



Feidhmeannacht na Seirbhíse Sláinte
Health Service Executive

EARSS in Ireland, 2005

Results of
invasive *Escherichia coli* infection
(blood/CSF)
surveillance

Antibiotic codes: *Escherichia coli*

AMK	Amikacin
AMC	Amoxicillin/clavulanic acid
AMP	Ampicillin
CTX	Cefotaxime
CAZ	Ceftazidime
CRO	Ceftriaxone
CXM	Cefuroxime
CIP	Ciprofloxacin
GEN	Gentamicin
IMI	Imipenem
MEM	Meropenem
NET	Netilmicin
OFX	Ofloxacin
PIP	Piperacillin
TZP	Piperacillin/tazobactam
TOB	Tobramycin
3GC	3rd Generation Cephalosporins (CTX, CRO, CAZ)

EARSS *E. coli*:

Objective and case definition

Objective:

To determine the proportions of *E. coli* isolates from blood or CSF that are resistant to aminopenicillins (e.g. ampicillin), 3GCs (e.g. cefotaxime, ceftriaxone or ceftazidime), fluoroquinolones (e.g. ciprofloxacin or ofloxacin) and aminoglycosides (e.g. gentamicin)

Case definition:

EARSS collects data on the first invasive isolate of *E. coli* per patient per quarter

Caveats in interpreting EARSS data

- Care must be exercised when interpreting the raw figures, i.e. increases in numbers of isolates, as the numbers of laboratories reporting to EARSS has increased over the years
- EARSS data does not distinguish clinically significant isolates from contaminants

Annual proportions of AMR *E. coli* bacteraemia, 2002-2005, with 95% Confidence Intervals (CI)

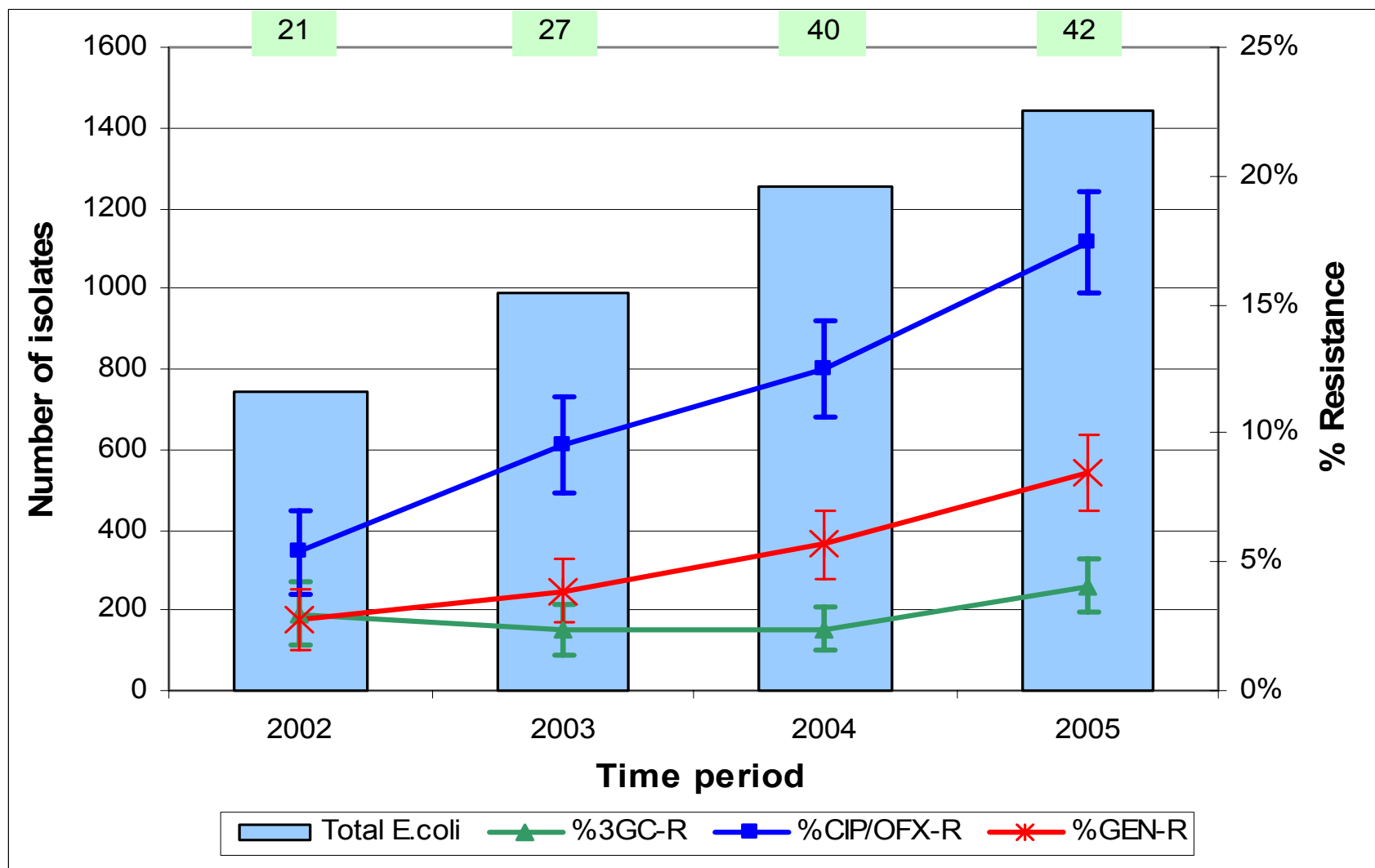
Year	No. labs	No. isolates	%3GC-R*	95%CI	%FQREC*	95%CI	%GEN-R*	95%CI
2002	21	741	3.0%	1.8-4.2%	5.4%	3.7-7.0%	2.7%	1.6-3.9%
2003	27	991	2.4%	1.4-3.3%	9.5%	7.7-11.4%	3.9%	2.7-5.1%
2004	40	1256	2.4%	1.5-3.2%	12.5%	10.6-14.3%	5.7%	4.4-7.0%
2005	42	1445	4.1%	3.0-5.1%	17.4%	15.4-19.4%	8.5%	7.0-9.9%

AMR, antimicrobial resistant

FQREC, Fluoroquinolone (CIP/OFX)-resistant *E. coli*

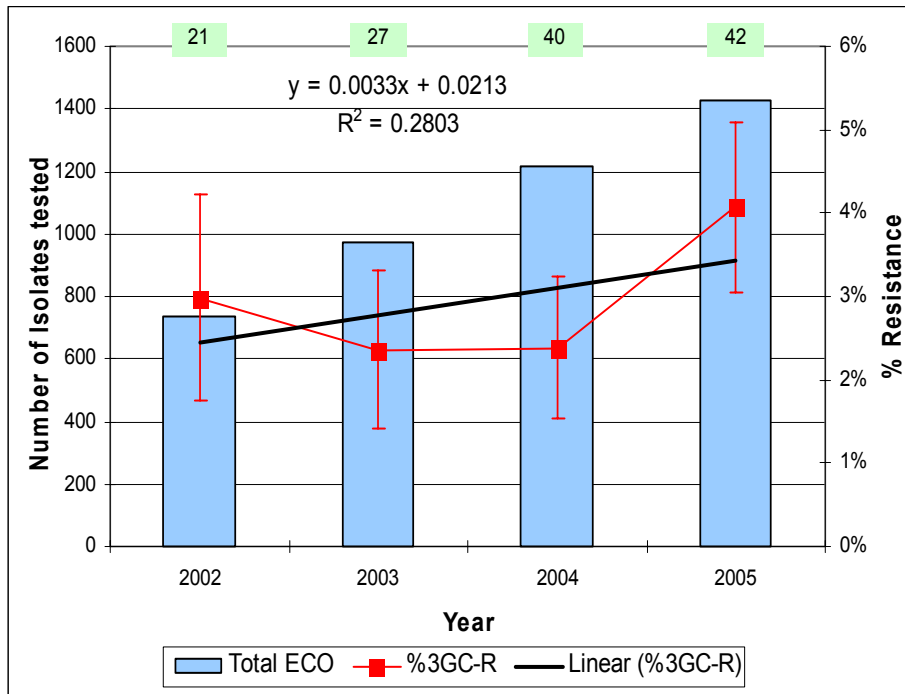
* Not all isolates tested

EARSS in Ireland – *E. coli* trends



Changes in the numbers of participating laboratories are indicated above the bars

