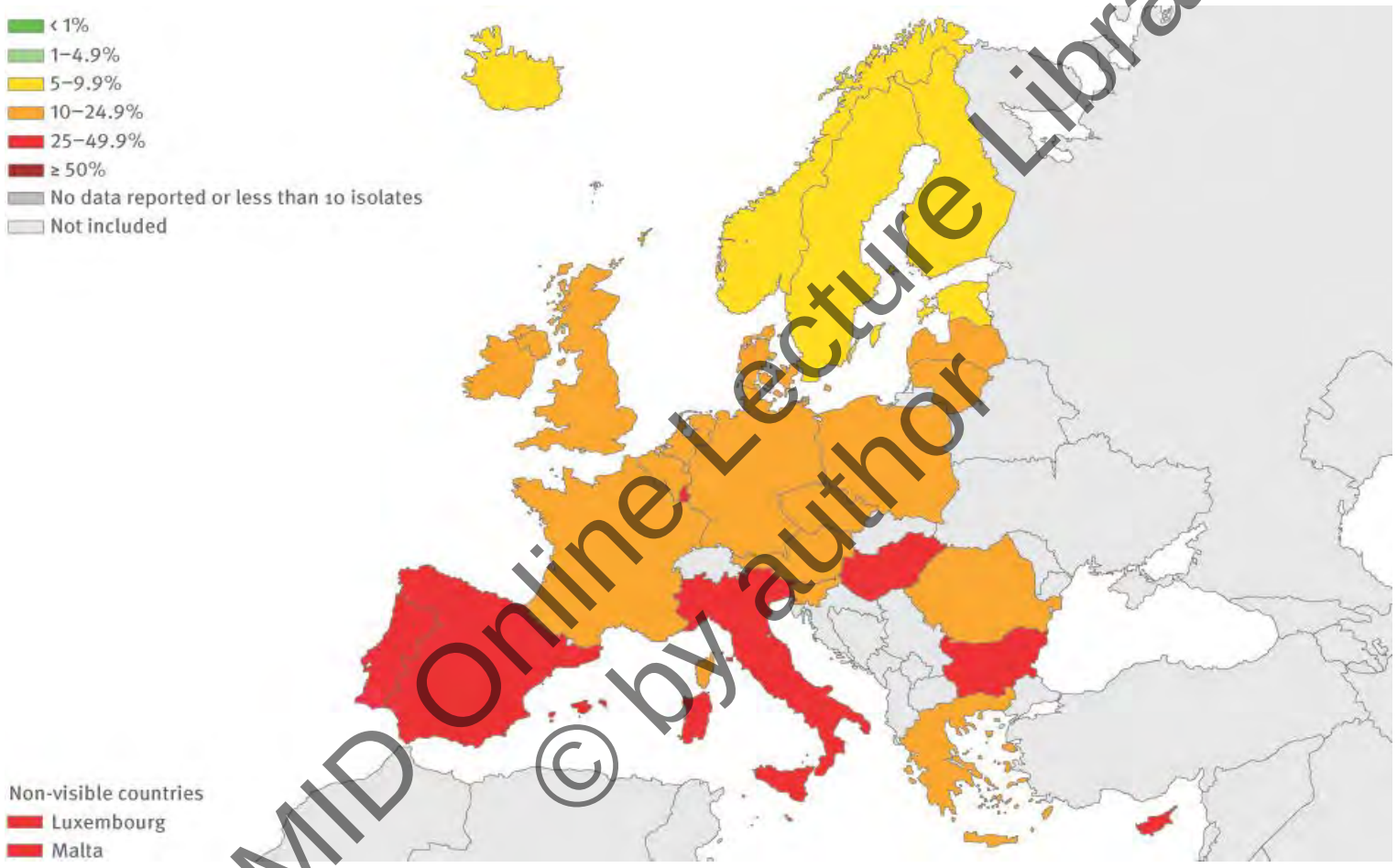
Countries participating in EARS-Net in 2010

As of January 1st, 2010, five non-EU Member States previously participating in EARSS (Bosnia-Herzegovina, Croatia, Israel, Switzerland and Turkey) had to be detached from the network.

EARS-Net Annual Report 2009

The EARS-Net Annual report 2009 (pdf) is available at the ECDC homepage: http://ecdc.europa.eu/en/Pages/home.aspx
The report can be found under “recent publications”.

direct link:
http://www.ecdc.europa.eu/en/publications/Publications/1011_SUR_annual EARSS_report.pdf



***Escherichia coli*: Proportion of invasive isolates with resistance to fluoroquinolones in 2009 (data: EARS-Net)**

***Escherichia coli*: Proportion of third generation cephalosporin resistance in 2009 (Data: EARS-Net)**

ESBL in *E. coli* and *K. pneumoniae*

Table 5.6: Number of invasive *E. coli* isolates resistant to third-generation cephalosporins (CREC) and proportion of ESBL positive among these isolates, as ascertained by the participating laboratories in 2009

Country	Number of laboratories	Number of CREC	%ESBL
Austria	24	86	94.2
Belgium	4	14	92.9
Bulgaria	12	37	94.6
Cyprus	5	19	100
Czech Republic	42	270	85.6
France	38	316	64.9
Ireland	25	117	85.5
Lithuania	8	23	100
Netherlands	6	40	90
Poland	16	53	89
Portugal	15	122	91.8
Slovenia	7	52	92.3
Spain	33	432	90.7

Only data from laboratories consistently reporting the ESBL test results for all isolates identified as resistant to third-generation cephalosporins and from countries with at least 10 of such isolates were selected for the analysis.

Table 5.9: Number of invasive *K. pneumoniae* isolates resistant to third-generation cephalosporins (CRKP) and proportion of ESBL positive among these isolates, as ascertained by the participating laboratories in 2009

Country	Number of laboratories	Number of CRKP	%ESBL
Austria	16	40	87.5
Bulgaria	10	66	98.5
Cyprus	4	22	86.4
Czech Republic	44	737	79.9
Estonia	4	10	100
Spain	20	70	85.7
France	27	89	80.9
Ireland	12	32	78.1
Italy	7	47	91.5
Lithuania	9	38	97.4
Latvia	5	17	94.1
Netherlands	4	11	72.7
Poland	12	70	92.9
Portugal	11	92	90.2
Romania	3	10	100
Slovenia	7	57	96.5

Only data from laboratories consistently reporting ESBL test results for all isolates identified as resistant to third-generation cephalosporins and from countries with at least 10 of such isolates were selected for the analysis.

***Staphylococcus aureus*:**
proportion of invasive isolates resistant to meticillin (MRSA) in 2009 (Data: EARS-Net)