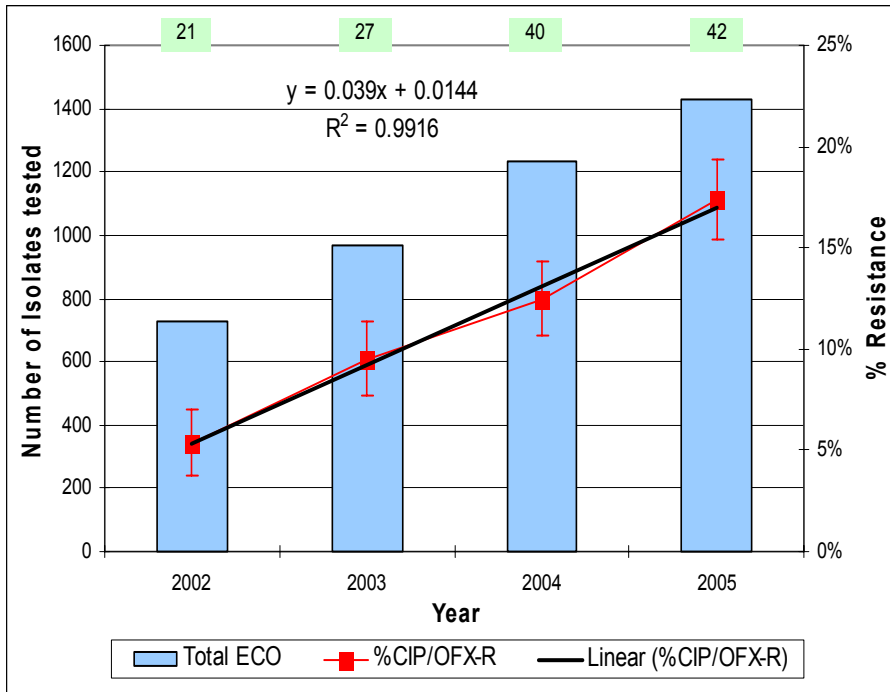
3GC-resistant *E. coli* trends: Linear regression



Changes in the numbers of participating laboratories are indicated above the bars

R^2 indicates that the regression line does not fit the data well suggesting that there is no linear relationship

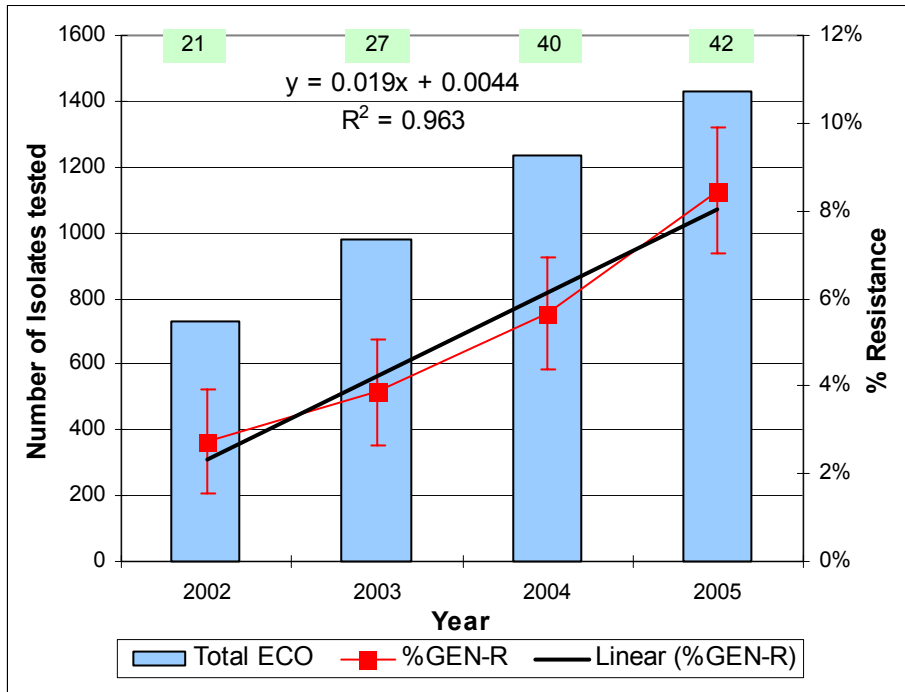
CIP/OFX-resistant *E. coli* trends: Linear regression



Changes in the numbers of participating laboratories are indicated above the bars

R^2 indicates that the regression line fits the data well suggesting a linear relationship; On average, the proportion of CIP/OFX-R *E. coli* isolates has increased by approx. 4% for each successive year

GEN-resistant *E. coli* trends: Linear regression



Changes in the numbers of participating laboratories are indicated above the bars

R^2 indicates that the regression line fits the data well suggesting a linear relationship; On average, the proportion of GEN-R *E. coli* isolates has increased by approx. 2% for each successive year

CIP/OFX- and GEN-resistant *E. coli* trends: Chi² test for trend

The proportions of *E. coli* isolates with resistance to

CIP/OFX (Chi²_{trend}=73.02; P<0.001)

and

GEN (Chi²_{trend}=36.99; P<0.001)

have increased significantly over the four years for which
surveillance has been undertaken

Comparison of 2005 data with 2004

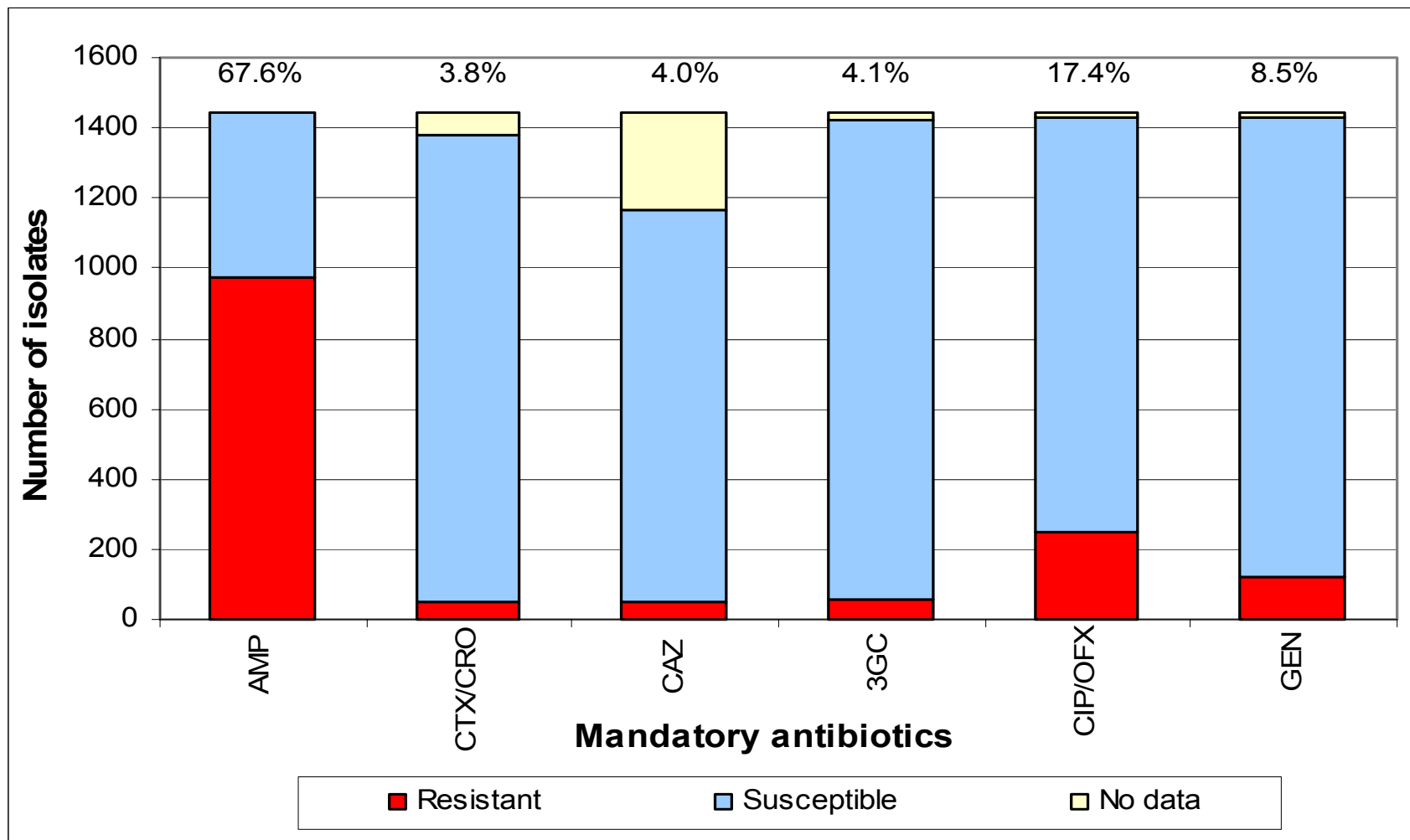
3GC resistance

- The increase in *E. coli* isolates with 3GC-R observed from 2004 to 2005 is statistically significant ($\text{Chi}^2=6.05$, $P=0.02$).
- This finding is not supported by the overlapping 95% confidence intervals

CIP/OFX and GEN resistance

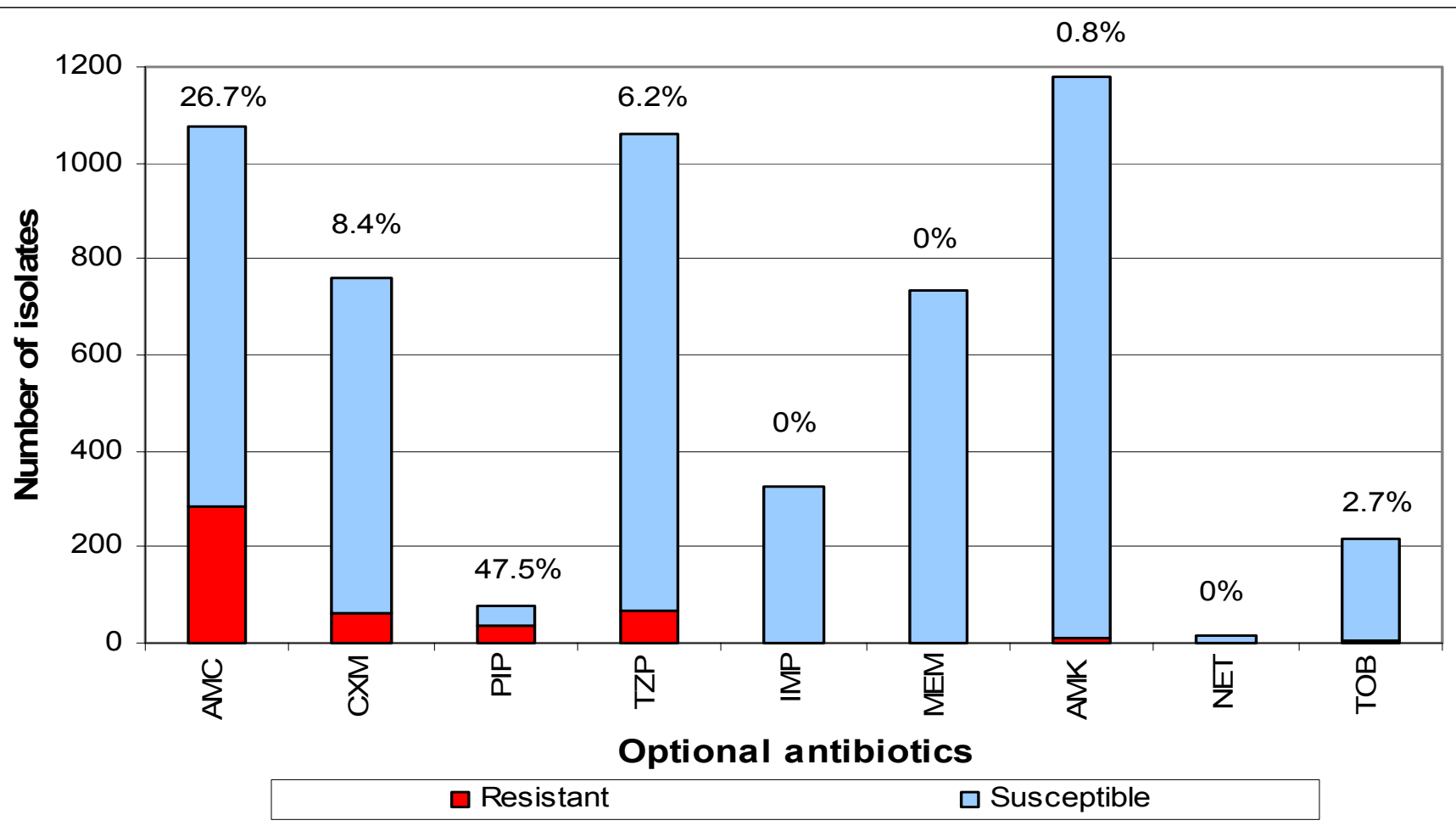
- The increase in CIP/OFX-R observed from 2004 to 2005 is statistically significant ($\text{Chi}^2=12.43$, $P<0.001$)
- The increase in GEN-R observed from 2004 to 2005 is statistically significant ($\text{Chi}^2=7.75$, $P=0.005$)
- These findings are supported by the 95% confidence intervals which do not overlap

Susceptibility data to mandatory antibiotics for *E. coli* reported in 2005



Percentage resistance is indicated above the bar

Susceptibility data to other optional antibiotics for *E. coli* reported in 2005



Percentage resistance is indicated above the bar

Resistance profiles of *E. coli* isolates in 2005

(n = 1445)

Resistance Profile	No. isolates	ESBL +ve	ESBL -ve
Fully susceptible	433		336
A	677		556
C	9		6
G	4		1
A3	16	7	7
AC	129		103
AG	28		17
GC	3		3
A3C	22 [^]	13	7
A3G	2 [^]		1
ACG	65 [^]		54
A3CG	18 [^]	10	7
Not tested against all	39		16
Total	1445	30	1144

A, Ampicillin; C, Ciprofloxacin; G, Gentamicin; 3, 3GC

ESBL, Extended-spectrum beta-lactamase

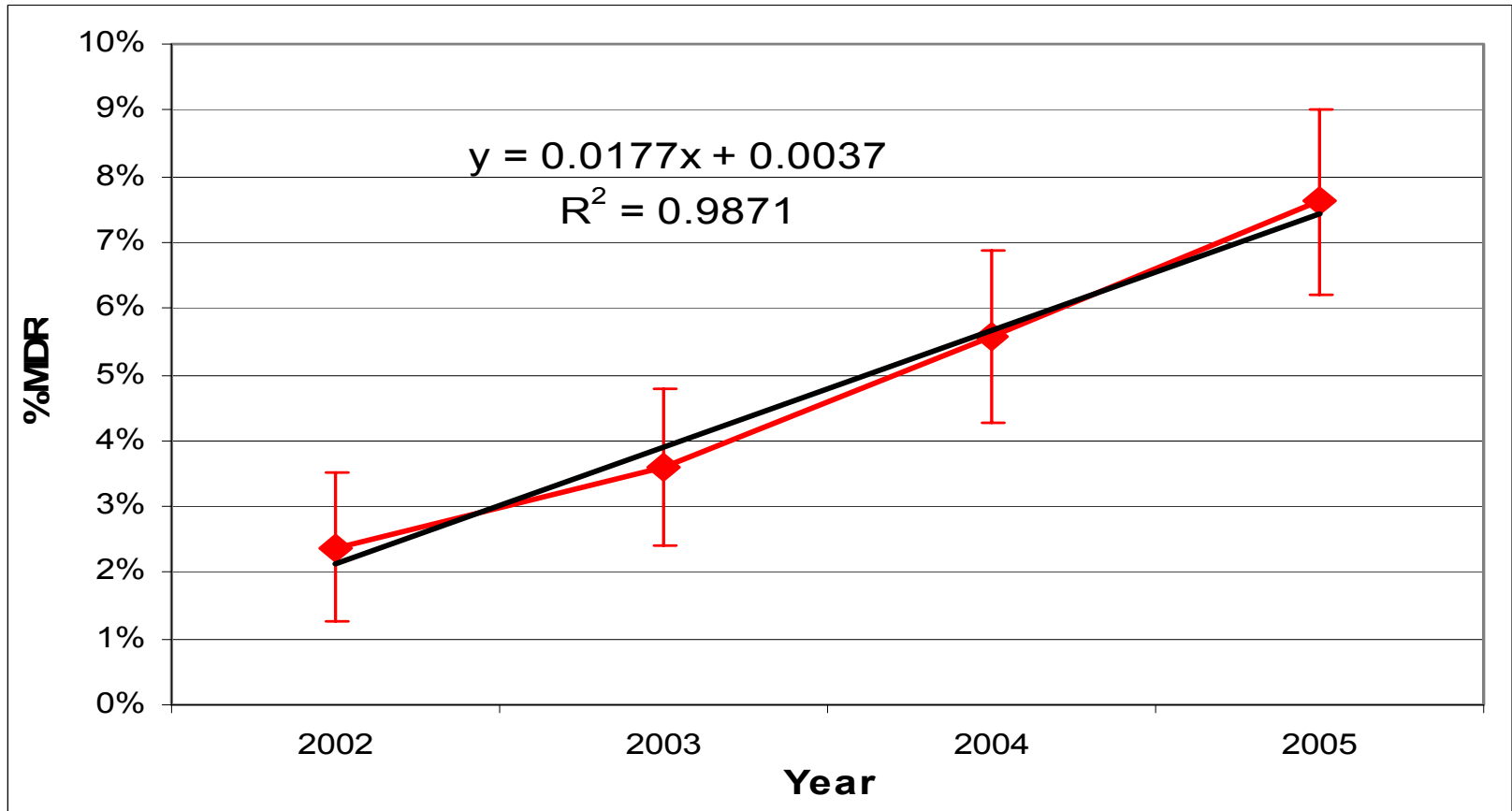
[^] Multi-drug resistant (defined as resistance to 3 or more classes)

Extended-spectrum Beta-Lactamases (ESBLs)

Year	Total ECO	No tested for ESBLs	ESBL detected	%ESBL	95%CI
2002	741	224	5	2.2%	0.3-4.2%
2003	991	576	11	1.9%	0.8-3.0%
2004	1256	861	11	1.3%	0.5-2.0%
2005	1445	1144	30	2.6%	1.7-3.6%

The proportion of ESBLs doubled from 1.3% in 2004 to 2.6% in 2005 ($\text{Chi}^2=3.44$, $P=0.04$), which is considered to be borderline significant. This finding is not supported by the overlapping confidence intervals

Trends in MDR *E. coli* isolates, 2002-2005: Linear regression



R^2 indicates that the regression line fits the data well suggesting a linear relationship; On average, the proportion of MDR *E. coli* isolates is increasing by approx. 1.8% for each successive year

Trends in MDR *E. coli* isolates, 2002-2005: Figures and Chi² test for trend

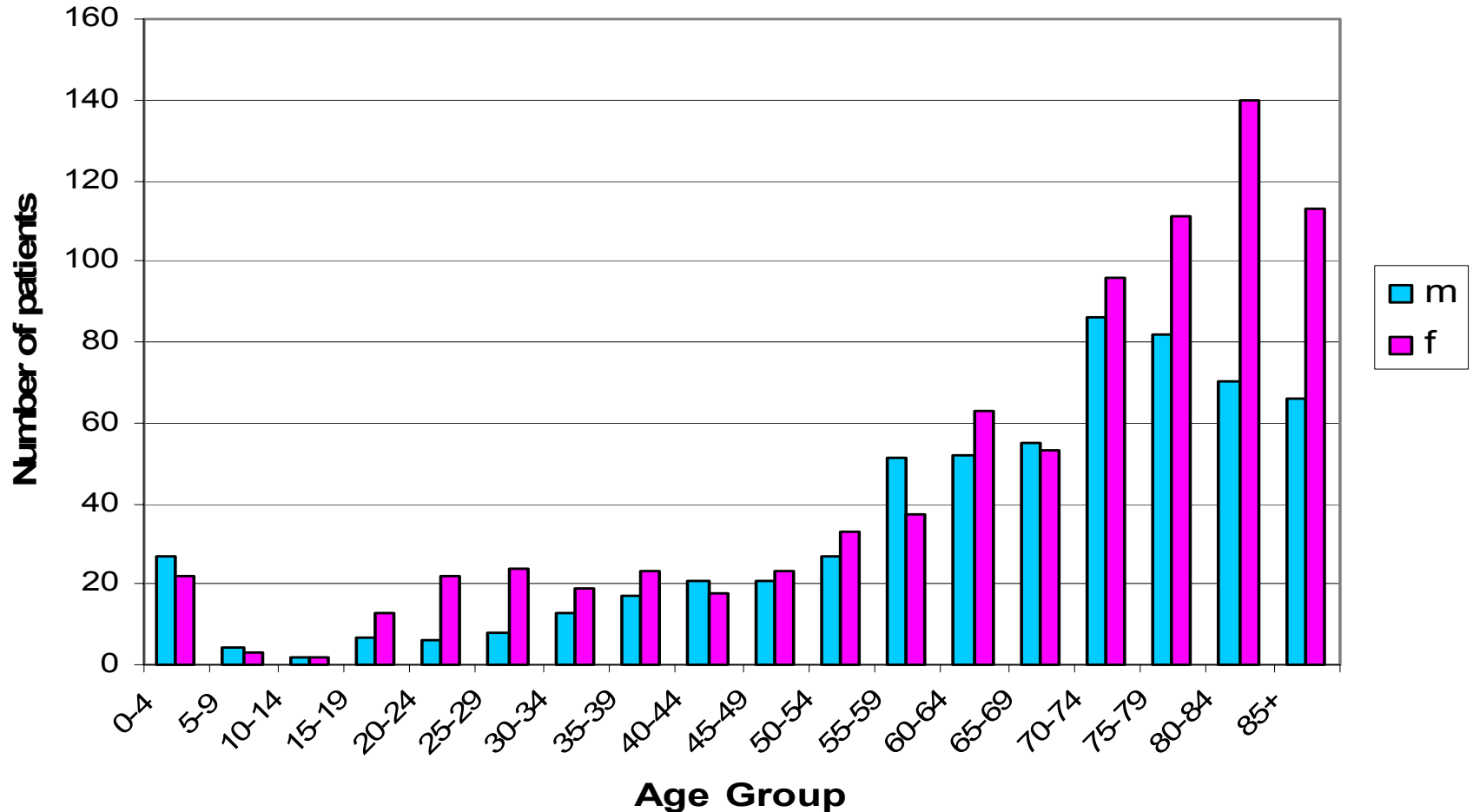
Year	Total <i>E. coli</i>	Total No. tested for all 4 mandatory antibiotic groups*	No. MDR	%MDR	L95%CI	U95%CI
2002	741	713	17	2.4%	1.3%	3.5%
2003	991	948	34	3.6%	2.4%	4.8%
2004	1256	1187	66	5.6%	4.3%	6.9%
2005	1445	1406	107	7.6%	6.2%	9.0%

MDR, multi-drug resistant – defined as resistance to 3 or more of the mandatory antibiotic groups

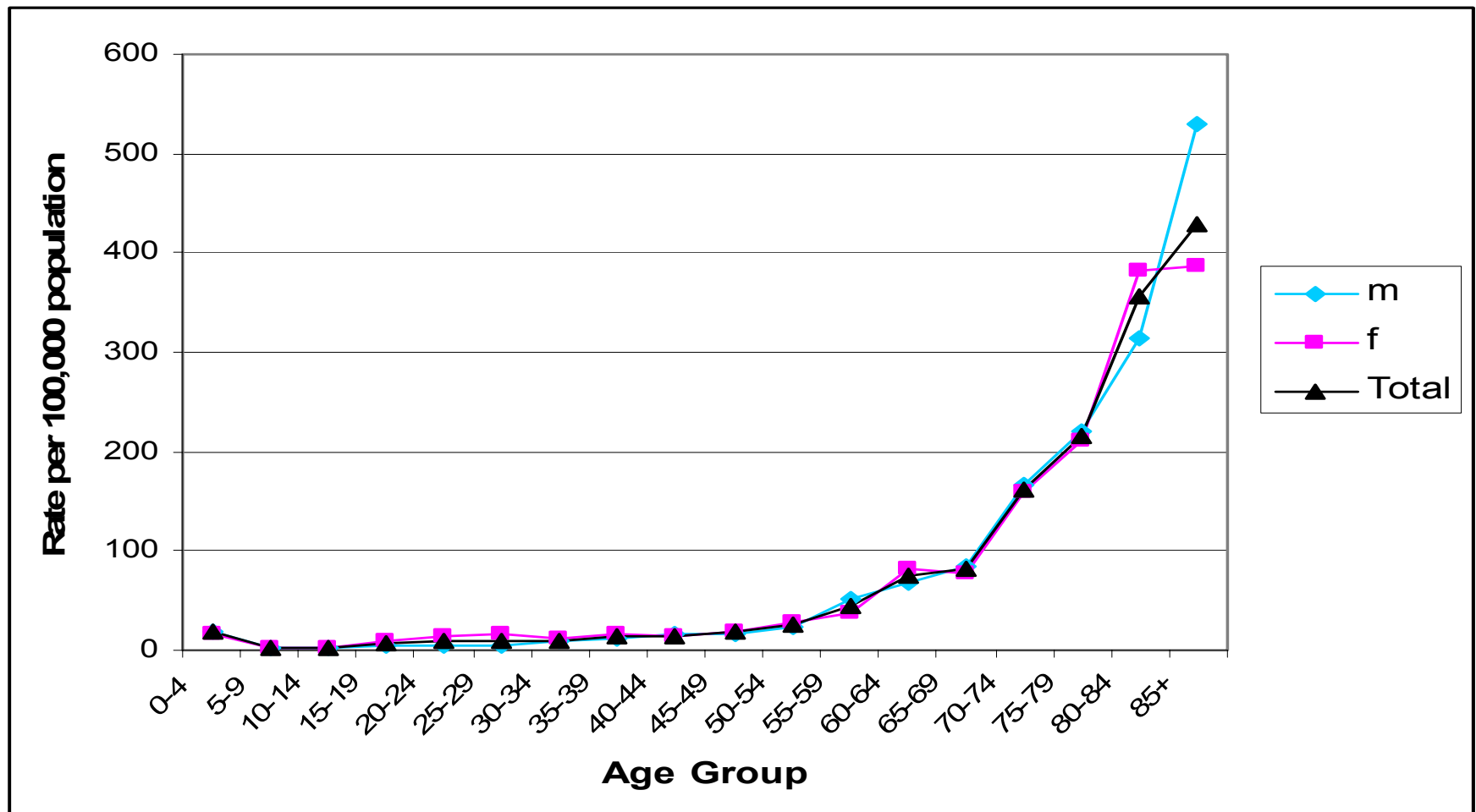
* Ampicillin, 3GCs, ciprofloxacin/ofloxacin (fluoroquinolones) and gentamicin (aminoglycoside)

The proportion of MDR *E. coli* has increased significantly
(Chi²_{trend}=32.54, P<0.001) over the four years for which
surveillance has been undertaken

Age and sex distribution of *E. coli* isolates in Ireland in 2005



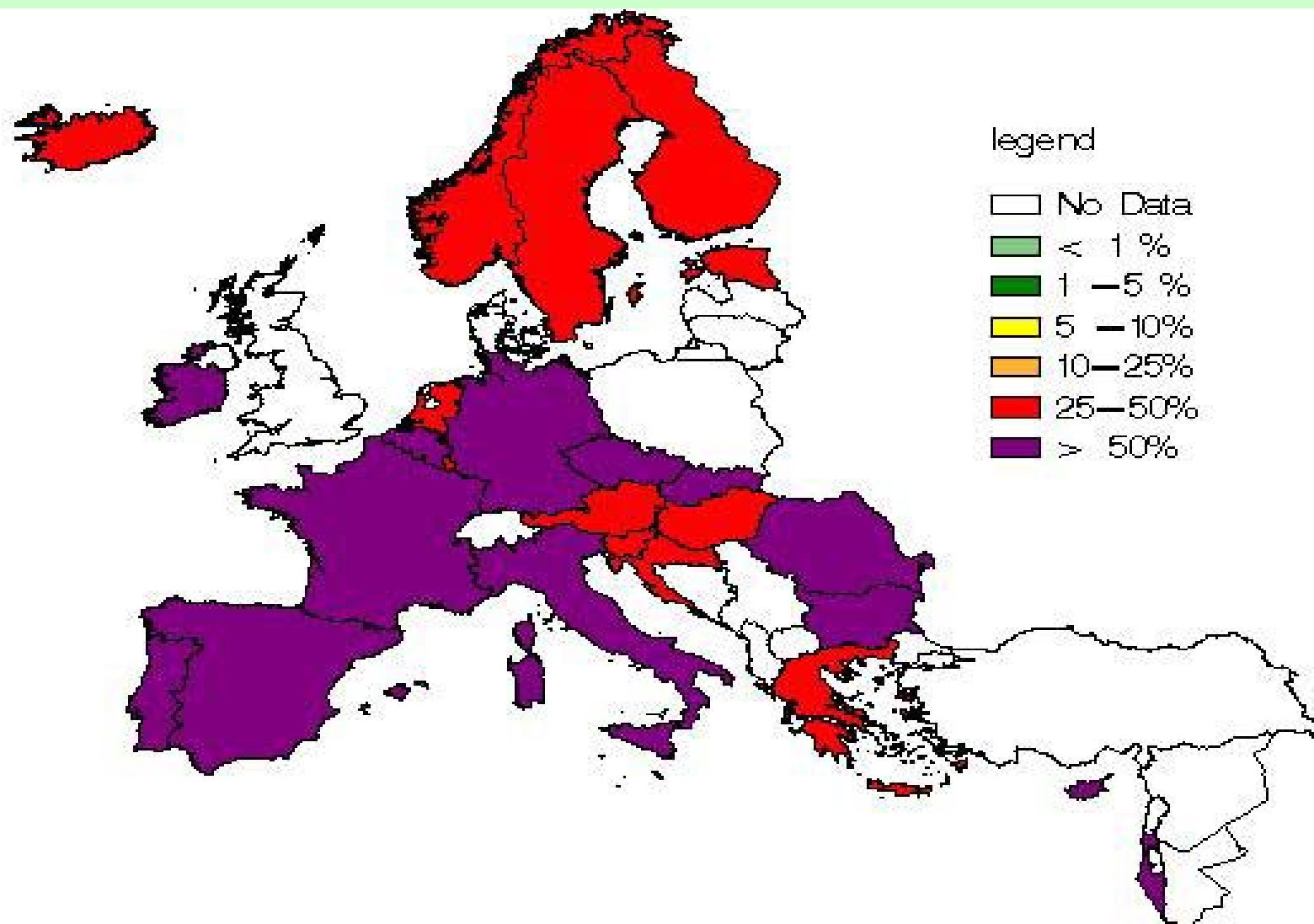
Age and sex-specific incidence rates of invasive *E. coli* infection in Ireland in 2005



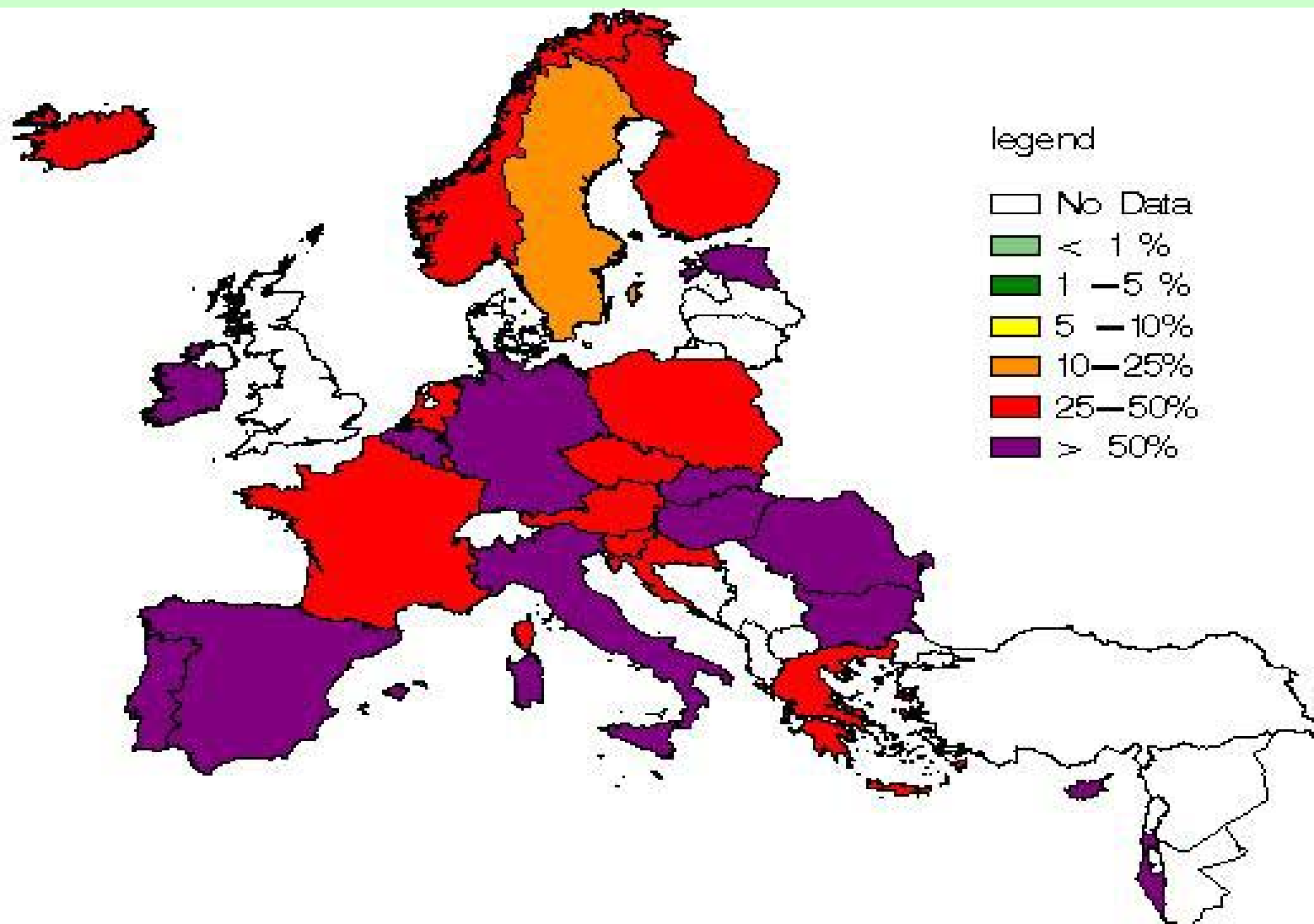
Using the 2002 census as the denominator

(NB. the estimated coverage of the Irish population by EARSS is approx. 98%)

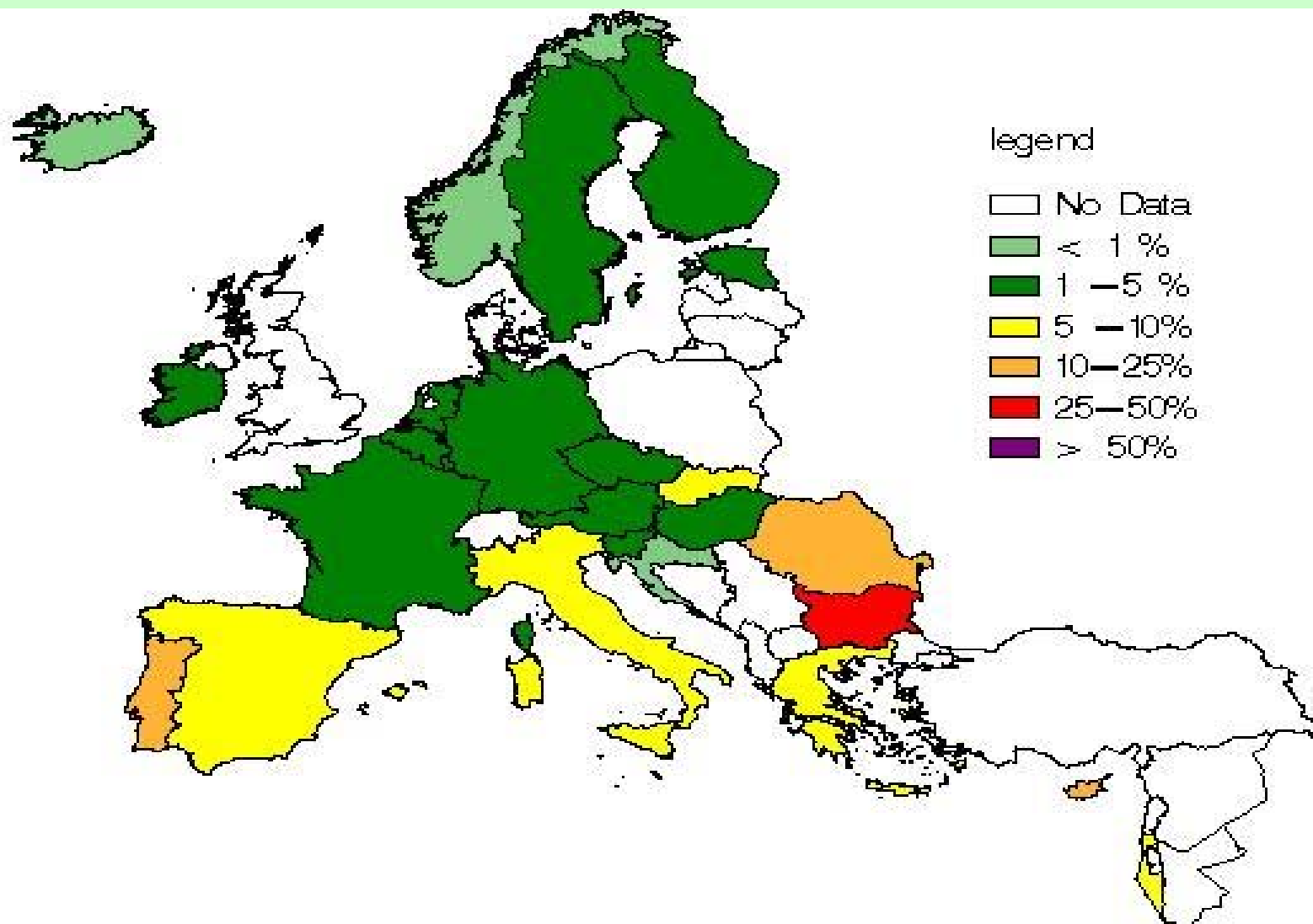
E. coli - distribution of ampicillin resistance in EARSS countries in 2005



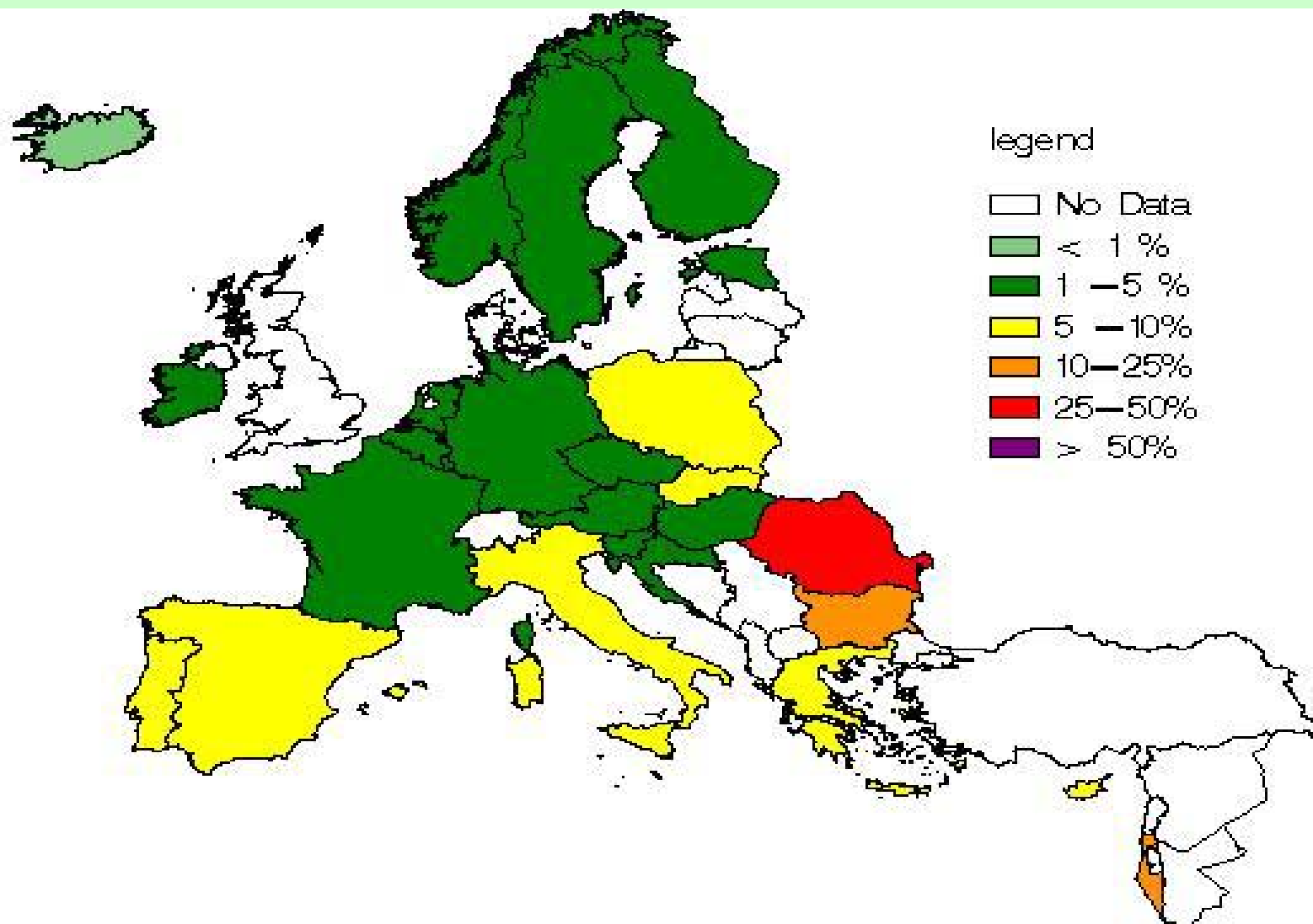
E. coli - distribution of ampicillin resistance in EARSS countries in 2004



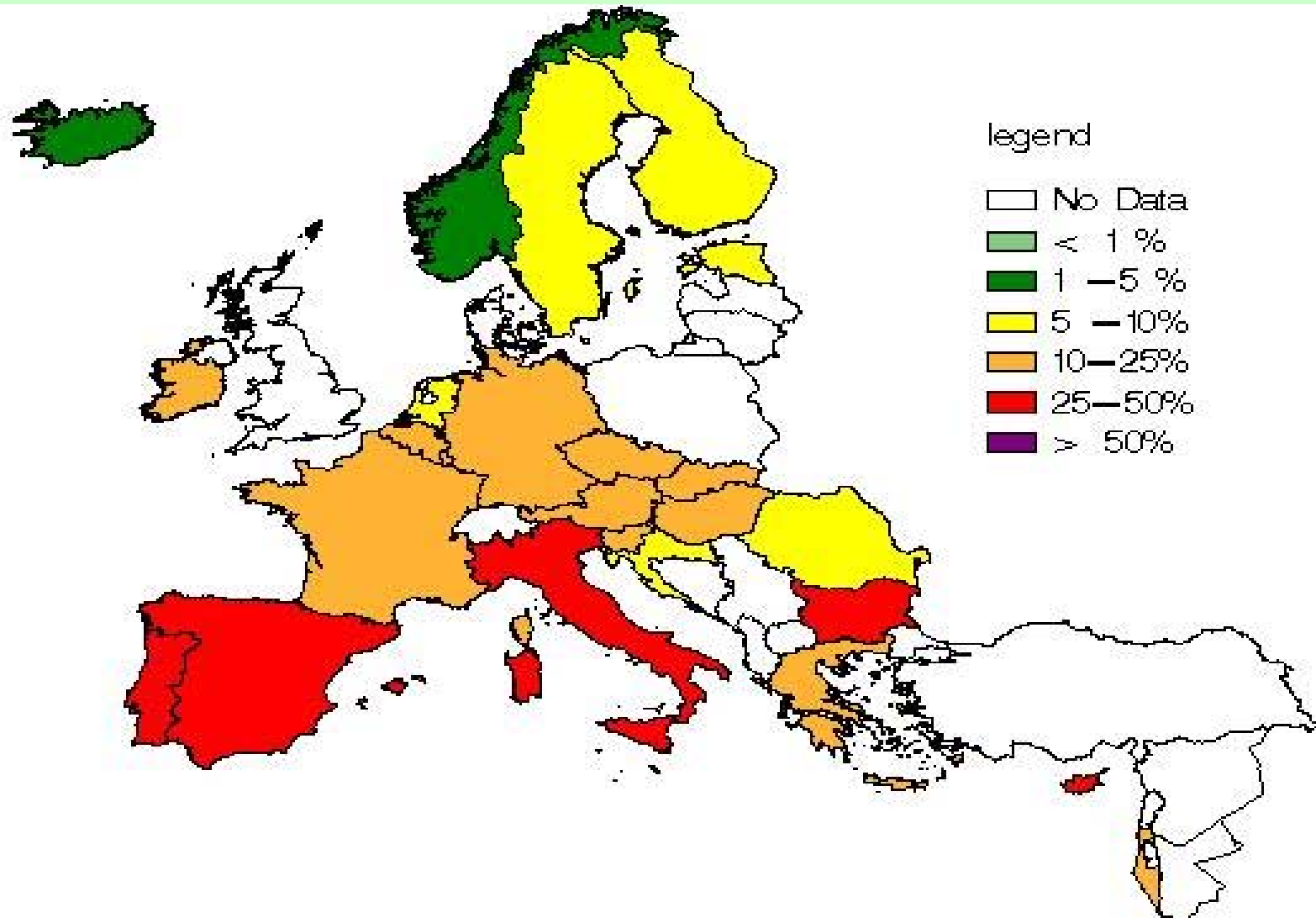
***E. coli* - distribution of 3GC (CTX, CRO or CAZ) resistance in EARSS countries in 2005**



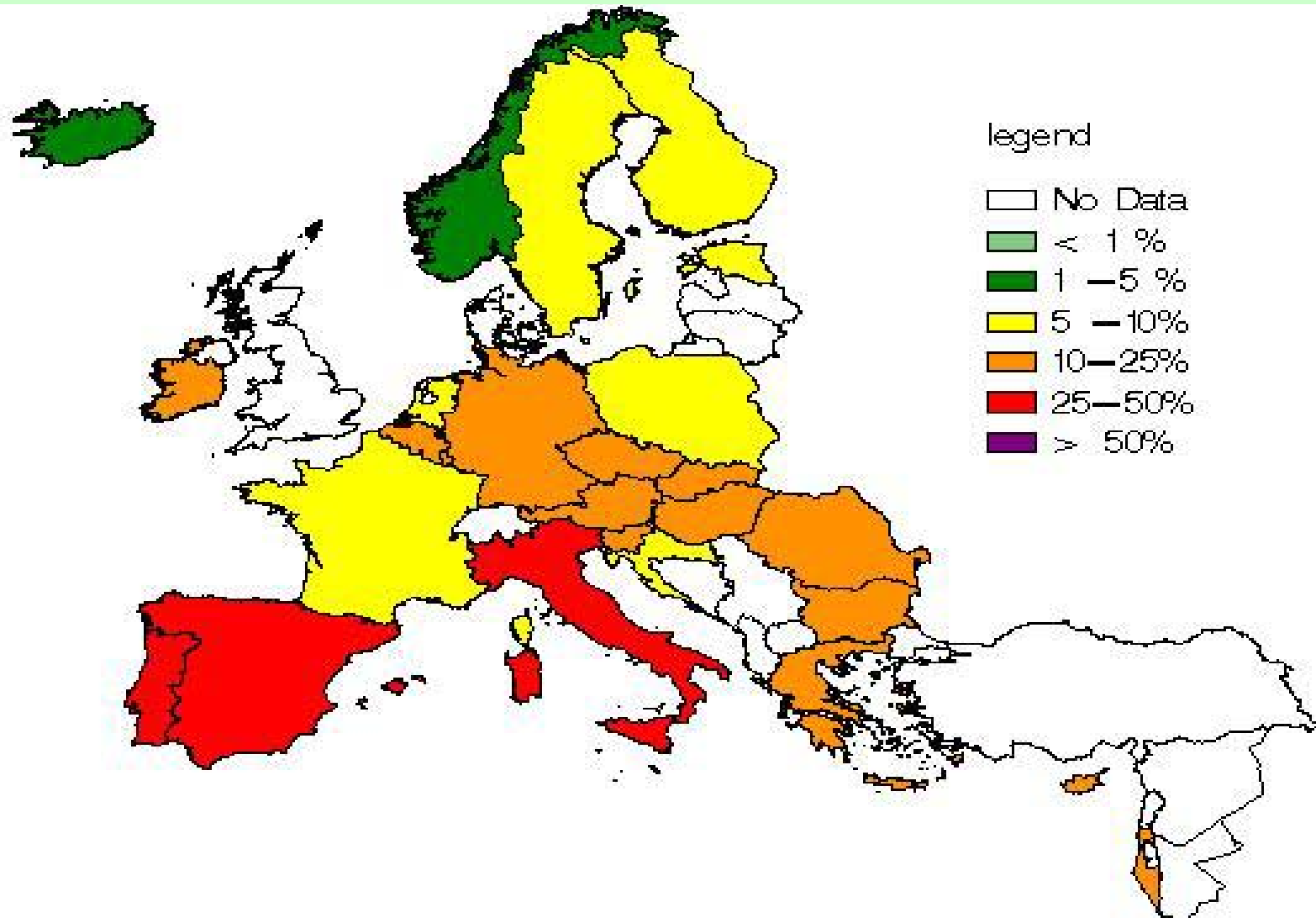
***E. coli* - distribution of 3GC (CTX, CRO or CAZ) resistance in EARSS countries in 2004**



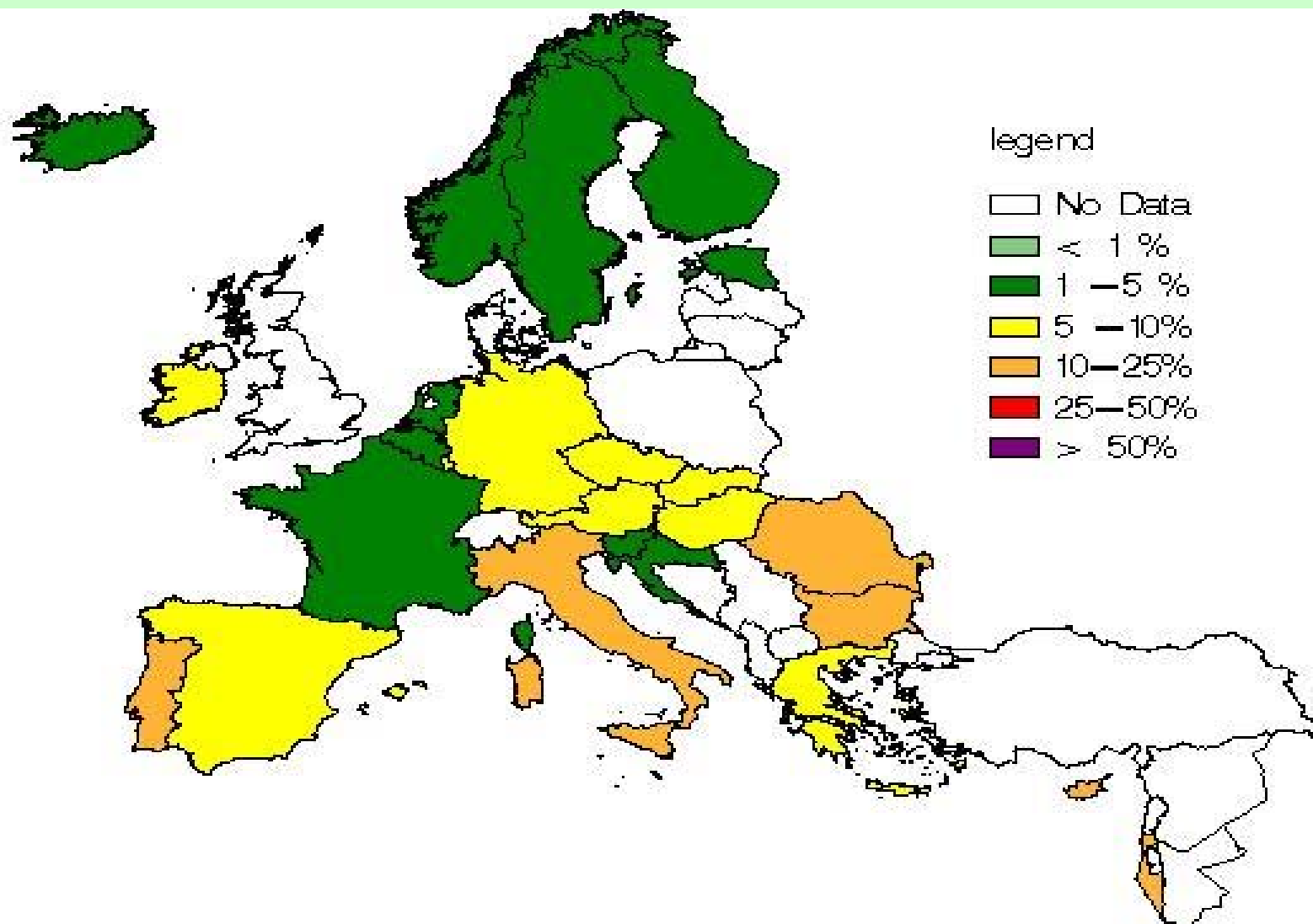
***E. coli* - distribution of fluoroquinolone (CIP/OFX) resistance in EARSS countries in 2005**



***E. coli* - distribution of fluoroquinolone (CIP/OFX) resistance in EARSS countries in 2004**



E. coli - distribution of aminoglycoside (GEN) resistance in EARSS countries in 2005



E. coli - distribution of aminoglycoside (GEN) resistance in EARSS countries in 2004

